

World Environmental
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Network

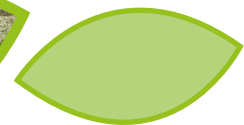


9 TH WORLD ENVIRONMENTAL EDUCATION CONGRESS
SEPTEMBER 9-15, 2017 | VANCOUVER, BC, CANADA

ABSTRACT BOOK

of the
9TH WORLD ENVIRONMENTAL EDUCATION CONGRESS

September 9-15 2017 Vancouver - Canada



organised by
World Environmental Education Congress Network
www.weecnetwork.org

and
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www.weec2017.org

ABSTRACTS BOOK

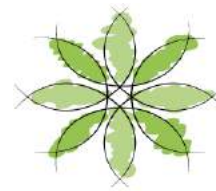
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Special Sessions: Novel Format

ID: 1045: (In)difference at the Edge: The Warp and Weft of Words and Worlds, Tracing Deep Epistemic Eco-Entanglements of Self and Other Through Métissage - Hilary Leighton, CA

A counter-narrative for difficult times, métissage invites collective, organic praxis by way of a wild hermeneutic braid of inquiry. Intended to blur, merge and often disrupt habitual story lines, this generative, arts-informed session calls us toward greater attunement of self/other in an effort to illuminate systemic issues of identity and relationship through life-writing and performance. Tangled narrative strands that speak of peoples and places, human and more-than-human nature, darkness and light, the known and the strange, juxtapose and push the hard cuticle of dualism to reveal what interconnected and earthy possibilities live in-between individual/collective and personal/planetary ways of being and becoming that we won't understand until we do this. Together, we will create a polyphonic mix of perspectives with their implications to shift understanding, shape emerging (re)search and move us to act more wisely. This workshop does not promise, we will sing, in fact (in keeping with William Stafford's 1997 poetic notion of the authentic), we may decide to moan instead as honest, vulnerable, often raw and surprising semiotic weavings coax new meaning to include yet transcend the knowledge we arrived with. Please bring writing implements and your journal and prepare to go outside.

ID: 1056: Embodying the earth: What homemade cookies and handcrafted pottery can teach us about our relationships with the planet - Kaeli Benoit, CA

Hands-on interactions with our material world play a significant role in shaping our relationship with the earth. The facilitators of this session will share a tea party on handcrafted pottery they created themselves. They invite participants to enjoy homemade cookies while conversing about the role of art in forming intimate connections with the material world and how embodied experiences shape the pedagogy of Environmental Education. Pottery serves as a metaphor for how a functional connection can forge a deep-rooted relationship between humans and the Earth. Potters, according to Amy Gogarty (2008), "cultivate and colonize interstices created outside conventional systems of exchange in order to contest capitalist domination and to demonstrate different ways to be in the world. The objects they create represent 'a bundle of relations with the world'" (p.59), that raise propositions about ethics and what it means to be human. Drawing on Kaeli Benoit's research into the lived experiences of potters, the facilitators discuss the value of embodied creative experiences and expressions and contend that "[k]nowing arises through moving, not only through perception. We move to perceive and understand" (Barbour, 2012, p. 70). We see, feel, taste, hear, touch and respond to our material world by participating directly in it. This leaves us with the undeniable impression that we are part of the world. The spirit of this session is reflected in a quote by Craig (2008): "Pottery is a conversation between friends, between the potter and the clay, between the maker and the user, between the vessel and the meal. It helps us find the common ground between apparently different cultures and teaches us about the beauty of nature and the joy of simply living" (p.26).

ID: 887: Take away coffee becomes Art To Stay - Karola Braun-Wanke, DE

Coffee serves both as relaxation and as energy boost in our everyday life. A quick coffee on the way to university or work is offered on every corner and has become an omnipresent habit and modern attitude. But the trend is not innocent at all: Every hour, 320,000 disposable cups are thrown away in Germany. This amounts to three billion cups a year. The production of these cups requires tens of thousands of tons of wood and plastic, as well as billions of liters of water. These resources mainly go to waste, because it is still a big challenge to recycle laminated and printed disposable cups. In order to draw attention to this growing waste problem, our initiative SUSTAIN IT! developed an interactive art project together with three artists from Berlin. We raised awareness for the environmental problem of the takeaway trend and sensitized consumers to enjoyable and waste-free alternatives. The art lab ART TO STAY! Have a break! Enjoy your coffee! consisted of three interlinked elements: a photo studio, a mountain of cups and a cup museum. The ceiling-high sculpture of about 30,000 disposable cups was the art lab's eye-catcher and served as a communicative stimulus. Only overproduced or misprinted cups, which were stock remainders, were used. The cup museum acted as a connecting element between the mountain of cups and the photo studio. Visitors were invited to choose their favorite cup and to enter the photo studio. Provided with a freshly brewed coffee, visitors on stage of the photo studio were able to capture their own, unforgettable moment of indulgence in a portrait. After shooting, the best picture was printed twice on-site. The guest could take one of these portraits with a cup home as a souvenir of the memorable moment of indulgence. The second copy stayed in the art lab and became part of a steadily growing photo exhibition that collected and presented individual moments of indulgence

in the university's foyer. With our art 2,000 people participated actively in the art lab. At the WEEC we would like to showcase how our artistic intervention managed to promote sustainable consumption without finger wagging.

ID: 934: Weaving Conversation Circles for New Understandings - Sharon Kallis, CA

Founded in 2013, the nonprofit EarthHand Gleaners Society develops community art-focused research projects connecting makers with materials through understanding our urban seasonal bounty. Working with plants around us using ancestral skills common to all cultures, we inspire participants to discover cultural connections, learn new skills, and discover novel sources of raw materials for creative practices, including seasonal garden waste and up-purposing invasive plants. We model How to be a Producer without first being a Consumer (Kallis 2014). This fall we launch a project called Land & Sea, posing questions such as How do we respond to rising interest in rewilding to fit cultural, municipal and environmental needs and constraints in Vancouver? Bringing together knowledge keepers, policy-, and culture-makers for both invitational and public dialogue, we use a Weaving-Conversation Circle format (tea, handwork instruction and facilitated dialogue), whereby shared handwork experiences allows building of new ways of understanding together. Engaging the body and senses through fibre work creates space for listening, thinking and responding reflectively; this approach builds relationships of trust and allows space to collectively deepen our understanding of complex issues. This 90 minute participatory session (novel format) leads delegates through a condensed version of the Circles to be held as a part of Land & Sea. Participants assist in processing stinging nettle fibres from plant stalks and collectively discuss the complexities and possible approaches for establishing foraging guidelines for cultural, environmental and municipal best-practice protocol. Accumulation of ideas articulated in this first Circle ground us as a lead-in for the project. Land & Sea addresses our community's desire to reawaken/revitalize land-based skills and traditions as a means for contemporary artistic expression while building awareness of the complex social and ecological issues that arise from land-based foraging and art practices in a post-colonized land.

ID: 935: Drawing meaning from nature: observation, symbols and stories - Robi Smith, CA

Edward O. Wilson (1984) observes that immersive exploration in nature affects something inherent to the human heart and spirit, stating that Humanity is exalted not because we are so far above other living creatures, but because knowing them well elevates the very concept of life (p.22). Often, we find that time in nature reflects back to us something relevant and meaningful to our own lives, helping us make sense of them in ways that human-centred contexts often do not. This hands-on workshop facilitated by two practicing artists will take participants outside to the oceanfront, where we will work with natural materials found on site and explore the symbolic meanings they might embody. Activities will involve close observation through a process-oriented practice of drawing (no prior experience required) as well as storytelling derived from the natural materials. Emphasis will be on how the dynamics and processes of nature relate to and teach us about our own lives, and how connecting with other life-forms is a meaning-making practice. Individual symbols and stories will be shared to find how they relate also to each other and to the larger life-sphere as a whole. In order to create a supportive and intimate context, this (preferably) 90-minute workshop is limited to 12 participants, and all materials are provided. It is suitable for educators working with all age groups.

Agriculture and Garden-based Learning

ID: 1037: Embodied Earthflow and Ecofractal Dance: Jumping Levels of Emergence while Jumping Up - A Garden Co-Encounter - Marna Hauk, US

The emergent realm of complexity thinking answers that, to make sense of the sorts of transphenomena mentioned above, one must level-jump that is, simultaneously examine the phenomenon in its own right (for its particular coherence and its specific rules of behavior) and pay attention to the conditions of its emergence (e.g., the agents that come together, the contexts of their co-activity, etc.). (Davis & Sumara, 2008, p. 34) Need for Perceiving and Working with Emergent Scales in ESE. Complexity-informed educational approaches feature studies of emergence (Davis & Sumara, 2008; Davis, Sumara, & Luce-Kapler, 2008; Doll, Fleener, et al, 2005; Mason, 2008). Emergence is the phenomenon of new scales of complexity arising from relatively simple interaction rules at more granular scales. As expressed in the opening quote, teaching and learning for emergence require cultivating the capacity to simultaneously perceive the scale of embodiment and the scale of emergence. Complexity-informed transdisciplinary and sustainability education has called for the use of arts-based and embodied methods to achieve this kind of perception of emergence (Brown, Deane, Harris, & Russell, 2010; Kagawa & Selby, 2010). Ecofractal Embodiments. Earthflow is the process facilitation of group collaborative creativity in which the biocultural nature system is a co-catalyst (Hauk, 2013a,b, 2014a,b, 2015a,b, 2017). Earthflow processes nurture and leverage biomimicry pattern languages, termed ecofractals, to perceive, explore, and express patterns of self-similarity recurrent across scale (Hauk, 2013 a,b, 2014a, 2015, 2017b). Mixed-methods research has connected embodied ecofractals with perceptive emergence and with enhancements in diversity and inclusion education, justice seeking behavior, and divergent creative production (Hauk, 2013b, 2014, 2015, 2017). This garden-based workshop invites a deep exploration of the ecofractals through embodiment to perceive and express emergence. We will dive deep and reach broadly for what have been described as transgressive, transformative, and social sustainability learning needs in times of systemic global dysfunction (Lotz-Sisitka, Wals, Kronlid, & McGarry, 2015), answering Selby & Kagawas (2010) call for social and holistic learning process[es]...for complementary and recursive use of artistic, embodied, experiential, and relational learning (pp. 242-243).

ID: 1026: Developing attentiveness and empathy through ecopoetic listening and inquiry - Susan Gerofsky, CA

In this arts-based workshop, participants will have the opportunity to explore ecopoetic inquiry in an inspiring learning garden. Scholarship in arts-based environmental education reveals deep and longlasting effects of artistic engagement with living ecosystems. The arts provide openings for attentiveness to particularities and relationships in the greater-than-human world, and enhance learners empathy and care for all beings (Inwood, 2008; Adsit-Morris, 2017). Artistic engagement requires a focusing of sensory perceptions, intuitions, memory and emotions in imaginative identification with the other. When that other is another living being, an ecosystem, or Earth itself, identification and empathy are the roots of understanding, connection and an ethos of care. Ecopoetic inquiry distills learning processes essential for this era of precarious transition and change. Ecopoetry begins from an inner stillness and the patience to engage in deep listening the same mindful practices of observation that naturalists and field biologists must cultivate to do worthwhile science. Practicing being in the presence of all our relations resonates with Indigenous ways of knowing, in respectful relationship with the more-than-human world. Presence in the moment in/with places that sustain us brings an awareness of the need to sustain and be sustained. Poetry brings playful awareness of the materiality of language and its immanence, nudging us towards powerful images and waking dreams. This workshop will introduce aspects of ecopoetic listening and inquiry, and invite participants to engage in experiences of relational and empathetic attentiveness, sensory focusing, languaging, and collaborative poem-making. There will be time to share our poetic threads, and reflect on ways that poetic processes weave into environmental awareness, ecolearning and engagement.

ID: 25: Gardening in Your Classroom - Monica Pastor, US

The University of Arizona CALS-CE Agricultural Literacy Program provides K-12 educators with research-based strategies to implement a garden food safety program as well as introduce agricultural concepts into their current curriculum. Implementing the garden safety component minimizes microbial contamination on harvested produce. The objectives of the workshop are to educate participants about food safety in school gardens to ensure produce is safe for consumption by students; utilize lessons that are aligned to academic standards; employ classroom strategies that enhance the current classroom curriculum; and encourage classroom teachers to use the real-world example of growing food crops while their

students are studying math, reading, writing and/or science.

ID: 320: Service learning through traditional medicinal and pollinator garden design - Caitlin Gilson, US

This is a service learning case study of a partnership between Bastyr University's Certificate in Holistic Landscape Design and Herbal Sciences Program and the International Rescue Committee's New Roots program. The study explores the benefits to Bastyr students and the refugee community at St. Thomas community garden in Tukwila, WA of an ecological site design and installation of a traditional medicinal and pollinator/beneficial insect garden. The goals of the project are multifaceted including 1) the Bastyr students development of professional skills in a real world setting, 2) increased community connectedness and cross cultural learning for both the gardeners and students, 3) improvement in the ecological management of pest issues onsite and 4) expanding gardeners access to traditional medicinal plants enabling the preservation of traditional medicine practices. The initial phase of this project consists of the garden design and installation in June of 2017. The complexity of the human and environmental variables in the project calls for the students use of an integrated systems approach to service learning in which they will consider multiple social-environmental feedback loops for the longevity and effectiveness of the design and installation process. This form of service learning has been shown to be effective in preparing students to deal with complex environmental issues (Simon, et al. 2013). In a later phase of the project, we will expand on the opportunities for educational interchange between the students and gardeners. Assessments of the project's success will include qualitative and quantitative assessments completed by students, organizational partners and community gardeners prior to and after the conclusion of the first phase of the project in June of 2017. This presentation would be geared to a teacher/educator audience and address core congress themes including, agriculture and garden-based learning, global and cultural diversity in EE, indigenous knowledge and EE, urban ecosystems, and social responsibility and agency/activism.

ID: 460: Food from my campus: A case study of action-orientated program about sustainable food in a university in Taiwan - Mengyuan Jen, TW

For most young people in Taiwan, when they go to university it is the first time they make their own decisions around food. Although plentiful choices of food are in and around campuses, there are many sustainable food issues such as health, food mileage, GMO ingredients, disposable tableware etc. The case study was an 18-weeks action-orientated program encouraging students to explore sustainable food issues on campus and take action to find possible solutions. The program was designed to create students' shared vision and strengthen commitment through action-based activities. The course included three stages: issues investigation, vision shaping and action planning. At first, the students defined sustainable food issues on campus including school policy of food ingredients, disposal packages and tableware, food waste, diet preference and lifestyle. After defining the issues, students visited farms and a wholesale market nearby to understand the linkage between farm and fork. After focusing on an "edible landscape" as their vision of sustainable food in the campus, students decided to take actions such as growing food, encouraging local food and reducing disposal tableware on campus. The implications of the program were (1) students were awakened to their own food issues; (2) students had much more motivation to learn about sustainable food issues; (3) students became empowered by successful action experience and had a more tangible vision; (4) teacher support and trust was significant for students in the process.

ID: 872: The right to cultivated city, between environmental education et food education : Example of urban agriculture on university campus, in France - Clarisse Pinel, FR

Since 2006, the major part of the world population lives in urban areas (according to UN-Habitat, in 2050, it will be 80% of the world's population). How to feed this growing city population? How to make them aware of the environmental and social impact of our plate? Environmental issues point to our current modes of production and consumption (UN-FAO). Urban agriculture cultivates the city but also urban dwellers. Il faut cultiver notre jardin, Candide (1759), Voltaire. The cultivated city, a new utopia for environmental education? (Urban agriculture, new integrative public policy). Urban agriculture brings multiple benefits for urban dwellers. Urban agriculture is a fertile soil for environmental education throughout its various aspects: it recreates the bond between Nature and Man (knowledge of biodiversity; cycles of seasons, of water, etc.), the bond between us and our plates content (seasonal production, provenance of the products, nutritional intake). Two main approaches to introduce urban agriculture in education include: public health policy and environmental public policy (sustainable development) For example: City of Rennes (France): urban agriculture and organic food in school canteen. City of Montpellier (France): workshop permaculture in garden with young children. Focus on the

university campus: “If you have a garden and a library, you have everything you need”, this quotation from Cicero shows the close link between terrestrial foods and intellectual foods, the essential needs. Education within university gardens allows people to cultivate the spirit by cultivating the land. And, more especially, to cultivate the bonds, between living beings. For example: University of Limoges, Limoges (France): permaculture for students and academic staff.

ID: 11: Collaborative research to enhance wellbeing through school and community gardens - Son Truong, AU

The importance of connection to nature for health and educational outcomes is firmly supported by evidence-based research. Studies have shown that residents who participate in community gardens report benefits to wellbeing, including perceived gains in social cohesion, and restorative effects, such as improved mental health. Correspondingly, there is an emerging body of literature that explores the impact of garden-based learning (GBL) on student engagement and outcomes. GBL has been found to have a positive impact on academic outcomes across the curriculum, and improve attitudes towards the environment and nutrition. In this presentation we examine a unique university-community partnership with the Royal Botanic Garden’s Community Greening and Youth Community Greening programs in Sydney, Australia. Firstly, we highlight the findings from a case study that involved the design and implementation of a GBL program with disengaged students. This pilot project involved collaboration between researchers, school teachers, GBL educators, and a small group of students in transforming their schoolyard. The students actively participated in the design, building, planting, and harvesting phases of the school garden. Data collection included participant observations, in-situ discussions, and semi-structured interviews with the educators. Analysis revealed five central themes within the GBL program: 1) enhanced health literacy and well-being; 2) building life skills; 3) engaging students in alternative educational environments; 4) connecting with adults; and 5) increasing self-esteem and social connection. We conclude by stimulating discussion on the development of collaborative practices with communities and showcasing the next phase of the research partnership with the Royal Botanic Gardens to better understand if community gardens have an effect on community members sense of community and quality of life. Our broader research calls upon a multi-sectoral approach to address spatial disparities and inequalities that may exist in the access to, and distribution, of green spaces.

ID: 527: Primary school gardens as mediators of pre-service teachers' environmental activism - John Cripps Clark, AU

School gardens are important venues for environmental education in many Australian primary schools where they are mediators in building up connections between teachers, students and members of the community and increase social capital, confidence and capabilities. Students grow, harvest, cook and eat food from the garden (and often the chicken run). School gardens have benefits for children’s eating preferences, social relationships, learning and wellbeing. This observational study investigated the self-reported effects on pre-service teachers setting up and running school gardens. Focus group interviews were conducted with three groups of pre-service teachers active in school gardens and kitchen gardens and undertaking a Master of Teaching (Primary). The students were located across three Australian states, in rural and urban schools and worked in school gardens in both a professional and voluntary capacity. Interviews were conducted using a web based conferencing program. The students formed support and collaborative structures both with each other and their communities to sustain their environmental activism. Even though they were dispersed across Australia they used communication technologies to share resources, experiences, and encouragement to set up and run school gardens in their local schools. Students reported not only an increase in knowledge and commitment to environmental education but also greater connection to schools, students, teachers and the local community. Although we have research on how school gardens affect students, teachers and the school community, pre-service teachers have received less attention. This study contributes to our understanding of how pre-service teachers are using school gardens as an important mediator in the development of their relationships with the schools that will be their future employers. Pre-service teachers work with school gardens is an important expression and reinforcer of their environmental activism. Understanding of the work of pre-service teachers in school gardens will enable more effective education of pre-service teachers.

ID: 591: Réhabilitation et Valorisation des jardins historiques : un espace d'apprentissage, de découverte et de sensibilisation collective pour la protection de l'environnement. - Loubna Chaouni, MA

La Réhabilitation des sites et jardins historiques, est l’un des outils d’éducation à l’environnement de la Fondation Mohammed VI pour la Protection de l’Environnement en réservant des espaces d’initiation, de découverte et de pédagogie environnementale. Ils facilitent aux adultes et aux enfants l’appréhension des écosystèmes à l’échelle humaine selon

différentes approches (technique, scientifique, ludique, créative, culinaire, historique). Ces espaces peuvent être des chemins pédagogiques, constitués de plusieurs points d'information, alternant de façon ludique, panneaux visuels et modules interactifs pour présenter les intérêts des sites et les enjeux environnementaux. Ils peuvent également contenir des jardins éphémères qui constitue un deuxième concept d'éducation et de sensibilisation à l'environnement. Ce sont des jardins thématiques composés de parcelles : jardin des senteurs, jardin des colonnes, jardin des parfums, arbre de vie, jardin des symboles, jardin des traditions, jardin potager, jardin des pots. Quant aux animations et jeux interactifs, ils forment un troisième type d'espace d'information, de sensibilisation et d'éducation. Différentes thématiques sont abordées pour présenter les jardins historiques : la biodiversité, l'eau, le tri sélectif des déchets, le compostage, les écosystèmes du Maroc, le jardinage écologique, les plantes peu consommatrices d'eau.

ID: 687: School Garden Learning Collaborative: the joining of formal and informal garden-based educators - *Sarah Stapleton, US*

This presentation describes a partnership in the US between a local garden-based education non-profit, a university-based teacher education professor, and a group of area elementary & middle school teachers. While the Collaborative has only been in existence for one year, the non-profit has been serving local schools for 15 years. Additionally, most of the teachers in our group have been teaching through school gardens prior to this project. Our work together has focused on the exchange of ideas and development of a support network of school garden educators. Research on the project explores the nexus of formal and informal garden-based education and the ways in which school garden spaces can be sites of convergence between formal and informal educators. The research also considers the varying affordances of formal and informal educators and the ways that these overlap in serving students through garden-based education. Given the considerable expertise within our group, we are working on an edited book in which various members of the Collaborative share their stories and insights of garden-based learning from their perspective as a formal or informal educator.

ID: 28: From Seed to Table to Actually Eating It! Impact of a Garden-Based Learning Experience in Children's Fondness to Trying and Eating Edible Plants. - *Tathali Urueta-Ortiz,*

As a garden educator and researcher, I have experienced how children's comfort levels with trying food when participating in Garden-based Learning (GBL) experiences are as diverse as the children themselves. It takes time for some of them, not only to put their hands on the soil but also to try and eat edible plants. In this presentation, I will share with the audience through children and parents voices how a one-year GBL experience influenced children's willingness to try and eat edible plants. GBL as a pedagogical tool has been used by environmental educators to teach children diverse topics. One of the preferred topics is to teach children through GBL what to eat; there are numerous nutrition education interventions reported in the literature, however, the scope of this research is limited as the majority of studies only focused on children's dietary intake of food. The approach at the one-year GBL project where this study took place is different, children experience food by planning, planting, harvesting, cooking, eating and composting, they experience the whole cycle of food production. In short, findings of my study highlight children's expressions about the way they interact with food changed, from being picky eaters to a try-out identity after participating in this one-year GBL project. It appears that being able to experience the whole cycle of food production during one school year is a pivotal element in the ways children define themselves with respect to food. Also, because of the knowledge gained in the GBL experience children recognized themselves as learners and experts on food matters. Children's voices also pointed out important issues regarding their lack of participation in the design of cooking activities and the type of edible plants that are grown in the garden. These and other issues will be discussed in this presentation.

ID: 1036: Caring Well for People and Places: Hands-on Approaches in the Community - *Shai Kroeker, CA*

Our structured, place-based outdoor learning framework integrates environmental education, sustainable agriculture and science conservation and in the Little Campbell River Watershed, and has a strong emphasis on community engagement. Selected case studies of Science, Fine Arts and Culinary Arts curriculum learning will relay how students from K-12 can be deeply engaged in exploring the natural world through their sensory skills using an experiential-discovery pedagogical approach. Learn and understand the value of scientific research and practical conservation projects of species at-risk, and how high school students and people in the community are participating in the ecological restoration of the watershed. Discover how agriculture and garden-based learning is engaging students and people from multi-cultural diversity in understanding the importance of sustainable living by re-connecting them with healthy food systems. Gain insight into how

the Community Shared Agriculture and Community Garden Network projects are able to promote local food movements (eating locally, organically, seasonally and sustainably) and raise awareness about food security. Case studies from the Farm to Families project will exemplify community collaborations with non-profit organizations and the local school district seeking to build healthy communities especially among at-risk children and youth, as well as the marginalized. See how partnership with the local school district can turn schoolyards into farmyards and develop an outdoor classroom in inner-city neighbourhoods. Preliminary data of feedback from our program participants will be shared for sparking ideas and inspiration.

ID: 1017: Aquaponics: out of the water and into the classroom - Gay Bingham, US

Aquaponics is the biointegration of hydroponics which is growing plants without soil and aquaculture which is fish production. Through Aquaponics, sustainability is achievable for the environment, the student and the commercial grower. Cross curricular learning is explored handily as biology, chemistry, physics and social sciences all play a role. Authentic and hands on learning help students and community members understand how Aquaponics can help in education and in sustainability. The audience will learn simple systems to implement immediately as well as larger systems that take more time and money. Raising money and awareness will also be discussed.

ID: 71: Global Learning in local school gardens through virtual school garden exchanges - Johanna Lochner, DE

Virtual school garden exchange (vSGE) is the international networking of learners who exchange virtually about their school gardens and related issues. The goal of a vSGE is, to use the topic of school garden to enable an exchange, which shows parallels, provokes a processes of reflection, supports intercultural learning, creates connectivity and imparts knowledge. This is one of many options to integrate and implement Education for Sustainable Development (ESD) in school gardens. ESD aims to enable children, young people and adults to think and act sustainably. It puts people in a position to make decisions for the future and to be able to estimate how one's actions affect future generations or life elsewhere in the world. In a time, which is shaped by global challenges those competences are needed. The master thesis "Global Learning in local school gardens through virtual school garden exchanges" gives an overview of experiences, challenges and solutions surrounding educational projects organizing vSGE. This is a unexplored field. Publications related to global school garden partnerships, ESD and school partnerships, as well as digital media and the author's firsthand experience with vSGE form the basis of this thesis. Seven vSGE projects have been identified through snowball sampling. Their general requirements, success factors and implementation barriers have been highlighted through standardized questionnaires and expert interviews. From this, a scheme with four levels emerged: 1) organization 2) implementation 3) schools and 4) learners. For all these levels, 29 categories can be allocated, which require consideration and may influence vSGE.

ID: 107: Climate Change and Agricultural Production program - Margit Sare, EE

The paper introduces innovative EE programs in schools related to Climate Change and Agricultural Production; implemented by Estonian NGO Peipsi Center for Transboundary Cooperation (CTC). CTC currently runs the project SAME World together with eleven European partners focusing to improve education in climate change, environmental refugees and environmental justice topics (www.sameworld.eu). As one of the new methods, we developed an interdisciplinary program aiming to create young people understanding that sustainable agriculture is one of the player in decreasing the impact of climate change. Workshop starts with the theoretical, where the presenter explains agricultural production and climate change interrelations. As a hands-on component, each child receives pots to plant different seeds. During a two-month period they have to water each pot either with natural nutrient mixture, chemical fertilizer solutions or tap water and observe and photograph the plants growth. At the end of the research, refractometer analysis will be used to measure plant sugars. Students will record the process, as a result a digital diary (Powerpoint format) is compiled. If possible, a short inquiry is made concerning agriculture production in the region, including personal contacts among farmers. The experiment of growing cereal plants and recording the process helps to evaluate the effectiveness, pros and cons of the traditional and sustainable agricultural production. This kind of experimental learning gives an opportunity for students to understand the environmental issues and the possible solutions. Workshops help students to create interconnections in order to understand the systemic and interconnected nature of today's world and make them aware of the fact that individual (food) consumption choices have an impact not only on the present, but also on the future.

ID: 747: Garden based learning in Environmental Education Centers and Networks in Greece - Fotios Pontikakis, GR

Garden based learning in Environmental Education Centers and Networks in Greece Fotios Pontikakis, Head of Environmental Education Center of Vamos, Crete, Greece. Greece has a public network of 58 Environmental Education Centers that organize seminars and workshops for teachers and adult citizens and offer environmental education programs for students. More than 1 000 000 pupils, teachers and adult citizens participated in these activities between 2012 and 2016. Many Environmental Education Centers in Greece prepared and offer environmental education programs about gardening, as there is a wide interest about gardening and cultivation of vegetables in small gardens during the ongoing economical crisis in Greece. ‘A garden at my school’ is an Environmental Education Network, originally created in the Prefecture of Chania in the island of Crete in the south of Greece and now expanding with the participation of teachers, pupils and schools from all over Crete island. The voluntary participation of teachers and students in an Environmental Education Network gives them the chance to exchange ideas with other teachers, students and schools who work in a common theme (recycling, energy, water etc). They also can present their work and ideas in an annual Meeting or Seminar of the Network. Such meetings, workshops and seminars are prepared annually by the Environmental Education Centers who coordinate the Networks. The last three years Vamos Environmental Education Center organizes a common Day of Action for Environmental Education Networks. During this day, teachers and students from schools from all over Crete organize in their school an action that has to do the theme of the year’s Day of Action (e.g. Reusing, Reducing and Recycling). Photos and reports from these and other activities of the Environmental Education Networks and of the schools that participate in these networks are publicized in blogs and webpages created for them.

Architecture and Green Design

ID: 204: How can Energy Efficiency be implemented as a Product Service System - Dirk Franco, BE

The debate on Greenhouse Gases (GHG) (and CO₂ emission connected with energy consumption/production in particular) is of main interest. Denmark is on track in view of GHG emissions, reduction of energy consumption and the share of renewables in the energy use. However for Belgium additional efforts will be necessary until 2020 to achieve the goals. Product Services System (PSS) is often considered as a solution for the environmental impact of products. It facilitates the economic grow without increasing material resources as it offers the service instead of product. Method. The CO₂ emission is very high in Flanders mainly because inefficient private and public building and too much traffic because of the rural architecture of (small) cities. The energy consumption in buildings can be lowered by means of the trias energetica. However this is often not enough. As energy can be divided into delivered energy (gas), useful energy (heat) and final energy services (heating room). It is clear that PSS is also applicable to energy aspects. The overall economic benefits should be clarified in an Energy Performance Contract (EPC) based on Energy Quick Scans (EQS). Results and discussion. The University college PXL is a front runner in view of new curricula in higher education institutions (HEI). The PXL (also as a first mover) recently decided to start a preliminary EPC study. The EQS performed in view of this study, will be reported and discussed. This possible evolution towards energy service needs a switch in mind set. It must also be accompanied with good social engineering in order to clarify the new role and responsibility of all (in- and external) stakeholders as well as for the users of the building. As HEI we want to be a catalyst to implement sustainable concepts in the evolution that is going on towards PSS.

ID: 58: 360 degrees of change: 360 tonnes of greenhouse gas emissions reduction in a school setting - Elaine Lewis, AU

A greenhouse gas emissions reduction initiative, involving a progressive series of plans to reduce greenhouse gas emissions has been successfully implemented for over five years at a primary school in Western Australia. A ten tonne greenhouse gas emissions reduction target was achieved in 2011, a fifty tonne plan implemented in 2012, and a one hundred tonne plan in 2013-2014. A two hundred tonne target was reached in 2016. To achieve these targets the emissions reduction plans involved undertaking a variety of biodiversity, waste, water, energy, air quality and social actions, within a whole school, whole systems thinking perspective. The effectiveness of this initiative is illustrated by three whole systems thinking sustainability projects conducted at the school. These projects involve local bushland, wetland and international settings and actions. Evidence relating to the depth of participant involvement, together with commitment to whole systems thinking and the overarching emissions reduction initiative is highlighted. Links to biodiversity, waste, water, air quality and social interconnections were documented in relation to emissions reductions, which were achieved through actions such as tree planting, litter collection and the purchase of solar lanterns. Overall, the initiative provided a successful example of systems thinking in action and demonstrated deep interconnections between different aspects of sustainability, both within the local setting and global sustainability contexts.

ID: 540: Using school buildings and facilities to create a low carbon future - Portia Odell, AU

While many schools around the world are currently pursuing sustainability at some level, there is often a disconnect between what is taught in the curriculum and the lived experience of the students in their classrooms and school buildings. School buildings, like many buildings around the world, are rapidly aging and becoming increasingly inefficient, leading to unnecessary carbon emissions and high utility bills. There is significant potential for schools to not only reduce emissions and save on utility costs, but the buildings themselves can also act as living labs, offering valuable teaching and learning opportunities for students. A new, innovative Low Carbon Schools Pilot Program (LCSP) in Perth, Western Australia is attempting to address these issues by helping schools to better understand their carbon footprint and how to reduce their emissions using a systematic and whole-school approach. The program enables schools to calculate their operational carbon footprint annually in a simple and standardised way, providing benchmarks and baselines for schools across the country to compare with one another. Through involving the students in this carbon reduction process, the school acts as a living laboratory where students obtain real-life data about their resource consumption and what can be done to address inefficiencies, which enables students to learn how to reduce their impact, both at school as well as in the home. Using the LCSP program as the context for this study, this research study examines effective carbon reduction strategies in schools,

the role students can play in school decarbonisation, and how students can act as catalysts for low carbon living in the community.

ID: 203: The Non Energy Benefits of Energy Efficiency for Higher Education Institutes in combination with Global Reporting Initiative accelerate Sustainable Development. - *Dirk Franco, BE*

Higher education institutions (HEI), have been growing their visibility as a key player in the promotion of Sustainable Development (SD). Often they try to make advancements in SD implementation at several domains at the same, consequently the global rate of success can be rather low. We present the results of Energy Efficiency (EE) and Non Energy Benefits (NEB) as an additional driver for the implementation of SD in two HEI. Method The Global Reporting Initiative (GRI) is often used in industrial concerns but also in HEI. Energy Quick Scans (EQS) investigate the employability of available techniques in order to reduce the energy consumption and emission of greenhouse gases (GHG) and to increase (own) energy production and flexibility. Energy Performance Contracting (EPC) benefits the building owners and users by reducing risks they would otherwise incur if they did it themselves. Results and Discussion HEI are often performing efforts at the same e.g. in terms of campus greening, curriculum renewal and research orientations. Instituto Superior Tecnico has been implementing several measures in terms of a sustainable campus. All these activities have been assessed through different indicators. This institution transposed the application of the GRI indicators to the context of HEI. The University College PXL started recently with several in- and extern stakeholders a postgraduate Energy Efficiency Services (EES). As a result of this curriculum renewal the PXL performs EQS for all their buildings. They will eventually decide to opt for an EPC. In addition the department PXL-Tech is preparing their first GRI report with selected items. We will discuss the interchangeability of the good practices of both set-ups. Conclusion EE (in collaboration with in- and external stakeholders) in combination with GRI reporting (mainly with internal stakeholders) gives additional opportunities and accelerate the introduction of SD in HEI thanks to the NEB.

ID: 233: Environmental Power Plant Project - *Micheli Machado, BR*

The Environmental Power Plant Project proposes a reflection on the importance of environmental education inside a school ambiance with the effective participation of students, teachers and the local community. In this sense, this proposal is centered within the vision of environmental education as a teaching-learning process for the exercise of citizenship and social and political responsibility, seeking to build new values and new social relations of human beings with nature, in order to form attitudes within a new perspective, which may improve the quality of life for all beings. The proposal has been carried out at the Paulo Freire Municipal School, which is located in the surroundings of the Bairro da Usina Environmental Protected Area (Bairro da Usina EPA), located in Atibaia, Sao Paulo, Brazil. The activities were based on a participatory methodology and the actions were divided into three modules: Diagnostic Module that sought to understand the local reality and the environmental perception of the actors involved; Module "Hands in the Mass", which consisted of project's execution, through practices carried out in the school environment and in the Bairro da Usina EPA; and Participatory Community Module in which the results of the activities developed in the project were presented to the local community. Since its beginning, approximately 400 children have been involved in the process involving outdoor activities, raising data on local flora and construction of seedlings nursery, organic food production and actions developed by the students themselves for environmental awareness of the community such as short film, exhibition of photos and workshops with environmental themes. The development of this project also reveals and reiterates the need to carry out environmental education programs in a conception that includes human beings and their complex interactions as part of the environment.

ID: 1011: Designing Regenerative Futures: A Lively, Transdisciplinary Design Conversation with Permaculture and Regenerative Design, Co-Design, and Embodied Gestural Studies - *Marna Hauk, US*

During this time of unparalleled danger/opportunity, post-oppositional pedagogies of radical interconnection (Keating, 2013) invite us to generate novel assemblages and conversations, across and beyond disciplinary divides. This lively experiential learning session explores three approaches for transdisciplinary imagination in sustainability: (1) Permaculture/regenerative design; (2) Co-design arts-based methodology, and (3) Embodied, gestural pedagogies. Part conversation/exploration, part experiential design charette, this session brings scholar-practitioners together to experiment with juxtapositions and synergies. We ask: How can we catalyze education for praxis in designing what Russell (2013) has called 'thrivability', aiming beyond sustainability and resilience for solutions that are anti-fragile (gets better when



disturbed), generative, and transformative? Our three approaches: (1) Regenerative design and permaculture bring systems insights to the sustainability design context. Stacking and stocking functions, reading flows across time and space, and designing for the triple ethics of people care, fair share, and earth care involve practices such as wild design, zone and sector mapping, and site-specific, multifactor visualizations. (2) Co-design brings unique offerings to the design conversation, inviting pluralistic, multi-stakeholder collectives to imagine embodied futures in particular spaces facilitated by co-design artist-listeners. As people talk, their voices merge into a complex web of interaction, illustrated with sketches and drawings on the spot. (3) Embodied, gestural pedagogies approach learning in holistic, visceral ways. Learners experience being what they are learning about, using resources from dance, theatre, poetry, logic, language and art to engage in inquiry.

ID: 1039: Innovative Participatory Urban Design and Planning Can't Be Ignored in EE - Julia Morlacci, CA

Environmental Education is failing according to professors Saylan and Blumstein (2011). Based on this premise there are possibly other alternatives such as the incorporation of participatory design and urban planning methods and Built Environment Education (BEE) curricula into EE. (Specific examples will be presented in detail from the USA, Canada, South America, Africa and Europe in the presentation.) The 1975 Belgrade Charter and the 1977 UNESCO-UNEP Tbilisi Declaration state that the built environment must be included in environmental education but this has been largely ignored in environmental education. Human settlements or the urban areas of our planet are the human ecosystem according to the UN MAB of 1976 as well is the conclusion of architects such as Joseph Luis Sert that the city is a living and breathing organism. Thus therefore the built and natural environments are connected and are one environment, that of systems within systems making up one system, the human environment. Historically the disciplines of urban planning, architecture, urban studies and others have also separated the environment or natural environment from the built environment just as EE has. Although in all of these disciplines this is beginning to slowly change but is still seen as an anomaly. In this day and age on an intrinsically linked planet we can no longer afford to view the built and natural environment as separate environments. It is not adequate to only study or educate children and youth and adults about fragmented pockets of ecosystems and community gardens in cities if the rest of the environment (built and natural) is ignored and not studied and not understood in its entirety as to the impacts of the entire structure. Connecting humans to their environment and allowing them to understand and share their connectivity is being done in the world of participatory urban planning/design and in BEE whereupon urban planning design methodologies including the formal Charrette and others that incorporate games and design-build and graphics for example are being utilized globally and this needs to be expanded into EE doctrine.

ID: 247: Sustainable Construction and Environmental Education - Micheli Machado, BR

This work sought to verify the contribution of sustainable constructions to environmental conservation, as well as to raise and analyze the relation of these spaces with the practice of environmental education. The study development used as methodology a bibliographic research and a case study was carried out at the Bragana Paulista Sewage Treatment Plant, located in Sao Paulo State, Brazil, owned and operate by the State of Sao Paulo Water Company (SABESP), which is LEED certified in the administrative building. Based on the adopted methodology, it was noticed that the benefits of sustainable construction involve the reduction of environmental impacts, besides optimizing the use of natural resources and leaving the enterprise more efficient, thus preserving the environment. However, some challenges are encountered for its implementation, such as making society aware that sustainable construction can be an economical and environmentally viable alternative if it is developed in a planned way and considering the assessment of the construction lifecycle. One of the relationships between environmental education and sustainable construction is that these spaces can create conditions for a critical ecological awareness and show that human beings and nature can coexist in a balanced way. Visits to the Sewage Plant made it possible to verify the benefits of sustainable construction; however, it was also observed that the LEED-certified administrative building is not exploited in its capacity for environmental education. Sustainable construction can be an important tool for education by encouraging a reflexive critical analysis of environmental problems, thus helping to minimize socio-environmental impacts.

Arts-Based Approaches in EE

ID: 158: Speaking 4 the Planet - *Phil Smith, AU*

Veg-in? A Copernican shift in our dreams? Making ornaments from human parts? A small-island counselling session? These have been some of the topics of talks and performances in Speaking 4 the Planet competitions. Speaking 4 the Planet is a public speaking and drama competition for high school students. It has also evolved to encompass art and video-making; it has expanded into primary schools, where it is called Kids 4 the Planet. The focus of the annual competitions is UNEP's World Environment Day theme. Speaking 4 the Planet makes an Arts-based contribution to bringing about a more sustainable world. Speaking 4 the Planet strengthens youth skills in advocating for healthy communities and a healthy planet. It mobilises students and links them to their local communities in conversation and action. This presentation will provide the results of an evaluation of the program and show students speaking and performing as advocates for an environmentally-friendly and socially-just world.

ID: 323: Animated movies as a tool for environmental educators - *Daniel Herrera Bojarquez, MX*

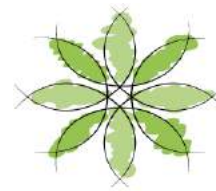
The goal of this paper is to study the potential of animated movies as an alternative to teach children and young people about environmental education. Animated films can be considered as one of the bases of the cultural and learning processes in most of the kids worldwide. These movies provide an innovative way to approach environmental topics, such as deforestation, pollution, habitat loss, and many others, seizing the appealing narrative and aesthetics of animated cinema. The first part of this work describes the connections between the plots of the movies, the narrative and their relation with the environment. Then it provides some examples of movies that fulfill the profile of an environment related movie. The last part of this paper focuses on providing strategies to teachers and educators on how to accomplish a successful dialogue with their students on this topics and the importance of complementing the projection of a movie with group dynamics and activities that reinforce the message of the movie.

ID: 256: Weaving new connections between the Arts and Sustainability: Researching children's responses to Chris Jordan's images - *Lyndal OGorman, AU*

Education for Sustainability (EfS) is fundamental for building new cultures and new environments for a sustainable future. While the future is uncertain, we know that cultural change is essential for rebuilding and reinventing our relationships with nature. Engaging and responding to the Arts provides rich opportunities for people to consider this relationships, to come to terms with our impact on the planet, and to advocate for change. Multi-disciplinary approaches such as bringing the Arts and EfS together provide contexts for experiencing powerful languages through which sustainability can be understood and communicated, a different set of tools for cultural change and education than those usually associated with EfS. Artist Chris Jordan uses his artworks depicting vast numbers of objects and pollution-affected wildlife to communicate potent messages about mass consumption and social justice. The artworks are eye-opening, confounding and confronting, yet provide access points and new connections for comprehending the realities of unsustainability. Thus confronted, the viewer has a clearer picture of reality and, potentially, increased determination to act. When mediated by empathetic educators, we believe Jordan's artworks are useful tools for building children's awareness, resilience, and capacity to instigate change. We discuss an in-progress study exploring children's responses to Chris Jordan's images. A small group of children between 5 and 12 years are participating in the study by exploring Jordan's interactive website. Responses to the artworks will be analysed in light of their potential for weaving new connections between the Arts and sustainability, and for encouraging active responses to sustainability themes.

ID: 452: EnACTment of future selves using nature and arts engagement - *Kumara Ward, AU*

Learning in the outdoors supports physical, emotional, social and cognitive development and the ecopsychological benefits of spending time in nature and connecting to place are well established. Environmental education through the arts is also an area of research that is gaining momentum as we seek ongoing ways of interpreting and interacting with the natural world. The transdisciplinary research presented in this novel session highlights the synergies between learning in the outdoors, psychological well-being and arts-based pedagogies. The study included the development of an outdoor learning program for 9-12 year old children with behavioural challenges, with the aim of developing positive future narratives. The innovative



program incorporated principles of Acceptance Commitment Therapy (ACT) with outdoor learning in the natural environment as an integral part of every session. Multiple arts experiences were adapted and implemented within the ACT approach to engage the children in developing psychological flexibility through acceptance, mindfulness, cognitive defusion, values, and committed action. Children's participation was uniquely enhanced through learning in the outdoors and the creative arts pedagogies applied. Data collection included surveys, focus groups, creative artifacts, student and teacher interviews and researcher observations. The culminating event involved a place-based arts experience with a local Aboriginal elder that creatively portrayed children living a valued life in community and place and featured mindfulness, self-reflection, ritual and storytelling and positive self-narratives. This session examines the art-based experiences from this program designed to assist children to explore values, commitment to action, and ways of connecting to self, place and others. The novel session format will afford participants an opportunity to be engaged in a mindfulness process, and in creative arts representations of their relationship to the natural world and their place in it.

ID: 449: Performance and ecological understanding - David Wright, AU

Performance processes facilitate learning that can then be interpreted ecologically. This is because performance processes construct relationships and because an appreciation of the relationships that determine learning is central to ecological consciousness. These are often thought of as human-to-nature relationships, but they are more accurately, individual relationships to sensed experience, to places, spaces and settings, to other-than-human life, to groups and communities, to personal and social processes - celebration, imagination, grief, belief and more. These relationships do not stand in isolation, they are interwoven - a place, a person, a celebration, a sound, a feeling and a memory that illuminates a way of thinking. Networks of associations arise, layers of association as well. Through sensitivity to this complex encounter with experience we can - individually and collectively - reflect upon and extend our appreciation of our immersion in ecological consciousness. Through a focus on performance learning can be brought to consciousness, embodiment can be recognized and language applied. Here performance processes of various kinds will be addressed for their potential to facilitate ecological understanding, which is the necessary precursor of effective environmental education.

ID: 614: Broadening the Appeal: integrating arts and environmental education in the Toronto Region - Rachel Stewart, CA

This session will provide an overview of the following programs, detailing both successes and inherent challenges: Voices from the Land, a two-day training for teachers, exploring the intersections between language, culture and the natural world, and celebrating our connections to the land and our relationships with each other. A partnership between the TRCA outreach program, Watershed on Wheels and Visual Arts Mississauga's ArtReach program, allowing schools to deepen their environmental knowledge, partnering each science-focused session with a hands-on art component. A pilot program running from April - June 2017 will engage four schools in the Region of Peel in Creative Nature, a project designed to engage students with their outdoor surroundings through arts-based activities. This interdisciplinary approach seeks to maximize student engagement by addressing a variety of learning styles. Using the arts as a context for learning about the environment provides rich opportunities for students to build meaningful connections with the outdoors, and to set them on a path towards sustainable citizenship.

ID: 588: Sustainable dramas for head and body - Marianne Odegaard, NO

In order for students to have bodily experiences incorporating the complexity of sustainable development issues, I want to focus on how different methods of educational drama could provide such complex arenas, and explore affective dimensions and opportunities for practicing action and agency in transdisciplinary drama. In, for instance, semi-structured role plays (see Author, 2003 & 2015), students might play out and explore decision-making situations where they must utilize acquired knowledge from a number of disciplines and simultaneously in the encounter, together reflect upon and perhaps build new transdisciplinary knowledge about issues of sustainability. UNESCO (2005) describes key features in ESD (interdisciplinary and holistic; values-driven; critical thinking and problemsolving; multi-method; participatory decision-making). Ojala (2013) also reminds us of the importance of emotional aspects in education for sustainable development. Many of these features have been attributed to learning in drama by different writers and researchers (Odegaard, 2001, 2003; Mork 2005; McNaughton, 2006; Jackson & Vine, 2013). Odegaard (2001, 2003) shows how role play can provide inclusive contexts for socio-scientific issues where students' different voices enrich the learning activity. Her studies explore how role play can offer situations where students practice negotiating values and make decisions at both personal

and global levels. Socio-scientific issues like climate change, biodiversity or gene technology all include personal, local and global perspectives. Drama and role play enables teachers to bring real life situations into the classroom and generate incidences where students can rehearse bringing factual knowledge together with values and norms in order to explore how to change existing practices (Boal, 1985; Jackson & Vine, 2013). Drama methods has also been shown to bring together fiction with contemporary science (Odegaard, 2004), where students use features of science to explore the universe of classical role characters, and concurrently creating a cultural historic resonance for a modern socio-scientific issue.

ID: 436: Enhancing and reinforcing the interplay of nature and music with elementary school students - Matthew Yanko, CA

Through a theoretical framework of autoethnography, written in the style of a creative non-fiction, this inquiry seeks to share a transformative experience of how an elementary school music program became a space for children to explore and create music in the outdoors. Informed by the philosophies and practices of the early childhood centers of Reggio Emilia, these place conscious experiences inspired participants to explore music as a language, a way of knowing and being to express, create, and illustrate their learning. During the course of this study as the students engaged in outdoor music-making endeavours, they developed a relationship with the land that, reinforced and enhanced their ideas and knowledge about the interplay of nature and music. Through the lens of autoethnography, the process of storying ourselves became autodidactic. Our shared experiences illuminated the voices of an elementary school teacher and his students. These narratives are lived tales intended to inform the reader about: (1) the ways in which music can evoke cross-curricular learning; (2) music as a language to express what can be learned in and from nature; and (3) the music soundscape of outdoor ecosystems. Thus as a scholarly composition written to reach a wide audience of practitioners, this inquiry is much more than a study of a music teacher, his students, and the Reggio Emilia approach. This inquiry situates us in experiencing the weaving of music-making and nature through the ears, eyes, minds, and hearts of young children and their teacher.

ID: 854: Artists as Culture-Makers: Educating for a Culture of Waste Reduction through Marine Debris Art - Jennifer MacLatchy, CA

Marine debris is a growing threat to all life on earth, and results primarily from human exploitation of the ocean's resources and excessive production and disposal of plastics. No shoreline, no matter how remote from human activities, is free from this plastic debris, yet still, many of us don't make the connection between our daily actions and this growing global problem. One way that some people are working to address this issue is through art. Artists are the culture-makers who conceive of creative responses and solutions, and engage and educate viewers in captivating and thought-provoking ways. Because of the abundance, availability, and variety of marine debris, many artists are using it as the materials, tools, and focus for a variety of forms of art. In addition to directly contributing to removing plastics from the ocean and remediating shorelines, these works create visual and cultural objects that serve to engage and educate the public by considering the ways in which we are all complicit in ocean pollution. This paper will briefly explore the work of a small selection of artists who work with marine debris, with the purpose of addressing the ways in which this work is an method of environmental education. The selection will include artists whose works depict marine debris and ocean pollution as captivating and beautiful, as threatening and grotesque, and even as both at the same time. It will include works that aim not only to engage viewers in thoughtful reflection in order to raise awareness, but also work to encourage viewers to engage in their own creative involvement in waste reduction. In doing this, this paper will argue for the importance art in order to make environmental education more engaging, innovative, and effective.

ID: 447: The Power of the Cow - Art + Agriculture = Food/Biosecurity, and Climate Change education in Australian schools - Lorraine Larri, AU

Many students are unaware of food and fibre production processes. Australian agriculture faces challenges in lack of understanding by urban communities about complexities involved in food production. Australia's future food security and economy is underpinned by engaging farmers with customers and the supply chain. Only then can we really work together to create long term sustainable agricultural industries. Australian teachers are implementing a program that uses creative arts and multimedia to increase student understanding of food and fibre production. Students work across curricula on project-based learning and integrate biosecurity, food security, and climate change themes challenging farming today. They are encouraged to consider agriculture related careers. Called The Archibull Prize (see <http://www.archibullprize.com.au/>), this is a play on words of a nationally significant art portrait competition. Each school gets a blank fiberglass cow and

educational resources. Student teams work collaboratively to research agricultural industries and respond to the theme, *Feeding, clothing and powering a hungry nation is a shared responsibility*. Young Farming Champions mentor and inspire students. This Poster Presentation explains the Archibull Prize and presents evaluation findings. The Program deepens students' and teachers' understanding of challenges and achievements of our farmers. It is educationally sound and increases engagement in learning.

ID: 383: The use of the arts to raise awareness among elementary school students about endangered species like the gizani of Rhodes. - *Vasileios Papavasileiou, GR*

It is an alarming fact that environmental issues nowadays are exacerbated constantly. Their solution requires action and especially, in order to be effective, needs concerned citizens who understand the consequences of local and global environmental problems on the quality of life of future generations. This research investigates whether the implementation of school programs on environmental education can contribute to the awareness of students on endangered species issues such as the gizani which is considered to be one of the most endangered freshwater fish species in Europe. It is a small spawner which lives exclusively in the rivers of Rhodes (Greece). In order to achieve the objectives of qualitative research, a school program on environmental education was designed and implemented in collaboration with the students. The planning was interdisciplinary and during the implementation great emphasis was given to cooperative methods and practical activities and actions. The project was implemented at the Second Primary School of Rhodes (Greece), from October 2013 to June 2014 with fifth and sixth grade students. The diagnostic evaluation was performed through brainstorming ideas and the final evaluation by a role-playing game. In this environmental program the visual, narrative, theatrical, musical and the kinetic approach were used of the environmental issue of endangered species especially concerning the gizani. The theatrical play, dramatized tale, song, dance, painting, cinema, poetry, photography etc were used to inform and sensitize students and the wider community. The evaluation results show that the use of the arts can be an important factor in environmental awareness as well as enhancing practical learning in the school environment and it becomes clear that environment and culture are in constant interaction. In conclusion, the arts can be a bridge between the school and the environment and proposes to emphasize its use for environmental awareness.

ID: 379: Jugar a la Sustentabilidad Ambiental - *Mauricio Guerrero, MX*

Esta propuesta de participación en la educación ambiental (EA) se suma a la secuela de otras obras artísticas en favor de la preservación del ambiente y a la reflexión sobre la fragilidad de los ecosistemas debido a la hostilidad de la civilización occidental con su entorno, contrastándolo con las concepciones de las culturas originales. El JSA propicia un proceso de comunicación que coadyuva a la EA de manera no formal haciendo una crítica al comportamiento de los tomadores de decisiones en el mundo tanto en política económica como ambiental, ya que los resultados -desde la perspectiva ética- no son precisamente los que benefician a las sociedades que representan. En esta obra nos hemos propuesto problematizar con los intereses de la naturaleza –ecológicos- y con los económicos, para transmitir a perceptores interesados en el tema la incertidumbre que se cierne sobre la humanidad y el planeta al observar el rezago de las metas planteadas en las reuniones Cumbre. Por medio de un juego de mesa tipo casino se han puesto a discusión los principales asuntos que la civilización occidental tiene en su modelo de desarrollo confrontándolos con los recursos naturales, preguntándonos si “la sustentabilidad” es sólo una panacea según la interpretación que cada quien tiene de ésta. Finalmente concluiremos que los resultados de la sustentabilidad siempre serán los mismos mientras las “reglas de juego” no cambien y esto solo a partir de la participación social consciente. Esta es una investigación en proceso, cuya hipótesis es: las artes visuales, el diseño y el juego contribuyen efectivamente a la EA ética con sentido crítico al demostrar que los intereses económicos prevalecen a los ambientales.

ID: 37: Stream of Dreams 'Fish on Fences' - *Louise Towell, CA*

For almost two decades the Stream of Dreams *Fish on Fences* program has specialized in integrating interactive watershed science and ecological education with the creation of public art generated by school age children and young people in communities across Canada. The *Fish on Fences* program educates communities about keeping their watershed healthy for salmon, people, and all creatures. The program promotes community stewardship by helping students discover their local waterway and understanding the importance of green spaces and rivers with healthy fish populations. The program provides examples and alternatives to prevent non-point source pollution in yards and homes. The program draws awareness to the sensitivity and interconnection of land and water. Stream of Dreams *Fish on Fences* is a whole school project that includes

having each student painting a wooden fish. The children transform a blank wooden fish into a vibrant Dreamfish, which then is fashioned onto the school's chain link fence to make a stream of beautiful Dreamfish. The mural becomes a legacy for the local community and a memory marker for the lessons learned in the Stream of Dreams program. Interweaving ecological education and the creation of meaningful art empowers children and families with a voice for salmon and the protection of local watersheds. The Stream of Dreams *Fish on Fences* program is a conduit for students and their community to be advocates for their watershed and stewards to protect all aquatic life.

ID: 719: Promoting Arts Based Environmental Education for Primary School Pupils in Guyana - Paulette Bynoe, GY

EE is the cornerstone for preparing young children for life through an understanding of the major global environmental problems today, and the provision of skills, values, attitudes and commitment needed to play a meaningful role towards protection of the environment with due regard to ethical issues (Belgrade Charter). Importantly, at a very young age, children need not only to acquire knowledge of the environment and its associated problems, but more importantly, to develop greater sensitivity to the local and national environment and their role in protecting it. To this end, the use of arts-based approaches are invaluable to such a life-long process that takes one from awareness to informed actions. This cross-sectional study employs a mixed methods approach, using a questionnaire survey and in-depth informant interviews to assess the status of arts based EE in primary schools across Guyana. The key research questions are: (i) What is the status of the use of the arts in EE in primary schools in Guyana? (ii) What are the perceptions of art teachers, as well as pupils, with regards to arts-based EE? and finally, (iii) What are the challenges and opportunities for promoting arts-based EE in primary schools in Guyana? The study also provides lessons learned and recommendations for enhancement of the use of the art forms for EE at the primary education level in Guyana, and if applicable, in other parts of the world.

ID: 877: Nature and Art in Environmental Education - Ana Olga Medina, PR

Ana Olga Gonzalez-Medina Guatiao Kachi Ke Ni Project Guatiao kachi Ke Ni (Friends of the sun, earth and water) is an environmental education project composed of university students from the San Juan Metropolitan Area in the Caribbean Archipelago of Puerto Rico. During the summer, they travel to Culebra Island where they develop a Summer Camp of Environmental Education for the children of the island. Culebra, as well as other islands in Puerto Rico, was used by the United States of America Marine Corps as a bombardment practice field, affecting the social and economic development of the island. The university students work as volunteers in this Summer Camp with the objective of assuming social and environmental responsibility. They offer art and crafts workshops with disposable materials for children from 5 to 13 years old. The workshops help the children acknowledge, interpret and transform their social and environmental surroundings. Through drawing, painting, molding, collage, handcrafts and guided walks in their natural scenery, they develop environmental and artistic concepts. These artistic concepts promote principles of protection and sustainable conservation of the coastal ecosystems such as the coral reef; as well as cultural values. Some of the workshops themes are marine turtle protection, global climate change, water conservation, Taino, and African cultural roots.

Early Childhood Education (ECE)

ID: 271: Complexifying child nature/culture encounters to counter the Anthropocene - Debra Harwood, CA

In this session, we critically consider our collective experiences with children and educators in three nature programs across Canada, by taking up complex ethical dilemmas experienced by our unanticipated encounters with various deaths in the outdoors, including those of baby squirrels, a raccoon, and an owl. Common-world (Latour, 2004) theoretical framing helps in positioning the child and adult as an indivisible part of the natural and more-than-natural world. This natural and more-than-natural world provides the impetus for children's and adults' increasing understandings and working theories related to sensitive concepts such as death (Mankiw & Strasser, 2013). Being and thinking with animals and more-than-humans complexifies nature/culture encounters in early childhood education and may help to challenge the Anthropocene (Pacini-Ketchabaw & Nxumalo, 2015). In re-imagining nature-culture entanglements, we posit that staying with the trouble (Haraway, 2016) disturbs sedimented embodied ideologies, so that we might listen and act differently on what we hear and see. We are working toward a more performative, storied and experimental way of being and learning together with children, learning to stay with the trouble of living and dying in response-ability on a damaged earth (Haraway, p.2). Advocating for place responsiveness, listening to multiple stories of place and staying with the trouble are proposed as an invitation for educators to confront and (re)consider the ways in which place, human, and more than human are alive and thinking (Watts, 2013, p. 21) within pedagogical deliberations. Frictions in the forests, like those depicted with our dead animal encounters, help fuel a reconceptualization of beliefs and pedagogies, challenging us all to embrace entanglements with forests and animals (Pacini-Ketchabaw, 2013).

ID: 756: From the Bubble to the Forest: Nature School Environmental Education - Barry Wood, US

The Bubble metaphor refers to the built environment of urban civilization. For children, the Bubble consists of artificial enclosures: family homes, vehicles, school buses, classrooms, shopping centers enhanced with TV, video games, and social media. Classroom education occurs within and supports these enclosures, preparing students for employment and a consumer lifestyle within the Bubble. Nature - the support system of human civilization - is pushed to the periphery, minimizing or eliminating meaningful environmental education. An important corrective occurs in the Forest School or Nature-based School, a European innovation that is spreading, though minimally, in the U.S.. Partial adoption involves one day a week ('Friday Forest Day') in the outdoors; full-scale adoption entails outdoor education five days a week. Locations vary from 3 acres at Maple Ridge Outdoor School, British Columbia, to 150 acres at Bosque Escuela la Olimpia, Puerto Rico. Settings include parks, reserves, beaches, arboretums, or donated acreage. Richard Louv has summarized Outdoor Education's value as supplying Vitamin N (Nature) and a cure for what we might call Bubble Disease or nature-deficit disorder. Various studies have documented Nature School benefits - physical, psychological and emotional. But this movement from Bubble to Forest has a broader purpose beyond benefit to the child. As severe environmental disruption continues - global warming, resource depletion, water shortages, deforestation, and loss of biodiversity - we need a huge contingent of professionals imbued with broad and deep environmental experience and wisdom. Tomorrow's environmentalist need lifetime preparation, beginning with facilitated escape from the Bubble to Nature at a very young age, followed by a continuous scientifically-informed, environmental education that brings the profound importance of the natural world back in focus. The Forest School today may be our best hope for building the experience, knowledge, and environmental ethic necessary for tomorrow's educated environmentalists.

ID: 371: Pedagogies for Sustainability in Bush Kinder - Fran Hughes, AU

While there is a growing awareness of the need for children to spend more time in natural settings, the pedagogical link between education for sustainability (EfS) and nature play requires further investigation. The assumption that children's connection with nature equates with (EfS) is a key issue, as is educators' understandings of their own pedagogical roles in relation to a nature sustainability nexus (Elliott & Davis, in press). This doctoral study explored how the links between nature and sustainability are perceived by early childhood educators in bush kinder settings in Australia, and the implications for their pedagogy. This study evolved from my concerns about how slowly the early childhood sector has addressed sustainability issues (Davis & Elliott, 2014) and the lack of curriculum guidance around Early Childhood Education for Sustainability (ECEfS). Australian policy requirements for early childhood education (ACECQA, 2013) promote stewardship, respect and care, but often the romanticised sensory immersion in nature discourse is the route

promoted and subsequently taken by educators. With the rapid growth of Australian bush kinder programs I argue that the time is right to question whether EfS is being implemented, or are educators assuming that connections with nature are enough to develop strong approaches to EfS. Using a social constructivist theoretical framework, a methodology based upon Participatory Action Research (PAR), Appreciative Inquiry (AI) and Case Study was employed. Data in the forms of individual interviews, focus groups, reflective journals and field notes from participant observation were collected over a six-and-a-half-month period where insights into the perceptions of the educators about sustainability and nature pedagogies were gained. Initial study findings suggest that the distinctions between nature and sustainability were often not easily identifiable by the participating educators and there is a need for cultural change to rethink pedagogy in bush kinder.

ID: 65: Environmental education and knowledge about the water cycle among Pre-service Teachers - Abidelfatah Nasser, IL

Water is a very important substance for sustaining life on earth and its unique properties are responsible for the formation of life as we know it. Therefore, the water cycle is an important concept in ecology, natural and environmental sciences. A large portion of Environmental Education research that has been carried out in the last two decades, focused on identifying "misconceptions" or "alternative concepts" related to environmental concepts and phenomena. Misconceptions also exist regarding the water cycle and they may be conceptualized through personal experiences or due to exposure to misconceptions in school, textbooks, and the media. No doubt that teachers have a critical contribution to students' knowledge about the environment and environmental phenomena, hence their misconceptions in this regards are likely to pass on to their students. Therefore, it is imperative to identify and correct prospective teachers' misconceptions before they become active teachers. This study was performed to evaluate the level of factual knowledge and the prevalence of misconceptions among pre-service teachers concerning the elements and processes of the water cycle and the influence of human activities on water quantity and quality. Another purpose of this study was to compare the level of factual knowledge and the prevalence of misconceptions concerning the water cycle among pre-service teachers specializing in different disciplines. The sample consisted of pre-service teachers specializing in preschool, languages and natural sciences education from an academic education college in the center of Israel. The majority of participants (98%) were females and their age was 19-23 years. The study focused on the following variables; type of misconceptions, the most prevalent misconceptions and the prevalence of misconceptions among pre-service teachers from different disciplines. A multiple choice diagnostic test was constructed using misconceptions concerning the water cycle which were detected in a group of pre-service teachers' responses to eight open-ended questions concerning the water cycle. Participants in the current study were asked to answer 21 questions on the diagnostic test and their responses were analyzed to address the research questions. The results revealed the overall scores recorded for the pre-service teachers on the multiple choice diagnostic test was 46.53% 19.1%. It is important to emphasize that the lowest percentage of correct answers were recorded for items regarding the processes involved in the water cycle, whereas the highest scores were recorded for the influence of the anthropogenic activities. More specifically, the highest percentages of correct answers, 72.9%, 70.8% and 62%, were recorded for the questions concerning the sources of groundwater, how the clouds are formed and the difference between the structure of vapor and water, respectively. The lowest percentages of correct answers were recorded for the questions "what is the fate of water in a glass in the refrigerator?" and "what causes the difference between water and vapor?", which represented items related to processes. Self-experience was the frequent source of pre-service teachers' information regarding the water cycle. Whereas, the media was the least utilized source of information. Findings revealed that, the frequency of misconceptions regarding the water cycle was higher among non-science majors (53.7%) compared to science majors (21.2%). The results of the present study exposed the need to impart knowledge and awareness concerning water issues among pre-service teachers in order to raise their awareness concerning environmental issues and to prepare them properly for their future mission as teachers and educators. Preservice teachers' proper knowledge regarding the water cycle phenomenon is critical for educating young people regarding the water cycle and its vital place in the entire cluster of sustainability concepts, principles and practices. The importance of educating people regarding the water cycle is in line with the framework of the UN Decade of Education for sustainable development, within which water issues were identified as a key priority among issues related to Education for sustainable Development (ESD) (UNESCO-Connect, 2003).

ID: 518: Teachers Praxis As A Way To Understand Environmental Education – Marilia Campos, BR

This research is focused on the insertion of environmental education in the school scenery, approached by the teaching leading role point of view. The teachers vision gives numerous contributions to comprehend several phenomenon that occur inside the teaching institutions, since each educator possesses their own references, knowledge and personal history. To



understand the trajectory of each subject, it's necessary to consider it in connexion with the social ecosystem where it is shaped, and for that is something unique, not repeatable and it is framed by the socio-historical circumstances. Subsequently, the insertion of environmental education on the multiple life spaces, and especially in the educative-formal scenery, where the teachers develop their professional activity, points an alternative to the current environmental crisis. The trajectory and experiences related by the teachers are a source of pertinent information for the improvement of the initial and continuous training of the teaching staff, since their own reflections point to deficiency on this area.

ID: 568: Environmental Educators as Sustainable Behavior Change Gatekeepers - Anna Kettunen, FI

SYKLI Environmental School of Finland has developed the Study Program for Environmental Educators in 2010. The studies take 1.5 years. In addition to contact teaching (15 days), it includes distance learning and online study as well as developmental assignments related to the student's own work. Since 2011 almost 500 students have started the study program and 200 have graduated with vocational qualifications. The majority of students have been working as experts in early childhood education and in other fields like teaching, as nature guides, youth workers and consultants. This study program has a remarkable impact on Education for Sustainable Development (ESD) in Finland while making the global action programme on ESD a reality. During the studies, students gain background knowledge, vision and practical methods for providing effective environmental education (EE). The work of the environmental educator requires, in particular, pedagogical competence and a wide-ranging knowledge of nature and environmental issues. The work requires good social skills, such as interactivity and cooperation and creativity. Over the course of studies, students draw up an EE plan and a sustainable development program at their working place. While making the education plan, students familiarise themselves with the fundamental principles of EE, its concepts and the theoretical models. For example, our students took part in creating the new curricula for early childhood education. The sustainable-development program gives tools for sustainable behavior change. Motivating the work community and strengthening their sense of ownership in the process are an important part of the studies. During the course students also plan and carry out EE events for different target groups including children, parents and colleagues. As a result, many outdoor learning methodologies used in EE (and ESD) have become familiar to kindergarten teachers and child care workers in Finland thanks to this education.

ID: 626: Being Outdoors in Norwegian Kindergartens - Tuula Skarstein, NO

Norwegians have a strong tradition for outdoor life. Accordingly, outdoor play and exploration in nature have a significant place in the curriculum for the Norwegian kindergartens. An important objective in the curriculum is to encourage children's love and understanding of nature and, through this, aid them in their first steps towards understanding the significance of sustainable development. Several previous studies indicate that children in Norwegian kindergartens spend a considerable amount of time outdoors each day throughout the year. Our study takes a closer look at how this time is used. Through a survey and group interviews with educators from eleven Norwegian kindergartens, we collected information on what kind of themes within science and physical education the educators focus on during the outdoor time. We also looked into the differences between time spent in the outdoor area of the kindergartens and time spent on excursions in nature outside the kindergartens playground. We hope that our study can contribute to the discussion on the importance of play and exploration outdoors and the educators' awareness of place-relational pedagogies.

ID: 147: Forest school programs: A review of the literature on this growing movement - Elizabeth Boileau, CA

Forest school outdoor educational programs are rapidly gaining popularity in Canada and around the world (Sobel, 2016). In Canada, over the last five years, around 160 practitioners have completed forest school practitioner training and over 40 sites are now offering programs (Child and Nature Alliance of Canada, n.d.). Forest school programs offer children, usually of preschool age, an opportunity to explore and discover a local patch of forest or other natural environment. This educational approach aims to promote children's holistic development through play-based inquiry and increase their awareness of natural history (Knight, 2013). Many parents and practitioners, for various reasons, are feeling drawn to this alternative approach to conventional care of young children. However, very little research to date has been conducted on forest school programs. As this movement grows, best practice needs to be guided by a strong theoretical foundation as well as empirical research. This is why a review of the literature on forest schools is warranted. I will present the findings from a rigorous review of research on forest schools programs (e.g., Elliott & Chancellor, 2014; Murray & Brien, 2005; Ridgers, Knowles, & Sayers, 2012) and other similar programs such as nature kindergartens, nature-based preschools, and forest preschools. As Larimore (2016) notes, all of these fall under the umbrella of early childhood environmental education, a



growing field of research (Somerville & Williams, 2015). Preliminary findings of my review show that forest school programs have a positive impact on children's development and on their environmental attitudes. The forest school literature does not, to my knowledge, cover the complex multispecies interactions that occur when children play in an area shared with other living beings, although a commonworlds framework is increasingly being used to study young children's relationship with nature (Common Worlds, 2015). As a contribution to this field, I propose to address this gap in my doctoral research. Therefore, participant's questions and comments following my presentation will be used to help guide my doctoral research proposal.

ID: 691: Teenagers and toddlers at forest school - Irit Lador, IL

Those who arrive at the gates of the nature park at Ramat Hanadiv on Fridays are exposed to a rare sight: a group of teenagers spending time with kindergarten children. This is an exceptional collaboration between students from the Moshava High School in Zichron Yaakov (Israel) and Hashita kindergarten as part of a new Junior Rangers program which opened this year at Ramat Hanadiv. The young instructors accompany the children of Hashita kindergarten on a "Day in Nature" program every Friday for outdoor learning. The activities take place in the nature park of Ramat Hanadiv, where they play in the natural area, climb trees, search for insects and animal tracks, and follow the changes that have taken place in area. This program is part of the overall educational approach of Ramat Hanadiv, whose goal is to assimilate principles and content for learning and living in natural spaces through training courses and educational programs.

ID: 941: Imitations Role as a Pedagogy for Environmental Awareness and Outdoor Skill Development: From Indigenous Practices to Canadian Forest Schools - Zabe MacEachren, CA

This paper uses multiple inquiry methods to explore the importance of imitation in the development of environmental ethics and skill in young children. An initial study on the outdoor skills of emerging Forest School practitioners in Canada lead to a further examination of educator's pedagogical understanding of the ways imitation is an effective learning tool. This research makes a comparison between the learning capacity available when students are in the vicinity of adults demonstrating exemplary environmental behavior and skill (i.e. Indigenous cultural practices required to live off the land like food acquisition and tool production,) to the capacity offered in conventional Forest School settings where child and play centered learning, and place-base inquiry focuses on verbal and written representations. Archival film footage, historic photographs and narratives from Indigenous people interactions with the land (pre the introduction of residential schools) provide the data by which the contemporary emphasis of child and play centered learning is examined. Selected data from the study will be used to deconstruct and illustrate what is lost when adults do not model environmental-based practices, like that of First Nation cultures living directly from the land and passing on practical skill to their young through effective role modeling. The study introduces some ideas by which to critically examine the child and play-centered pedagogy of many early childhood education programs in light of the pedagogy frequently associated with traditional Indigenous practises that honouring the wisdom of elders. The presentation will propose a Child Adored, Elder Respected (CAER) basis for Forest Schools in North America and specifically Canada.

ID: 279: Understanding the children's ecosystem interrelationship through 'the Living things in the park' Project - Okjong Ji, KR

One of the important values to be addressed in early childhood environmental education is the "ecosystem interrelationship" proposed by the LEC as the second principle. The purpose of this study is to reveal how young children (5 year olds) perceive 'ecosystem interrelationship'. To achieve this, eight early childhood education institutions conducted the 'Living things in the Park' project. It happened from March to May 2016 in a park near their institution and under the supervision of the researcher. The data collected were the reflective journal written by the teachers during the project, records of the five meetings between of the teachers and researcher, records of the visiting researcher's institution, and the works of the children during the project process. The data analysis was done by the qualitative analysis that synthesized all of these. As a result of the research, understanding of children's ecosystem interrelationships was gradually identified by stages: no understanding stage; faintly understanding stage; the understanding stage of interrelationships between the two, such as 'cherry tree and ant', 'ant and soil'; and the understanding stage - the interrelationship of the park's whole ecosystem. The final development stage of this understanding was different according to the institutions, and it was found that the teacher's proper intervention & scaffolding was the important factor to the children's understanding of 'ecosystem interrelationship'.

ID: 339: Music and play as methods for ESD in early childhood education - Maire Turunen, FI

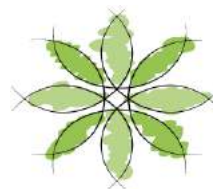
Music is very important to children and they are naturally attracted to it. Children enjoy singing and dancing, and music also responds to children's urge to move. The benefits of music in early childhood are widely known; for example, melodies and rhythms exercise the brain while stimulus to neural pathways is associated with abstract thinking, empathy and mathematics. Music affects especially the emotional side of a child's life and helps processing information in a playful manner. Environmental School Polku in Finland is part of Helsinki Metropolitan Area Reuse Centre Ltd and has been exploring the use of music as a method for EE in early childhood education. A new art based educational session 'Earth-play' has been launched for kindergarten use. It shares evidence-based knowledge about our environment combined with songs of folk and indigenous tradition. More than that, it invites children from age 2 to 7 to share a moment around planet Earth by singing, moving, discussing and making imaginary exercises dealing with the emotional side of the matter. How does it feel to be a polar bear in the Arctic, a seashell in the ocean or a tiny seed aspiring to become a tree? The importance of protecting the environment is taught at the children's own level of understanding. The session is held around an Earth-shaped canvas with inspirational activities and tasks helping the storyteller to engage with the children. Feedback from the pilots has been overwhelmingly positive. Arranging the session is very practical and sustainable: the materials fit in a rucksack and can be carried to the kindergartens using public transport. Duration of Earth-play can vary from 30 minutes to one hour depending on the age of the children and group size. Preferably it is between 10-20 children.

ID: 364: The Art of Reading the Storied Landscape of Childhood - Victoria Finucane-Bell, CA

In my role as Early Childhood Educator at a full immersion, outdoor preschool I held great value in the power of story as a means of communication throughout our community. At the start of the school year traditional storytelling was implemented to create a common bond and sense of belonging among young children who would be expected to travel together in a group through unfamiliar terrain. As we travelled and started to notice the details and intricacies of our wonderful environment, the stories became our own. Now based upon our theories and first hand, sensory experiences they became the glue connecting us to place. Waiting for friends at the Decomposing Rat or stopping to guess the mood of the Tree with a Face eased transitions, in fact they enriched transitions. Driven by curiosity and stoked by imagination, the children experienced nature play through a storied lens. Responsive and multilayered settings provided a stage for rich, creative play and with time and familiarity deep, personal connections to place were formed. As the children peeled back layers of learning they discovered that this place did not belong to them, they were spending time alongside birds, insects, industrious worms, decomposing logs... a busy, breathing earth. In this unconventional preschool setting where the learning wasn't always obvious, I felt it my responsibility to capture our rituals, theories, adventures and misadventures in stories to share with a broader audience to try and answer those adult questions: What did you do today? What did you learn? Even though, relaxing in the grass with our tight knit group of adventurers the questions were: How do you play a part in the story of this place and how does this place play a part in the story of you?

ID: 1006: Potters' Children: Environmental Education Of Children Through Sequences Of Teaching And Learning - Cesar Nava, CO

Introduction: The Martina school (Tausa, Colombia), has for two years developed a strategy of environmental infantile education, through Sequences of Teaching and Learning (STL) with approaches in Science, Technology, Society and Environment – STSE. It is designed to facilitate the children's exploration of their land, knowledge, value and use of its natural resources, as well as their interactions with family and community vis a vis its use of clay. Objectives: Through fun and creative experiences, generate in children the knowledge of how the soil in the area is transformed and used. Methods: The investigation is quasi-experimental. There develops a STL based on the cycle of learning and applied to the work with the clay: To extract the previous conceptions; to wrap the children who assume the workers' pottery roll, to explore and to explain situations; to prepare stories about the history of the clay in the path; to extend learning to its contexts (creativity) and to evaluate the learning processes. Focal groups are realized with the parents on the sustainable bricks production and interviews to the children. Results: The results suggest that the application of the STL, strengthens the construction of conceptual knowledge, the development of practical and artistic skills and learning to coexist with the natural, social and cultural way in balance and harmony. The students investigate, interact and value the resources of its natural way, transforming them in an artistic way into useful objects in its routine character. There develops an environmental education based on the place and local outdoor learning.



ID: 841: Drawings as a methodological tool to evaluate knowledge and attitudes towards animals in kindergarten children - *Antonio Fernandez Crispin, MX*

Among the skills that are expected to be developed by Mexican preschool children (kindergarten) are those of observing natural phenomena and acquiring positive attitudes towards environmental stewardship. The most common assessments of their environmental knowledge and attitudes are tests and questionnaires, but not all preschool children are able to read and write. However, drawings are an ideal methodological option, because they go beyond language barriers and socio-economic context. This research focuses on children who are finishing preschool and are aged 5 to 6 years. The study was conducted in rural and urban schools located in Puebla Municipality, Mexico. The research question is: How do the third grade preschool rural and urban school students in Puebla Municipality, Mexico, represent their environment through drawings about nature? The study also evaluates knowledge and attitudes about animals. There was a total of 233 drawings. Most drawings are in Schematic Stage. Children identify many environmental elements, and prefer to draw open environments and characters that are usually happy. Few environmental disturbances are represented and consequently few pro-environmental actions. Children represented 86 kinds of animals, of which 67 were deemed bad and 61 good. Most animals were represented in both categories. An aggressive animal was largely considered bad, a characteristic generally associated with predators. In contrast, an animal was deemed good if it is not aggressive or does not eat meat. Children in urban schools usually cannot explain why an animal is good or bad, they even gave evasive answers. By contrast, children in rural schools gave more specific answers. We believe that children's contact with nature as part of environmental education could help their caring about biodiversity.

ID: 216: ESD-Coalition of Kindergarten and Community for Energy Transition - *Ute Stoltenberg, DE*

The urgent need for energy transition makes it incumbent on educational institutions to also address this task. Model-Projects based on ESD have already established the potential of this issue as contributing to the quality of early childhood education. The project, KIEN Kindergarten and Energy Transition, focuses on the potential of new connections between kindergarten (exemplary for an educational institution) and the community through energy transition. Thus, this Project aims to contribute to the GAP ESD, having kindergartens deal with energy questions, integrating ESD in community policies, and in this way underlining the interdependency between education and social action in the sense of sustainable development. From this perspective, the project developed means to establish new forms of co-operation between Kindergarten and community that included political players and stakeholders in the field of energy. With these resources kindergarten-teachers have been enabled and encouraged to identify learning opportunities that raise children's awareness of, attention and sensitivity to the issue. Parents have been involved as members of kindergarten and at the same time as citizens. Mayors became aware that kindergartens could play an important role for communicating and participating in energy transition. Due to the concept of ESD new societal partners now collaborate with kindergartens on energy issues. The project takes an interdisciplinary and transdisciplinary perspective, working with social and educational sciences as well as economical and technological knowledge and generating new knowledge together with the experts in the field. <http://www.leuphana.de/professuren/nachhaltigkeitsforschung-bne/forschung-projekte/kien-kita-und-energiewende.html>

ID: 921: Empowering the public to take conservation actions in cities: a case study of Shanghai Wishing Star Lake Park nature guide book - *Lin Chen, CN*

Under the background of biodiversity degradation and urbanization, it is urgent to engage the public to solve environmental problems and explore ways to live a sustainable life. City parks are playing more important roles empowering the public to take action in China. In this project, WWF China aims to design a nature guide book of a wetland park using WWF education theory. This case study will describe the process of the project, the educational philosophy behind the guide book, and ways it supports activity-based education. Nature guide books are only one form of environmental interpretation. In our case study, we also provide different interpretation options for different audiences in different seasons.

ID: 368: Energías renovables, una temática de conexión entre asignaturas - *Nelson Arias Avila, CO*

Es una realidad incuestionable que para conseguir un desarrollo sostenible —integración equilibrada de los desarrollos económico, social y ambiental— se precisa un cambio orientado hacia una menor dependencia de las fuentes fósiles de energía. Dentro de dicho cambio, la educación en general, y la enseñanza de las energías renovables (ER) en particular, especialmente en los niveles básico y medio, debe jugar un rol preponderante. Como un aporte al proceso de enseñanza-

aprendizaje de las ER, por parte de la Universidad de Burgos (UBU) y de la Universidad Distrital Francisco José de Caldas de Bogotá (UDFJC) se ha presentado y viene desarrollando el “Proyecto Colaborativo en Energías Renovables” (PROCOLER), en el cual participan profesores y estudiantes de las mencionadas universidades, y colegios vinculados. Dicho proyecto se fundamenta en una serie de materiales didácticos, entre ellos cabe resaltar la “Cartilla para la enseñanza de las Energías Renovables”. En ambos, la metodología planteada se centra en el trabajo colaborativo y transversal, con enfoque multidisciplinar, que posibilite a los estudiantes ubicar a las ER, relacionándolas con las diferentes asignaturas de su formación y con su vida cotidiana. Se presenta un breve resumen del PROCOLER, y los resultados iniciales de su implementación en colegios de Bogotá y Burgos. Asimismo, como parte integrante del Proyecto, se presenta el diseño y avances de un sitio web, que pronto estará a disposición del público; dicho sitio se continuará desarrollando mediante el trabajo colaborativo y transversal que caracteriza al conjunto, y espera contar con los aportes de todos los interesados.

ID: 52: The Power of Childhood Attunements in Nature to Shape Adult Socio-Cultural Behaviors This workshop is designed to share my recent integral research on Cultural Ways of Forming Ecological Identities and Factors Affecting Their Ontologies. - *Betsy Jardine, CA*

This workshop is designed to share my recent integral research on Cultural Ways of Forming Ecological Identities and Factors Affecting Their Ontologies. Workshop participants will learn about their own childhood attunements in the natural world and experience the joy released by conscious awareness of this knowledge and look for patterns in their socio-cultural behavioral patterns as adults that may resonate with childhood attachments formed in the natural world. My research investigated how the attachments formed through moments of personal attunement in the natural world are mediated by one's cultural milieu. Participants from the Hebridean Islands, the UK, Australia, Bhutan, France, Russia, Uganda and Mi'kmaq helped to shape the understandings acquired through this integral research project. Our ontological way of being in the natural world is mediated by culture as is the power relationship we form with the natural world. Developing a conscious awareness of our ecological identity may be a harbinger of hope for the future. When one becomes consciously aware of one's attunements with the natural world, a person is able to consciously direct one's feelings to shape future actions. To do otherwise would be to experience cognitive dissonance. Utilizing psychoanalytic theory and attachment theory, this research shows that experiences in the natural world as a child may continue to influence patterns of behaviors decades after their occurrence.

ID: 131: The Theory and Practices of Mediated Learning Experience - *Bhavishya Sunar, NP*

Mediated Learning Experience is a central organizing concept dealing with modifiability of children in general and in the development of children with special needs in particular. All three terms -mediation, learning and experience - are important to the concept. Learning with the MLE indicates that mediation by an intentioned adult is not just a process of transmission but refers to an area of activity that becomes the content of the interaction. Experience in MLE is the reciprocal, emotional, effective and motivational aspect of the interaction that melds the activity into a meaningful and structural whole. Leading to self-awareness, structural change and cognitive development, as such mediated learning experience is an extremely powerful tool in sharing a child's existence. Our goal as parents, educators and caregivers, is to help the child to learn and develop their learning potential, thereby facilitating their integration into their family and society and their functioning in the best possible way. Young children learn about the environment by interacting with it. Educators and other adults must attend to the frequency, nature, and quality of child-environment interactions during the early years. Many young children have limited opportunities for such experiences. Studies indicate that the average American spends more than 95% of their time indoors, and that by the year 2000, more than 90% of all Americans will live in urban areas. Studies also indicate that children growing up in urban areas tend to develop unfounded fears and feelings of disgust in relation to natural objects. Young children tend to develop an emotional attachment to what is familiar and comfortable to them. If they are to develop a sense of connectedness with the natural world, they need frequent positive experiences with the outdoors.

ID: 157: Children as Agents of Change for Environmental Sustainability: An Early Childhood Case Study - *Ann Montague, CA*

My MA thesis and proposed poster presentation will present findings from an exemplary case study of an international Early Childhood Education program in Bali, Indonesia. Green School Bali has been acknowledged as one of the best examples of how sustainability can be integrally woven into the infrastructure, culture and curriculum of a school. The school's no-wall bamboo campus and mission to educate young leaders in global citizenship concerning sustainability have

been touted as some of the most innovative ways to achieve a successful environmental program for children. Having gained global accolades over a relatively short period of time, it is important to look closely at if and how Green School shapes children's agency towards environmental issues. My research serves both the academic and practitioner community and will provide insights into the under-researched, expanding intersection of understanding how young children are shaped into agents of change for the environment in an international context. I am currently conducting fieldwork over the course of six months with Green School's Early Years Program with children ages three to six years old. I will learn about and evaluate how the roles of local Balinese and international culture, program curriculum, and physical setting of the school may shape the youngest of children into agents of change for the natural environment. My ethnographically-oriented case study combines participant observation of and with children, teacher and administrator interviews, and a parent survey.

ID: 81: Education au développement durable au Bénin et en Belgique- Séverin Tchibozo, BJ

Les activités d'éducation à la conservation de la nature, de lutte contre les effets des changements climatiques et de plantation d'arbres ont commencé avec les enfants du Bénin depuis 1998. En Belgique, ces activités sont également devenues omniprésentes au sein des écoles. En 2013, une collaboration sur ces thèmes a débuté avec les enfants de Belgique. Depuis le printemps 2016, l'accent est aussi mis sur la protection des martinets, oiseaux migrateurs qui représentent un lien symbolique entre la biodiversité des deux pays. Plusieurs écoles au Bénin et en Belgique savent désormais l'approche du développement durable.

ID: 165: International perspectives on early childhood education for sustainability in the Asia-Pacific: Weaving new connections for change - Lyndal O' Gorman, AU

As acknowledged by UNESCO DESD reports, early childhood education has an important place at the very beginning of lifelong learning in sustainability. Furthermore, across expanding international contexts, research is growing apace with early childhood practitioner interest in early childhood environmental education (ECEE) and education for sustainability (ECEfS). This is in stark contrast to the isolated patches of green and marginalisation that has previously characterised both early childhood education and environmental education. In this celebratory context we identify culture and environment as inseparable, particularly in early childhood settings and consider how different international contexts offer diverse cultural and environmental lenses to inform ECEfS. This symposium describes what is happening in ECEfS across international contexts, connected through the Transnational Dialogues in Early Childhood Education for Sustainability Research Group (TND). The TND group provides regular opportunities for ECEfS researchers and practitioners to strengthen existing connections and to weave new connections as the group is renewed and extended. From a beginning in 2010, with researchers mainly from Scandinavia, Australia and New Zealand, the group now includes participants worldwide. We cannot claim certainty in the right ways forward to address sustainability issues because educators come from a range of cultural contexts, so generalizations and assumptions are likely to be unhelpful. We propose that rather than focusing on cultural and environmental differences, we must work together across international boundaries to find common ground and to encourage shifts within our own diverse contexts. Such shifts are key to addressing sustainability, and we argue that early childhood education is an essential place to instigate the rebuilding and reinventing of our environmental relationships and changing cultures towards a greater emphasis on sustainable living. The presenters will provide an overview of ECEfS in their cultural and environmental contexts and report on challenges and opportunities for continued mobilization of ECEfS internationally.

ID: 930: Practice and Exploration of Environmental Education 1 + N in Sichuan, China - Xiaohua Zhu, CN

Environmental issues have become a worldwide topic. To carry out environmental education and ecological civilization education is the inevitable trend of social development. So far, a complete system of education environment from kindergarten to universities is not available in Sichuan, China. The project of environmental education put forth by a normal university (China West Normal University) mobilized organizations to join the project. Environmental education in schools is strengthened by forming relationships between schools and environmental protection enterprises as well as from community organizations and government departments. There were 14 schools, 7 enterprises and more than 20,000 students that received environmental education through this project. This paper mainly summarizes the practical activities, analyzed its implementation effects and problems, and put forward the solutions. It provides support to improve the development of Environmental Education in Sichuan and helps promote this model to other provinces in China.

ID: 390: Exploring Early Childhood Learning Environments in terms of ESD and Media Literacy: A Needs Assessment Study of the Turkish Context - Sule Alici, TR

This study examined the existing situation related to ESD (Education for Sustainable Development) and Media Literacy (ML) in early childhood learning environments in Turkey. To achieve this aim, early childhood (EC) teachers' knowledge of and awareness of ESD, their ML levels, and to what extent they integrate media and ML into their teaching practices in regards to the 7R's of ESD (Reduce, Reuse, Respect, Reflect, Rethink, Recycle and Redistribute) were investigated. Seven early childhood educators practicing at state preschools in Ankara, Turkey were the participants of this study. The data was collected from a variety of sources, including interviews, stimulated recall interviews, and content analysis of the teacher documentation (daily and monthly curriculum plans). The data is currently being analyzed. Preliminary results indicate that EC teachers (a) were not knowledgeable about ESD, (b) were generally aware mainly of the environmental protection dimension of ESD, (c) primarily focused on Respect at a very low level, and on Recycle and Reuse, (d) used media primarily as a tool to support learning activities and to draw children's attention to the activities, and; (e) had media literacy levels that ranged from basic to medium. This study has implications for preservice and inservice teacher education in Turkey.

ID: 97: Benefits of educating flood environmental risk to primary school students: experience from Sudan - Eltigani Abdelgalil, SD

Annual flooding has environmental risk and also damages houses, schools, health facilities and roads. However, environmental hazards from flooding have generally been neglected in the country and there was lack of knowledge of flood risks particularly among primary schools students. These problems led to health and educational problems particularly among primary school children. Unplanned and immediate cleaning practices to non-designed drainages are currently practiced by local government. Samples of 500 primary school students from 50 schools were selected and educated about environmental hazards due to floods to minimize the flood risks in Gezira state, Sudan. Their knowledge and behavior on flood risks were assessed in the next season. It has been observed that students behave positively during flood season and act appropriately. Students transfer flood risk knowledge to their families and the knowledge scaled up to include a wider community. The benefits of floods (fishing and soil fertility), health environmental hazards (water associated diseases) and cultural components such as the link between people and water for the stakeholders in Sudan have been recorded. It has been agreed that educating environmental hazards from floods to primary school students will minimize the environmental impact of floods and can be replicated in other states in the country.

ID: 475: School And Non-School Children And Environmental Protection - Ndashimye Daryl, BI

The protection of the environment is more important for the development of our country Burundi. Environmental education in the school curriculum is currently Integrating actions for the sustainable conservation of biodiversity. Media messages tend to disconnect the public from local problems. The national education program in general, has been trying for years to integrate environmental education into its program but without much success. Young people between the ages of 10 and 18 who are enrolled in school are more likely to come across a program that talks about environmental education either in documentaries, school environment clubs, environmental protection associations, or in mobilization speeches for sustainable development, etc. But what of out-of-school children, who are perhaps closest to nature, who live off of the agricultural production of their families and who do not know that their actions, for their survival, can have consequences on the environment and climate change in particular. It will be necessary to provide a means of raising awareness and mobilizing young people in school and out of school together for the same cause.

ID: 329: The application of environment education in Iraq, goals and real situation - Alaa Abdullah, IQ

In this paper we will discuss the ability to apply the theories and principles of EE (environmental education) on Iraq. Iraq exports 4 million barrels of crude oil daily with a value of no less than 180 million USD. Despite this high rate of income, the country suffers from issues with electricity and a high poverty rate of more than 18% of the population. The environment is highly polluted due to a lack of awareness by the population. The developing countries faced and are still facing serious problems such as poverty, illness, disease, administrative corruption, the misuse and management of natural resources as well as the absence of the government to acknowledge all these reasons and problems. This has led to the environment being put aside and neglected. The basic principle of EE is to act through the educational systems of the

countries and in Iraq we have a gap between what the people know about environment and what they do. One of our suggestions is to start a new position in the primary schools in Iraq. This position will be called environmental coordinator (EC). This teacher will take the responsibility to teach the children to love the environment through their skills and behaviors. The educational system in Iraq needs this position to build an EE culture starting from childhood.

ID: 378: Reconsideration of Spirituality in Japanese Culture: From a Practice of a Nursery School Based on Waldorf- and Forest Pedagogy. - Momoko Kono, JP

In this presentation, we are going to reconsider the importance of spirituality in Japanese culture in relation to education, with a particular focus on one nursery school in Nagano, Japan. As a result of the awareness that sprung from regular discussions about environmental education in early childhood, many nursery schools have begun to adopt environmental education into their curriculums. However, the relationship between spirituality and environmental education is a topic often not discussed. Last year in Japan, the team carried out a project to characterize “holistic education” by interviewing teachers and administrators who currently use this method at their respective educational institutions. One of those interviewed was the principal of the nursery school in Nagano. At this nursery school, Waldorf pedagogy (the pedagogical methods of Rudolf Steiner) and forest pedagogy make up its curriculum. We are going to illustrate how the children spent time in the woods and how spirituality helped them understand the actuality of life and death as a cycle in nature. We will then discuss the influence of the spiritual-environmental education on child development. Finally, we will explore the form that the relationship between spirituality and child education should take according to Steiner and assess how this relates to the traditional Japanese spirituality. We are going to reexamine the importance of spirituality, which is often overlooked in the stream of modernization and globalization, and think of new opportunities for approaching nursery education holistically.

ID: 530: Raising children in this time of eco-socio-political distress - Nicholas Stanger, US

The enhanced, digitally-enriched, screen-addled world where news of ongoing and ensuing environmental, unjust, and political crises continue to be poured into our attention bubbles. Yet those boisterous, curious, and ecophilic kids of ours continue to remind us to go outside, to cherish small things, and to love the world as it is. This workshop does not seek to provide answers, but perhaps help identify entry points into parenting and simply being a child in this troubled time. Or perhaps this should be seen as a reframing of a time of troubled-ness to a time of opportunity, just as many children help us see through new perspectives. We seek to facilitate a discussion with a community of kids, parents, teachers, and researchers, using various approaches to managing environmental distress and anxiety including Joanna Macy’s “Work that Reconnects and Nonviolent Communication”. This is a kid-friendly discussion. We will bring ours along and hopefully get him involved in some of the discussion and activities!

ID: 653: The Role of Screen Based Technologies in Altering our relationship with Our Global Environment and Each Other - Mari Swingle, CA

Mass globalization of screen based technologies (pads, pods, PC’s, cell phones and good old fashioned TV) have drastically shifted our relationship with the environment and each other (culture). Many of us are significantly less involved with our actual physical environments and many issues seem far too distant to trouble ourselves with. Many children don’t walk through forests, city parks, or fields, watch clouds, play in streams and roll around on the grass anymore; often choosing to isolate themselves with their digital devices or in otherwise programmed virtual worlds or constructions. This mounting disconnect with the environment is fostering a parallel disconnect in society and arguably, a dramatic shift if not loss of culture. Support of environmental causes are dominant online, but the understanding of what, how, and why, are lessening. This is fostered by disinforming arguments of what many are now starting to call the post truth era. In this paper/presentation Dr. Swingle will explore the societal/cultural shifts that foster both negative and positive influence(s) of technologies on our relationship with nature, the environment, culture and each other. Discussion will focus on the primary influences on the developing person (children, adolescents and youth) and emergent cultural shifts observed with growing up digital, to the exclusion, as opposed to the integration, with the physical world and surrounding environment.

ID: 783: How do Environmental Educators Engage Young Children with Animals in order to Forge Deeper Interspecies Bonds? - Patty Born, US

Using the human-animal bond and relational ecology as theoretical underpinnings, I aim to better understand the array of contexts and experiences wherein young children are able to interact, either directly or indirectly with animals. The actions, behaviors, interactions, and encounters between children and animals are rich with complexity and warrant further study. More and more, this "Common World" (Taylor, Pacini-Ketchabaw, 2015) approach asserts children and animals as co-creators of children's learning and development. The relationships, nuances, and engagements between child and animal are themselves teachers. This has important implications as we move into a time where environmental connectedness and interspecies connectedness matter more than ever (Haraway 2008). My work focuses on this question: how do environmental educators engage children with animals in order to forge deeper interspecies bonds and how animals are portrayed generally in EC EE settings. In general, most EC teachers, when asked, report that animals are very important for development, yet children have relatively few opportunities for unstructured, child-led engagements with animals. Many of the experiences that are encouraged in ECEE settings are adult-directed or based in make-believe. In cases where classroom pets are involved, children are often not participating in caring directly for the animal, which is a powerful factor in developing a sense of caring, fostering empathy and affordances for boys to show vulnerability and nurturing behaviors (Noddings, 1995 and Melson, 2001). While the majority of those who work with young children assert the value of encounters with animals, many identify barriers to connecting children with animals which reflect the barriers to nature engagement in early childhood overall. Yet I posit that in order to better frame our human understanding of ourselves, we need to better understand our relationships with animals. That means starting by understanding children's experiences with animals.

Environmental Communication (and Uncertainty)

ID: 673: Transferring a boardgame into an environmental education activity - A case study on the 'Upstream-Downstream' - Yu-Jie Chang, TW

“Upstream-Downstream” is one of a series of excellent games related to climate change risk which were developed by Boston University and Red Cross/Red Crescent Climate Centre. This boardgame was designed originally to generate emotional experiences on the impacts of climate change. In this study, we tried to transfer this game to an environmental education activity. This was to make sure the learning performance could be achieved by various facilitators. At first, the game was played in the class with graduate students many times. The brief curriculum objectives were developed after discussions. The initial environmental education activity was reviewed by a group of experts for implementing environmental education elements into them. The evaluating methods and tools for these materials were also developed in this study. 77 people completed the training workshops and provided feedback. Most attendees agree that the game transformation to environmental education activity is helpful for facilitating this game and also to obtain a better learning performance. Feedback data analysis also shows that the game transformation is helpful to new teachers rather than senior ones. A website included translated game materials with feedback function were built for further dissemination. It is expected that these climate change games materials and amendments will be helpful for promoting them.

ID: 47: How an Interactive Popular Science Video for New Media Increases Audience's Understanding of Environmental Issues: Contrasting Persons with an Environmental Science Background vs. Those with a Non-scientific Background - MeiYing Tsai, TW

Science is an important part of human life. To communicate environmental information adequately and effectively, the mass media needs to provide suitable information and channels so the community can acquire new information, and thus generate innovations. In addition, new media has become quite important and convenient to a new generation. The purpose of this study is to investigate how an interactive short film for new media regarding popular environmentally-important issues can increase audience learning and involvement, and the differences in perception between audiences with an environmental science background from those whose background is not scientific. The researcher chose to use as a sample topic of an environmental education issue: the ways microplastics spell big problems for future generations. This application paper indicates methods of achieving collaboration among a group of scientists, journalists and video production teams, ways for them to plan and produce an interactive popular science video step-by-step, and means for applying science communication strategies. Having produced an interactive short film, the researchers launched two focus group interviews of 12 to 14 audience members to discuss their perception and understanding of this short film. One focus group of students who all have a background in environmental science from the Institute of Environmental Engineering and Management of National Taipei University of Technology in Taiwan. The second focus group of students who are all from a non-scientific background from Shih Hsin University. This study aims to compare their interests, perception and understanding regarding this popular science short film and to discern similarities and differences between these two groups. This study selected scientists who know the microplastics issues well to participate in this research and popular science video-producing process.

ID: 349: Le E-learning une autre façon d'apprendre - Ihssane El Marouani, MA

Today, E-learning, through the use of New Information and Communication Technologies (NICTs), has become a means of communicating knowledge and performance in ESD, improving the quality of learning by using more playful and interactive methods. The Foundation is conscious of the importance of the use of NICTs and in the continuity of the actions deployed in terms of ESD (communication via its sites and portals, Collaborative platforms: Intranets, forums), set up the program of strengthening the capacities of young journalists in Africa to improve environmental information via an E-learning platform designed and produced by the Foundation. This is a pioneering experience in Morocco using ICTs oriented towards ESD. This program allows for the establishment of links between the different media of Africa and to create a network of journalists interested in protecting the environment in the region. These young people, trained and with the new knowledge and skills they have acquired, will have the opportunity to provide citizens with key messages on the importance of preserving the environment.

ID: 824: An innovative approach to communication and dissemination of the "culture of sustainability" - Francesca La Greca, IT

Regions need to protect ecosystems and vulnerable landscapes and prevent biodiversity loss in their territories to prevent (further) degradation of these natural assets. The sustainable management and exploitation of the natural environment can also foster sustainable regional development based on ecosystem services, green infrastructures and a shared policy on climate change. An innovative approach to addressing the global challenges facing society is "naturebased solutions" (analysis of economic, social and environmental benefits). The complexity of these issues makes it difficult to spread and share with political decision-makers, public employees and economic operators, who must implement them in their development policies and strategies. It is therefore necessary to focus on effective communication capable of simplifying complex concepts through sustainability education actions. The Piedmont Region has analyzed the ways in which these results will be implemented in the framework of LOS_DAMA! Landscape and Open Space Development in Alpine Metropolitan Areas¹ (European project approved and eligible for funding under the Alpine Space 2014-2020 Program and in which the Piedmont Region is a partner). For this purpose, a training workshop on environmental sustainability will be set up between September and December 2017 for public administrators, political decision makers, economic actors, NGOs and researchers operating in the metropolitan area of Turin, structured in two operational modules:

- the first module will promote the knowledge and sharing of ecosystem services (cooperative learning);
- the second module will cover the application of concepts in communication and promotion (learning by doing) projects.

The purpose of this training workshop is to raise awareness among local actors on the themes of the project by providing them communicative and operational tools to implement these themes within local and regional policy tools, with a specific focus on territorial and landscape planning policies.

ID: 144: Integrating Information and Communication Systems in Urban Environmental Education for Global Transformation Initiatives - Kalpana Chaudhari, IN

The human population is predicted to increase by more than one billion people within the next 15 years, reaching 8.5 billion in 2030, and to increase further to 9.7 billion in 2050. The Urban population of developing countries is predicted to rise from one third in 1990 to over 50% by 2025. Looking at urbanization, in 2016, an estimated 54.5 per cent of the world's populations lives in those urban regions. By 2030, urban areas are projected to shelter 60 % of people worldwide. On the basis of these figures and other global trends, it would appear that Africa and Asia will have the highest share of world's urban growth in next 25 years, resulting in the considerable rise of several metropolitan cities and towns. In the coming years the greatest increase in population, in production and in poverty will occur in cities in Asia and Africa, causing the social, economic, financial, and organizational problems for socio-economic and urban environmental management in these cities. Therefore the task of urban transformation through environmental sustainability such as water, energy, sanitation and environment services creating organizational, operational and financial management problems in urban environmental system will be vital. This presentation deals with Global initiatives on the identifying problems in environmental education for global transformation and environmental sustainability. This would continue to investigate problems related to social-economic issues resulting from urbanisation to aid in mitigating planning in the globalised world to form a basis for sustainable solutions in environmental learning. The presentation aims to assess the potential of information and communication technology for environmental education and intercultural/interreligious dialogue promoting mutual knowledge and understanding, both within different societies and internationally for sustainability and global transformation. The presentation aims at building the global network of environmental education organisations in the third world for effective application of information and communication technologies for urban sustainability.

ID: 617: Environmental Exhibition as a Method of Community's Capacity Building In Environmental Issues - Susy Suwandi, ID

Beside conducting training for certain target groups all over Indonesia, Puslatmas is also participating in exhibition, both the exhibition that is held by MoEF and by other related Ministries/organizations. Unlike most of participants, the goal of participating in the exhibition is to introduce their organization and to promote their program. Puslatmas goal is to educate

the visitors to practice environmentally friendly behaviour. Accordingly, Puslatmas provides an exhibition kit (back wall, pop up counter, standing banner, posters, brochures, souvenirs etc) and experienced staff to serve visitors and explain environmental issues. Most visitors shows limited attention and just briefly visit the exhibition look around the exhibition booth, or sometimes just to take souvenirs such as key chains, pens etc.. In order to achieve the mandate in raising environmental awareness and knowledge, it needs to change the strategy in treating the visitors. The visitors have to answer questions from Puslatmas, participate in environmental education games, respond to quizzes, trivia questions or other games before receiving gifts or merchandise. Further, Puslatmas will also conduct mini workshops, coaching clinics, consultations and demonstrations of making handycraft from waste. The exhibition booth has more visitors who are more engaged, aware of environmental issues, and also some of them have become environmental practitioners.

ID: 7: Metaphors for teaching concepts in ecological restoration: Three examples - Valentin Schaefer, CA

The general public and students who engage in ecological restoration in cities often do not have a background in Biology or Sociology. They are involved in a restoration project for various reasons - it is in their neighbourhood, they want to help the environment, they like learning more about nature and/or they enjoy the social contact. They are, however, invariably interested in learning more about what they are doing and why. In teaching the principles behind restoration projects I have found it useful to use metaphors, drawing parallels with other more familiar concepts. Three of these metaphors are described here. I use a business model for customer behavior to explain niches, medical analogies to describe approaches to ecological restoration and investment models on reducing risk as a way of dealing with uncertainty. 1. The Harvard Business School Apostle Model for service and loyalty offers parallels in nature where customers who have no other available stores are hostages just as endangered species have no other available habitat, loyalists who promote the brand are comparable to keystone species, and invasive species are mercenaries. 2. Ecological restoration can be seen as healing landscapes and there are parallels to maintaining personal health. For example, strong intervention involving expensive equipment in hospitals and well-trained doctors compares with using GIS and excavating equipment and expert engineers and scientists in ecological restoration. 3. In ecology we often deal with uncertainty and investment economics is a good metaphor; for example, one way of reducing risk associated with the uncertainty in the stock market is to diversify your portfolio which is comparable to maintaining and restoring species diversity in ecosystems to build resilience and reduce the risk of ecosystem collapse in the face of climate change. People can usually relate to these three metaphors of marketing, medicine and investment and by analogy we can use them to teach concepts in ecological restoration.

ID: 326: Local Government Institutes of Environmental Research in Japan can be New Educational Resources for Scientific Literacy in the Region? - Yoshinori Saitoh, JP

In Japan, all prefectural and several major city governments have respective institutes of environmental research, which provide various environmental data as scientific basis to the department of environmental policy. To collect the basis, those institutes investigate and analyze environmental issues such as water pollution, air pollution and so on. We think this institutes' feature could lead to new educational resources to give opportunities of experiential learning, within that participants would be able to investigate themselves and discuss the current status of the environment issues scientifically and objectively. Such Environment Educations (EE) might promote the participants' Scientific Literacy for taking a matter dispassionately against a reputational damage. Aimed at exploring the possibilities of those institutes to be new educational resources for the region, we firstly had carried out a questionnaire survey to 67 institutes in Japan about the current programs of EE and organizational structure in terms of special staff and action plan for EE. To analyze the characteristics by EE's themes, we compared with EE being handled by the department of environmental policy in the same governments, which are thought of typical themes of EE in Japan (Fig. 1). The departments' EE were characterized by the experiences in nature, mainly including just observation and thinning in a mountain, afforestation project. These programs, being friendly and easy to learn, could promote Environmental Attitude but less likely Scientific Literacy. On the other hand, the institutes' EE had considerably fewer experiences in nature, alternatively a large percentage of Water and Atmospheric Environment. Additionally, Risk Commu and Radiation of institutes' EE were small but important difference from those of the departments, that were almost 0. Those themes might bechallenging to also teach and learn due to being requiredto dealwith environmental data in many cases. Nevertheless such EE could promote Scientific Literacy.

ID: 343: The Role of Aggressive Advertising and Subliminal Suggestion in Public Awareness through Environmental Education - Timothy Phiri, ZM

Timothy K. Phiri and Pauline Monde Cheelo University of Zambia, Zambia We currently live in an era of technology and the optimal use of multimedia for propagating information and enhancing communication among people. Not a day goes by without each one of us being consciously or subconsciously bombarded with adverts on billboards and through the electronic media on various leading commercial brands such as: Bakers biscuits, Colgate, Coca-cola and Pepsi to mention a few. This presentation explores the possibility of re-packaging and re-branding environmental education in a way that emphasizes its crucial role in changing the attitudes of various members of our society in the context of Zambia and Southern Africa. In Zambia today we face a myriad of ever increasing environmental and social problems: Gender-based violence, detrimental personal habits-such as littering, the use of shortcuts instead of designated routes, HIV/AIDS, a young democracy whose elections are party and personality based instead of being issue and character based. All these problems have a negative impact on our society and personal lives as Zambians. We opine that advertising and subliminal suggestion can be used to mitigate these negative impacts and bring forth positive environmental and social impact. This can be achieved through the design of innovative advertisements that use 'hooks' and 'cues' to deliver educative and transformative messages that challenge people to re-think their negative role in impacting others and the physical environment. Should aggressive advertising and the use of subliminal suggestion be the preserve of the commercial business world only? Are we not ignoring and undervaluing two of the most effective means of communicating values and important messages to people currently available to us? This presentation argues that there is more we can do to deliver the core message of Environmental Education and sustainability to the masses. Formal education behind walls and books is not enough to inculcate positive values among the various strata of our society.

ID: 431: Communicating about Unique Aspects of RCE Greater Burlington via Sustainability Stories - Thomas Hudspeth, US

The Greater Burlington Regional Center of Expertise (RCE) on Education for Sustainable Development is one of 154 such networks recognized by United Nations University. Recognizing that it will take all of us working together to address complex, 'wicked,' planetary-scale problems/challenges of the Anthropocene such as climate change adaptation and poverty alleviation, the network draws from various sectors: individuals, NGOs, higher education, K-12 schools, businesses, government, faith community, media. It uses education as a tool to create a sustainable future for the greater Burlington region through promoting the work of sustainability practitioners there and encouraging collaboration to strengthen existing sustainability initiatives, stitching together on-going activities. To improve effectiveness and create tangible improvements in its communities, it uses collective impact--a framework for cross-sector coordination/collaboration to initiate large-scale social change_†"to connect research and practice and to be inclusive, where all participants help devise a shared vision of change. Storytelling is an amazingly effective form of communication that helps us recognize new and better solutions to sustainability problems and, ultimately, bring about paradigm shifts and envision and work toward more sustainable futures. This paper utilizes Sustainability Stories about positive role models/exemplars (sustainability heroes and heroines) in the RCE's region for others to emulate in transitioning/downshifting to more environmentally-sustainable communities. These sustainability stories are drawn from all of the sectors mentioned previously; from all of the tracks for the 9th WEEC; and from all capitals (natural, built, human, social). In seeking to operationalize sustainability, make it more concrete, make it come alive, humanize it, and put a face on it, the Sustainability Stories offer hopeful, inspirational, local, place-based solutions with global implications; further, they let people know what a sustainable future could look like and that there are alternatives to business-as-usual, overconsumption, 'growth at all costs' model that we're addicted to.

ID: 528: Judging the credibility of environmental communications in a new information landscape - John Cripps Clark, AU

Environmental communication has a proud tradition of reaching out to the public with a message that enlists both reason and emotion. However, we are experiencing public confusion and erosion of trust in environmental messages with beliefs (and actions) becoming tribalised and anti-science. The exponential growth of digital knowledge freely communicated on the web and the seductive power of search engines has given citizens easy and direct access to vast amounts of information and new ways of sharing it. In previous generations, gatekeepers such as teachers, editors and librarians mediated this knowledge but now individuals need to make their own judgments of accuracy and reliability. This raises the challenge of how we can cultivate the ability to make more sophisticated judgements and this question has been central to our teaching and research. Although there is much research on how people access and evaluate information (generally highlighting inadequacies), programs to improve the judgment of the accuracy and reliability of information generally fail. This research

examines the conditions necessary for developing more sophisticated judgments of the accuracy and reliability of information. It highlights the importance of actively generating criteria for making judgements. These criteria are tested and then applied. This is done collaboratively using authentic examples which engage motives. In education we need to frame communication as central to environmental practices and develop structured sequences of creative, multi-modal communication challenges. We are in the midst of a revolution in communication which will enable greater understanding and action for a better environment and sustainable future. We cannot predict the knowledge environment we will find ourselves in in five years time, but we can be equipped with the skills needed to generate reliable criteria for evaluating the environmental information we are immersed in.

ID: 570: Les Trophées Lalla Hasnaa littoral durable- Sami EL IKLIL, MA

Les Trophées Lalla Hasnaa littoral durable se présentent comme étant une continuation des Trophées Plages Propres, conservant ainsi le même esprit et la même logique visant à identifier dans une démarche de reconnaissance les bonnes pratiques en faveur des plages auparavant et qui s'est étendue à tous le littoral. Une logique qui repose principalement sur les notions d'éducation et de sensibilisation à l'environnement. Des principes qui devront être renforcés via ces Trophées au cœur des projets de développement territorial durables. L'ouverture des Trophées aux différents profils de candidats passant par les organismes privés et publics, centres de recherches, universités, ONG et Individu, ont permis d'initier un large éventail d'initiatives, de projets et d'actions Eco citoyennes, d'éducation et de sensibilisation à l'environnement en générale et à la préservation et la protection du littoral marocain en particulier. La présentation des Trophées lors du WEEC permettra de présenter l'impact ayant permis l'émulation de diverses initiatives innovantes en matière d'éducation et de sensibilisation à la protection de l'environnement ainsi que la fédération de différents profils autour de la même cause, ainsi que la large communication engagée par la Fondation autour de ces initiatives, ayant permis une prise de conscience de plus en plus élevées du public par rapport aux questions environnementales. D'autre part, le WEEC est une occasion pour initier la promotion des Trophées au niveau international.

ID: 299: How many butterflies will lose their habitats? - Communicating biodiversity research using virtual and real European butterflies - Karin Ulbrich, DE

In times where biodiversity is highly endangered, only little of recent biodiversity research is implemented in school education. The collaboration of scientists and educators provides the opportunity to fill this gap. The learning environment SITIS (SIMulation of buTterflies for Schools) was developed that combines an educational software tool with students' own nature observations. Research findings about climatic impacts on species habitats are presented using the example of fifteen European butterflies. Which of current habitats will remain, which ones will get lost in the next decades - or will new habitats emerge? Three future scenarios are applied to answer these questions. They base on different assumptions about social, economic, and political development, which result in different sets of models and parameters. The educational software provides detailed explanations of those methods and shows how scientists deal with uncertainty. It addresses students aged above twelve years. A simulation tool is included that allows obtaining projections of geographical habitat distributions for the three scenarios with annual time steps until the year 2100. The user is led through the content in a user-friendly dialogue form. An essential part of the learning environment is related to butterfly monitoring in the field. Students register the abundance of species such as the Brimstone or the European Peacock, thus combining virtual and real studies. The learning environment was tested with students of different schools, aged from 12 to 18. The learning success was evaluated using pre-test and post- test questionnaires. First evaluation results show that by using the learning environment SITIS students gained a significant increase in their level of knowledge about biodiversity.

ID: 32: Attitudes and knowledge about the marine ecosystem: An exploratory study in northern Peru - Daniella Biffi, US

In Peru, marine science education has been overlooked in school's curricula, even in schools located in fishing communities along the Peruvian coast. The purpose of this study is to explore the attitudes and knowledge towards the marine ecosystem of 5th and 6th grade students in Los Organos, a coastal district in Piura, northern Peru. Sixty-three students from three public schools located in Los Organos completed an eight-item differential scale for attitudes, and a 30-item multiple-choice knowledge questionnaire. The items on the knowledge section were based on relevance to the study site and on contemporary issues affecting the area. Results showed that the general perception toward the marine ecosystem was highly

positive. However, the study revealed that students have a low level of knowledge of the marine ecosystem. We found no relationship between the knowledge and the attitudes towards the marine ecosystem. Student ignorance of current issues, even those that get international news attention, tell us that these issues are not reaching Peruvian schools. This exploratory study provides preliminary but important insights into students' knowledge regarding marine conservation. We hope these results raise awareness of the outcomes of a lack of proper marine environmental education.

ID: 488: The study of environmental risk communication strategy: an example of environmental communication of climate-change - Yuh Yuh Li, TW

The development of science and technology sometimes is accompanied by environmental risks and such risks will cause problems for future generations; the examples of environmental risks are climate changes and air pollutions. Government often would like public to acknowledge the dangers of potential environmental risks, but it is also critical to frame these information about risks so that public will not overwhelmed by these risks and thus oppose the development of science and technology. However, it is very important, especially in risk society, to collect scientific evidence to know how to communicate with general public the potential risks that technology possesses and how to frame these information. This research seeks to examine the effects of two risk communicate strategies: knowledge and scientists' 'consensus information. The first communication strategy, knowledge, is to assess how subjective knowledge will affect public risk attitude. The second strategy, consensus information, is to assess how scientists' 'consensus influence public risk attitude. Our research assumes that the effectiveness of subjective information and contextual strategy will be dependent upon personal cultural identity. This research, in this regard, consider the importance of personal cultural background when it comes to the choice of risk communication strategy. We focus on university students and the exemplary topic of climate change. This research uses semi-experiment design through comparing students of different treatments; the treatment group being students taking climate change class and control group being those who doesn't take this class. Surveys will be done with both the treatment group and control group to compare the treatment effect, which is the attitude change of students after taking climate change classes. This research is also conducted through an experimental design by randomly exposing students with different degree of consensus information related to climate change on an assigned computer. We can see the treatment effects of students on the perception of climate change. The results will be compared across countries who conducted similar surveys. It is expected that the project will broaden our understanding of public risk perception, and we can develop a tailored local risk communication strategy for local communities.

ID: 354: Citizen science in drought research: does getting hands-on with ecology alter volunteer perception of risks and resilience? - Patty Ramirez, GB

Droughts impact on the environment, agriculture, infrastructure, society and culture, and are predicted to become more frequent and severe in the UK in the future. However, in the last decade extreme floods have affected several regions of the UK, and are more 'visible' to the public than droughts, which in contrast are pervasive with a creeping onset. The UK Research Council-funded DRY Project ('Drought Risk and You') seeks to integrate citizen science and ecological research as one research strategy to make 'hidden' drought more 'visible'. It is exploring whether involvement as a citizen scientist is a way of communicating risk, through experiential learning about drought impacts. Citizen scientist volunteers on the DRY Project have been working with academic researchers on a long term ecological mesocosm (rainout shelter) field experiment, investigating the impact of simulated drought on grassland plants. Through their regular collection of data on the development of grassland plants, volunteers have witnessed the potential impact that a one in one-hundred-year drought would have on local grasslands - important for agriculture, habitats and lawns. Following a period of volunteering, citizen scientists are being interviewed about their experiences 'linking science and narrative - using novel techniques. The use of 'storytelling' seeks to provide a critically reflective space for individuals to explore whether and how their involvement as a citizen scientist has (i) built their drought knowledge as personal capital in 'learning for resilience'; and (ii) altered their relationship with water and views of drought in a UK context. This is the first time narrative interviewing has been used to investigate motivations and outcomes of citizen science involvement, while the type of citizen science involvement is unique within drought research.

ID: 618: Teaching anticipation for sustainability: Sitting with uncertainty. - Senan Gardiner, DE

As the world continues to experience tumultuous upheavals in geopolitics, ecosystems and in particular, our climate, many ask, what kind of future are we heading for? (Jeffries 2016). In order to answer that question, one needs to engage in the

process of anticipation. To anticipate is the ability to 'analyse, evaluate and craft rich pictures of the future' (Wiek et al., 2011) and has long been linked to education for sustainability (Floyd and Zubevich 2010). Since the Talloires declaration in 2005 higher education leaders acknowledge the role higher education institutions have to play in both education for sustainability and for educating anticipation (Talloires 2005, Rieckmann 2012). Anticipation is seen as a key component in educating competent sustainability problem-solving graduates but there is still debate on how to foster anticipatory competence (de Haan 2010, Wiek et al 2011, 2016). Starting in 2014, this researcher has spearheaded an action-research case study in the operationalisation of anticipatory competence (AC) through a course entitled 'Sustainability and the Future' in the University of Vechta, Germany (Gardiner and Rieckmann 2015, Gardiner 2017). Through action research, the researcher has continually engaged with and updated the programme focussing the investigation on students' perceived key components of AC. Through reflective journaling, interviews and focus groups with participants, key aspects of AC have been highlighted such as emotional and affective aspects. Through working with students, one cognitive skill that has yet to be fully incorporated into anticipatory competence is uncertainty (Withycombe 2010, Wiek et al 2016). Uncertainty here refers to the uncountable and unknowable factors that will arise in the future and Miliken (1987) defines three major forms as state, effect and response uncertainty, the latter of which refers to the uncertainty of how actors can respond to external changes. Through intensive scenario work (Tapinos 2012, Wayman 2009), this researcher is operationalising the skill of managing uncertainty and drawing out key transferable points for its teaching and learning. Arizona State University.

ID: 565: Pedagogical strategies for teaching how to manage contradictory and uncertain environmental knowledge -
Rebekah Tauritz, GB

Today's society faces urgent environmental challenges that require people to develop the competences necessary to deal responsibly with the uncertainty and contradiction that typically accompanies environmental and sustainability information. This inquiry examines pedagogical strategies for enhancing the development of 'uncertainty competences' which are the abilities, knowledge and attitudes needed to constructively address complex issues. This qualitative study focused on Scottish children in the final two years of primary school (typically ages 9 to 11), since these children are increasingly confronted with complex environmental issues, both inside and outside the classroom. Teachers in the study reasoned that most children of this age are ready to engage with complex issues and able to venture beyond the security of right and wrong answers. The study involved observations of 133 children and 5 teachers during classroom lessons about complex and inter-disciplinary environmental topics. Topics selected by the teachers included global warming, dams and species reintroduction. Classroom interactions were captured using audio recordings and field notes, and complemented by focus-group interviews with children and interviews with teachers. Preliminary findings indicate that teachers are often not aware of the ways in which the language they use influences the learning process. Findings further suggest that learning activities, questioning and discussion designed to welcome uncertainty into the classroom provide opportunities for the development of the skills required to understand complex environmental issues. These findings have implications for classroom practice and teacher education programmes.

ID: 470: An International Study on Education and Resilience with Special Focus on Disaster-Affected Areas in Asia and the Pacific -
Yoshiyuki Nagata, JP

Six years have passed since one of the most powerful earthquakes in recorded history hit Japan in March 2011. A lesson we have learnt from this experience in the field of education is that resilience plays an important role through the process of recovery as well as at the time of disasters. In some countries affected by disaster there are cases where people reacted flexibly at the time of unprecedented events and adjusted effectively in restoration processes. On the other hand, there are other cases in which people found themselves at a loss on what to do, or lost their lives as a result of following rules blindly. The objectives of the research project are, first, to obtain basic information on the theory and practices of resilience and other related key-concepts such as sustainability, diversity, effectiveness, redundancy, robustness, etc.; second, to conduct an international study on resilience at the individual or collective level; third, to make an analysis on the collected data to identify the characteristics of resilient institutions and communities with particular emphasis on 'school culture'. With a view to find answers to questions such as what sort of characteristics resilient individuals/ institutions/ communities have, and how institutions such as schools can function effectively as part of a resilient community, an international comparative study was conducted in Indonesia, New Zealand, Philippines, Sri Lanka and Japan. There are some key findings from the international survey. Resilience in each country has different characteristics. Such characteristics as robustness, redundancy, rapidity vary from country to country. Also, some principles value humane factor like humour even straight after the

disaster, and factor proper to each community like kiwi spirit in NZ and kizuna (connectedness) in Japan. In conclusion the study shows some systematic classification of common and differentiated features of resilience in the participating countries.

ID: 30: Climate Change Mitigation Practices to Promote Safe Water and Sanitation in Nangabo Sub County -
Norman Juuko, UG

Water is the main channel through which the impacts of climate change will be felt by people, ecosystems and economies. However, predicting impacts on the availability and quality of freshwater resources, and on water-dependent services and sanitation, remains difficult. Climate change is already influencing many systems essential for human livelihoods including water resources, food security and health. This causes a great challenge for the sustainability of life, ecosystems, livelihoods and the economy in Uganda. Despite its central location and proximity to the country's capital city, Nangabo Sub County has a problem of access to safe domestic water. The safe water coverage is 49% as per baseline survey and water quality tests conducted in 2015. Most of the inhabitants especially those in the rural areas draw water from the unprotected natural springs which are contaminated, unreliable and distant. The tests revealed high levels of faecal coliform bacteria and water turbidity. This was a result of human activity that contaminates the water sources and also affects the water catchment areas. Poor sanitation facilities and hygiene practices coupled with the lack of safe and clean water has led to high incidences of water borne and hygiene related diseases like diarrhea that impart negatively on the health status and productivity of the communities. Most inhabitants depend entirely on rain fed subsistence agriculture but due to changes in climate change patterns especially the delay in the onset of rainfall and the prolonged severe dry spells productivity declined which affected food security/nutrition and overall livelihood of the rural communities. In search for solutions to the above problems, NECEA is focuses on a four phase approach to safe water provision including; Construction of spring water tanks, protecting the water catchment areas, sensitization on the safe water chain and point of use safe water interventions

ID: 596: Climate Change Keywords Mining in the News and Secondary Science Textbooks in Taiwan -
Chih-Ling Peng, TW

Due to global warming, extreme weather phenomena have more significant impact on the environment in Taiwan over these years. To promote environmental sustainability, environmental education and climate change impact adaptation have been included in the K-12 National Basic Education Curriculum. This study uses word frequency statistics to explore keywords distribution in the corpus in order to determine what vocabulary to be analyzed. The corpus is referred to the databases on climate change glossary from five institutions such as the United Nations Framework Convention on Climate Change (UNFCCC), BBC News. Then, the climate change important keywords are extracted after conducting a questionnaire done by secondary school teachers on important vocabulary about climate change. For news uses the vocabulary of the daily life; textbooks are the main media for teachers to teach and students to the science world. We use the keywords resulting from the questionnaire to examine the content about related topics reported in the main news media (the China Times 2006-2015 and United Daily News 1999-2014) in Taiwan by using the method of computational linguistics. A total of about 11.57 million words are obtained by using the Chinese Lexical Analysis System and term marking automated extraction. Also, we analyze and compare with the content of high school science textbooks. The study has found that the top 10 keywords from the teachers' viewpoint are also included in the news as well as textbooks, for example, keywords as greenhouse effect, global warming and greenhouse gas. However, keywords such as climate feedback and emission trajectories are not found in the news as well as textbooks. Education should help students connect with the real life context and develop the ability to solve problems to be good global citizens, so the textbook design better considers the concept of important keywords to lead students into the science world. Thus this study may inspire lesson design.

ID: 808: Fueling change? Exploring guilt in climate change communications -
Caitlin Hill, CA

It has proven difficult for environmental education and communications (EEC) professionals to communicate climate change and encourage low-carbon behaviour. While emotional appeals have been used as a communications strategy and extensive research has been conducted into the use of fear and the apocalyptic narrative in relation to climate change there is less research exploring the use of guilt rhetoric. The purpose of this study was to explore the use of guilt appeals in climate change communications. To ground the research, the study used an example of guilt in climate change communications that was first introduced in Ontario, Canada in early 2013: Robert Shirkey's climate change warning labels. Twenty participants from across the Metro Vancouver region participated in this primarily qualitative, mixed

methods study. Each individual participated in one of three focus groups with discussions kick started by a survey completed upon arrival to the focus group. Together, the survey and focus groups facilitated an exploration of the following questions: how do people feel about guilt-based communications?; how do people feel about and respond to Robert Shirkey's proposed climate change warning labels for fuel pumps?; and what, if any, recommendations would participants make to improve the labels and/or climate change communications? Findings reveal that participants are receptive to guilt appeals in climate change communications but highlight the need for communicators to take into account the following: responsibility, education, alternatives and credibility. The study provides a list of recommendations for Shirkey's labels and climate change communications as a whole.

ID: 433: Environmental Communication: reflections in the field of Climate Justice for the inclusion of people with visual impairment - *Environmental Communication: reflections in the field of Climate Justice for the inclusion of people with visual impairment* Gomes, BR

In this summary, we discussed the scenario of climate justice, including visually impaired people as a social group in a vulnerability situation and, therefore, should have access to relevant information on the subject, as well as being part of the debates on climate change. Considering that the confrontation of social-environmental conflicts are based on their critical understanding, it is fundamental that society is encouraged to this reflection, increasing its capacity for social transformation. In this sense, we inquire about the quality and accessibility of the information that reaches people in their different "normality patterns", allied to the lack of documentary sources that deal with climate change and its impacts on people with disabilities. The mentioned context instigated to verify how the environmental communication has transmitted the information about the social-environmental disasters, taking into account the resources of communicational accessibility made available to those who have visual impairment, a group that represents the greater part of the Brazilian population with some kind of disability. In a qualitative way, inspired by the exploratory research, we conducted participant observations and semi-structured interviews with a blind and low vision community, who use the public services offered by the Center for Support and Inclusion of Special Education (CASIES), The Institute of Blind People of Mato Grosso (ICEMAT) and the Association of Blind People of Mato Grosso. In general terms, the present study brings reflections on the social role of environmental communication, whose objective is to enable access to knowledge, promoting political and dialogic engagement.

ID: 405: Las Representaciones Sociales del Cambio Climático en un Grupo de Estudiantes de la Universidad de Santiago de Compostela: Cultura Común Vs. Cultura Científica - *Kylyan Bisquert i Pérez, ES*

La comunicación presenta los principales resultados de un estudio realizado con estudiantes de la Universidad de Santiago de Compostela sobre la relación entre su formación académica y las representaciones sociales del cambio climático, así como los niveles de incertidumbre en este colectivo. Se ha aplicado un cuestionario elaborado ex proeso a una muestra de 644 estudiantes, conformada en base a dos criterios de selección principales: 50% de ciencias sociales y humanidades y otro 50% de ciencias naturales e ingenierías, y simultáneamente el 50% que está comenzando sus estudios de grado (1º o 2º curso) y otro 50% que los están finalizando (3º o 4º curso). El cuerpo principal del cuestionario contiene 32 ítems con enunciados (verdaderos o falsos) sobre causas, procesos, consecuencias y alternativas al cambio climático. Los resultados muestran diferencias significativas entre los estudiantes de una y otra rama académica, favorables en la mayoría de los ítems a los de ciencias naturales e ingenierías, si bien se sitúan en el límite de la significación estadística. Los ítems apenas registran diferencias significativas en base al curso que realizan, mostrando una competencia similar aquellos que están comenzando sus estudios con aquellos que los están finalizando. Este comportamiento muestra como la cultura común y la cultura científica, a la que se supone que los estudiantes tienen un acceso privilegiado, se mezclan e interactúan en la forma en que este colectivo se apropia y representa el "objeto" cambio climático. En el análisis pormenorizado de los ítems se pueden detectar patrones de representación del cambio climático propios de la cultura común, que coinciden con los detectados en otros estudios realizados desde la perspectiva de la Teoría de las Representaciones Sociales con poblaciones legas desde un punto de vista científico. Uno de los patrones de esta representación es el alto grado de incertidumbre que muestra.

ID: 56: Modelling sustainability through energy-saving on campus: Student perspectives from 8 universities in 3 countries - *Debby Cotton, GB*

There is increasing debate about what the 'sustainable university' should look like, but for many it implies a university which models sustainability through its own operations as well as through teaching and research (Sterling et al., 2013). Energy saving on campus is an increasingly important part of universities' responses to the sustainability challenge, and many students and faculty would like to see their institutions exhibiting leadership on this issue (Wright and Horst, 2013; Drayson, 2015). There have been a range of targeted programmes focused on energy saving in higher education, and it is a major indicator in sustainability rankings such as the Green League[1] in the UK and STARS[2] (Sustainability Tracking, Assessment & Rating System) in North America. There is some evidence that students are considering sustainability as one of a range of variables when deciding where to study and that they are putting pressure on university leaders to consider sustainability in campus and education strategies (e.g. Drayson, 2015). This paper draws together data from a project exploring students' perceptions of energy-saving activities at 8 universities across 3 countries (UK, Portugal and China). There are substantial variations across the different contexts studied, but between a quarter and half of the student respondents at all the universities feel that their university does not do enough to save energy (with most of the rest answering, 'don't know'). The majority of students in all contexts felt that there was insufficient information about energy-saving on campus, and that they would be more likely to choose energy-conservation behaviours if there was a visible representation of energy use. Given that many of the universities involved in the study did in fact have innovative energy saving projects underway, this suggests that a lack of communication with students is a missed opportunity to share good practice with students and to influence their behaviour.

ID: 193: How does academic environmental education change the way students evaluate the severity of environmental problems? - Nurit Carmi, IL

Understanding how people perceive various environmental problems is important for mobilizing public opinion and public support for environmental protection. Our research questions were: 1. What are the criteria that influence the perceived severity of environmental problems? And 2. Does environmental education change the way people perceive these problems? We presented a list of the major environmental problems the country is currently facing to 130 students with and without academic environmental education. The students were asked to evaluate the severity and the priority that should be given to solving each of the problems. We used a repertory grid, a structured interview technique used for eliciting personal considerations while making risk evaluations and prioritizations. We found that: 1. the perceived certainty of the risk and the emotion that it arouses have a strong influence on the perceived severity of the problem. 2. In addition, we found that environmental education changes both the perceived severity of the problem and the priorities given to address the problem. The importance of academic environmental education and messaging unequivocal information and arousal of emotions in environmental education and communication will be discussed.

ID: 330: Cinco formas de comunicar la educación ambiental en contextos inciertos en México (1992- 2017) - Rafael Ramirez Beltran, MX

La ponencia documenta el trabajo sostenido por más de cinco lustros de un proyecto de formadores docentes a nivel posgrado que ha tratado de buscar formar, informar, dialogar y comunicar la educación ambiental en México en una sociedad inestable, con debilidad política y sin certidumbre hacia la sustentabilidad. El Proyecto se traban con cinco ejes de educación ambiental ligados entre si mostrando algunos de sus logros comunicativos y lo que han enfrentado en un contexto inestable:

- 1) Programa de Formación de educadores ambientales para maestros del a nivel posgrados. Es el origen del trabajo en educación ambiental, que se ha dividido en cuatro partes: una maestría, una especialidad (en educación básica), un diplomado y cursos y conferencias. En su conjunto se han formado 400 profesores y el impacto ha sido diferenciado desde la modificación de la práctica docente hasta investigadores y funcionarios públicos en el campo de la Educación Ambiental. La forma comunicativa fue la *Revista Caminos Abiertos* que fue eliminada en un recorte presupuestal.
- 2) Intervenciones Educativo-ambientales estas acciones son colaborar durante una estancia corta apoyando el desarrollo de otro programa en alguna parte de México. Se ha trabajado en varias regiones. El límite es el tiempo y se ha comunicado en reportes de investigación.
- 3) Los Coloquios Nacionales de Egresados y Estudiantes, donde se vincula a los alumnos de posgrado en Educación Ambiental a nivel del país, Son autofinanciados y auto sostenibles. Las memorias y la colección editorial *Vuelta de tuerca* han sido su expresión.
- 4) La revista educativa electrónica <http://palido.deluz.mx/>, en los últimos 7 años en la forma digital, interactiva, directa, amplia e inmediata de comunicarnos con el campo. Su límite es la producción y colaboración.

5) El programa televisivo DocumentArte en Green. Tv, sobre cine y educación ambiental el logro es la audiencia y producción; el límite la forma en que se produce televisión.
El enemigo más grande de estas acciones ha sido la incomprensión institucional.

Ethics Lead Learning in EE

ID: 10: Adopting Sustainability through Whole School Community Approaches - *PETER MILNE, GB*

Peter Milne, Founder/Director of Target4Green, will share his insights on the whole school community Education for Sustainable Development programmes he has developed and run in the UAE and the UK, as well as the experiences he has had over the last 25 years as a teacher and consultant/trainer in international and multi-cultural/multi-national schools. The session will focus on challenges faced by schools which include: Gaps between awareness and understanding Motivation to and knowledge of how to become more sustainable; from individual to collective empowerment Finding Time and a Voice Parental involvement Support from School Management/Budgeting Creating a framework for professional development linked to ESD Linking infrastructure change to mind set change Whole community engagement Creating a Culture of Change Towards the Local Environment Through focusing on the Sustainable Development Goals and the post Paris agenda, Peter has developed a series of Educational Symposia called Beyond COP 21 where school communities come together to learn and discuss, interact with experts and come up with practical solutions, whilst at the same time addressing many of the challenges mentioned above. A key part of the day is a Sustainability Showcase, where companies and organisations set up displays and activities and interact directly with the students, teachers and parents. The global series has the support of Bill McKibben of 350.org as well as Eco-Schools Global and Jane Goodall's Roots & Shoots Programme, and has proved to be an excellent local or regional CSR initiative that directly supports the SDGs through education. With collaboration between schools and with the local sustainable business community, the series has helped to develop Social Responsibility and collective action between the business and education worlds.

ID: 170: School Culture, Sustainability and the New Finnish Core Curriculum for Basic Education - *Niina Mykra, FI*

The Finnish pupils' success in international student assessment tests (PISA) has been a focus of global interest and admiration. This presentation analyzes Finnish school culture from the point of view of sustainability; particularly, the role of ecological sustainability in the new core curriculum and teachers' engagement of it. The Finnish national core curriculum for compulsory basic education was renewed in 2014 and the new curriculum has been implemented since August 2016. Sustainability is one of the key concepts. The new curriculum states: 'Humans are part of nature and completely dependent on the vitality of ecosystems. Understanding this plays a key role in growth as a human being. Basic education acknowledges the necessity of sustainable development and ecosocial knowledge and ability, follows their principles and guides the pupils in adopting a sustainable way of living.' And 'A learning community accounts for the necessity of a sustainable way of living in all of its activities.' There are plenty of details about sustainability also in many other parts of curriculum. How do these statements realize at schools? What kind of discourse is there between teachers and administration about the subject? My presentation will illuminate the aspects of sustainability in the curriculum and show how they are reflected in the administrators and teachers accounts. This analysis is part of my PhD study, which examines the perspectives of ecological sustainability in educational discourse. I am interested in the multilevel organizational aspects and systemic thinking. In addition to the curriculum texts, my data contains interviews (33) of teachers and administration, and the annual plans of the schools (38 x 2). The preliminary results suggest that even if the core curriculum emphasizes sustainability in many ways, the implementation of these principles to the guidelines for administration and concrete everyday situations at school does not automatically take place.

ID: 1023: Deep Ecology in Life and Work - A Teacher Educator's Autoethnographic Inquiry as a Way to Respond to "TRC Calls to Action" - *Xia Ji, CA*

Teachers are the engineers of humanity's soul. As teacher educators we have the chance and privilege to touch the soul of soul-touchers. Thus, it is of utmost importance that we teacher educators genuinely engage with the lifelong journey of learning to teach and act to be a role model and to walk the talk. The integration of what/ how we teach and how we live is absolutely necessary to maintain our integrity. The author, as a daughter and a mother, a teacher educator, an environmental educator, a citizen of the Maple Nation, and a dweller on Turtle Island, explores the learning possibilities that the TRC Calls to Action brings in her own life and work. With deep ecology as the guiding ethical and philosophical framework, this autoethnographic inquiry documents the author's journey and understanding as she engages with the Calls to Action since 2015, and even earlier since 2008 when she became a landed immigrant to Canada. Specifically this presentation/ article draws upon the authors' daily journal, teaching log, regular meditative practices such as walking, biking, dish washing,

folding laundry, and once in a while meditation (sitting or standing still, improvised dancing/ movement, or painting) .

ID: 879: The Role and Contribution of Humanistic Ethics in Environmental Education Learning - *Jorge Rodriguez Aboytes, MX*

Environmental Education has the purpose that students to conceptualize and understand the environmental and civilization crisis in order to generate some solutions to it and can contribute to the construction of a sustainable world. In order to achieve this, it is crucial that they analyze the relationships between human being, society and nature. The purpose of this research was to propose and discuss the role and contribution of Humanistic Ethics to the achievement of these learnings, in the field of Environmental Education. Humanistic Ethics provides the study of the ontological conditions that makes human beings different from other types of living organisms in nature, and how they interact between them. This Ethics refers to the way of living and act of human beings, accordingly to the virtues that humanists throughout history have established as the main characteristics of the developing of human potentialities. Also, Humanistic Ethics denounce consumerism and extravagant lifestyles as factors that damage both society and environment. So, this work represents a bridge between two practical/knowledge fields such as Ethics and Environmental Education, allowing students a different approach to comprehend this complex world problem. Key words: humanistic ethics; environmental education; virtues; and complexity.

ID: 892: Learner-centered pedagogies for sustainability - *Mark Caddey, AU*

The Sustainability Action Process (SAP) is an investigation and action scaffold for school-age students that supports authentic student-centred learning and sustainability action. It is the action learning scaffold integrated into the Sustainability Curriculum Framework (2010) produced by the Australian Government to guide teachers and curriculum developers. Developing effective SAP learning resources has been undertaken over several years with range of partners including Education and Environment Departments and community organisations. Pilot projects have covered a range of contexts including climate change, student leadership, thermal-comfort, and sustainable transport. This approach also develop students' understanding of systems, world-views and futures thinking, the three conceptual organisers of the Sustainability cross-curriculum priority of the Australian Curriculum. The SAP has five steps: Making the case for change; Defining the scope for action; Developing the proposal for action; Implementing and; Reflecting and Evaluating. It guides students to become sustainability project managers for issues in their classroom, school, local community, or home and helps guide the development and implementation of solutions. Students build a sense of agency, investigate of multiple sustainability perspectives and concepts, and manage their own learning. This pedagogical approach can be challenging to teachers with minimal knowledge of sustainability concepts. The resources structured with questioning framework so teachers and students can share the learning journey. This presentation include evidence from evaluations, work samples and teacher feedback on the effectiveness of the SAP. The new SAP learning resources have been published on the Australian national learning portal. They cover seven sustainability topics: energy efficiency, water efficiency, waste and materials, biodiversity, thermal comfort, food gardens and transport. The resources are differentiated for primary and secondary students for age-appropriate sustainability projects and include curriculum information and a student learning journal for recording their work. Resources at <https://education.nsw.gov.au/curriculum/sustainability/sustainability-action-process>.

ID: 292: Children's Thinking Patterns in Environmental Ethics Development - *Tassanee Ounvichit, TH*

Despite ceaseless efforts to develop environmental ethics by all means, environmental degradation seems never cease. This study chose to focus on the environmental ethics development of children in hopes that it would fill in the ethical development gaps early on. Employing the ethnographical study of action research, it investigated the environmental ethics development situation in a Ramsar community of Krabi, Thailand where local mangroves continued to dwindle and devised alternative approach to rectify the situation. Through an immersion into the locality and interviews of 45 community residents, it was unveiled that the common methods of environmental ethics development there included mainly dominating explanation and habitual inculcation. The local family and religious institutions were succumbed to the search for economic welfare while the educational institution separated environmental learning from the childrens daily life. As a result, what children learned were related to how to utilize rather than conserve their mangroves. An alternative ethical development method was tried by involving 15 local children, aged 12-15, in a project for their constructivist learning about their environment. The monitoring of their development tendencies towards the three prongs of egocentric, homocentric and ecocentric ethics indicated that their initial thinking patterns were similar but the 11 children who demonstrated ethical

development engaged more in the higher-order thinking while the other four did not. The four children who could touch on the ecocentric level were keener about summarizing their knowledge for presentation. Understanding the relation between the thinking patterns and the ethical development tendencies helped environmental educationists understand the value of embedding thinking skills in arranging constructivist environmental education.

ID: 589: Value education is embedded in the process of playing a simulation game twice - *Jen-shiuan (Susan) Shiau, TW*

Trial and error is an important process for problem-solving. Playing the simulation game, Fishbanks Ltd., twice also provides this kind of opportunity to develop strategies to avoid the occurrence of 'the tragedy of the commons' and, at the same time, finding the way towards sustainability. Dr. Dennis Meadows, the game manager, addressed that the first time play aims to discover problems in the system through making mistakes and being caught by surprise and the second time is to confirm solutions. The reflection and discussion conducted in the game also suggested certain level of value education. The author Ms. Shiau is a Fishbanks game manager and recently played the game with a group of 20 people twice in a row. The group experienced the fish collapse and examined that the game objective 'gaining greatest assets' induced their desire of 'getting more.' They then created 'keeping a big fish population' as the other goal. With this consensus towards the new vision, they found a way of reaching dynamic balance between making profit and keeping fish population in the ocean. One participant mentioned the whole experience as 'the first time was a game and the second time was a mission'. According to the players' feedback, the most valuable thing they gain in the first game includes the connection between selfishness and negative consequences and between over fishing and marine resource depletion. In the second time, they had deeper understanding about the importance of clear vision, consensus, self-control, scientific examination, sustainable management, group-interest, cooperation and system structure in sustainability. The ethicist Noel Preston once said that 'It is often asserted that one's ethical framework is 'caught' rather than 'taught'.' The simulation game Fishbanks provides a space for players to test their values and further identify the suitable ones for pursuing a sustainable future.

ID: 576: The Sulitest : raising awareness and assessing sustainability literacy worldwide - *Aurélien Decamps, FR*

How do we make sure that current and future decision makers have sufficient awareness on sustainability to take informed and effective decisions? The Sustainability Literacy Test (Sulitest) is an international assessment tool measuring sustainability literacy. The Sulitest is a tangible implementation of the UN HESI (Higher Education Sustainability Initiative) launched at Rio+20 and a featured initiative in the SDGs Partnership Exchange. It highlights the need to raise awareness and to measure core literacy on sustainable development. The Sulitest is designed to provide an open online tool available for any higher education institution worldwide with students from any discipline at all levels. It serves as a training and assessment tool for raising knowledge, skills and mindsets on sustainability and building an international database to monitor progress on sustainability literacy. The scope of the Sulitest is attached to the SDGs' agenda and the results are used to monitor progress on core literacy on these global goals. The Sulitest has gained an international recognition with more than 500 organizations registered in 57 countries and almost 60000 candidates who have already taken the test. A community has been gathered contributing to enrich the tool, and to open it to non-academic stakeholders such as corporations, institutions or NGOs to maximize its impact. The objective of this symposium is to discuss the recent evolutions of the Sulitest towards a collaborative platform to promote ESD (Education for Sustainable Development) and more broadly to raise core sustainability literacy worldwide. During the session, we will welcome feedback from higher education institutions or other stakeholders which are already using the Sulitest and we will provide resources to engage every organizations willing to discover this tool and to join the community. An interactive quiz will be organized to engage the participants in using the tool.

ID: 575: Holistic, experiential and balanced: The fundamental principles on an ethically-based environmental education - *Calin Gurau, FR*

This paper's analysis and criticizes the increasing fragmentation and abstractization of knowledge in the post-modern society, and the drastic isolation of the pedagogical experience from the natural environment and living phenomena. This approach leads to an inward-looking, human-centered perspective, subordinated to economic gain and material control. Unfortunately, the elements contributing to the ethical comprehension get lost in the process of knowledge fragmentation and abstraction, because the concepts of 'good' and 'bad' associated with real situations are highly contextual and cannot be properly expressed and measured through quantitative variables. Often in life, too much 'good' can turn into 'bad', while

the peak or a 'bad' situation can bring a breakthrough that initiate a positive dynamics of events. Rather than static and linear, the reality is dynamic and circular, as the Taoist symbol of Yin and Yang, that evolves fuelled by paradoxical contradictions, from one state of dynamic disequilibria to another. To counteract the negative effects of the post-modern Western pedagogy, geared towards control and profit, it is necessary to develop an education based on a holistic perspective of the reality, using experiential learning and a balanced presentation and investigation of the elements composing and influencing reality. Rather than attempting to control the natural and social phenomena, the accent should be put on understanding, participation and integration into the natural and social flow of events. A useful pedagogical tool to enhance this perspective is the longitudinal curriculum focused on inter-disciplinary mentorship and feedback, the integration of applicative and theoretical science, humanism, and ecological thinking.

ID: 506: Pro-poor Environmental Education and Sustainable Livelihoods: A Case Study at a Small Recreational Fish Farm in Taiwan - Hui-Nien Lin, TW

According to the United Nations, poverty eradication is the greatest global challenge for sustainable development in the 21st century. Although Rio+20 urges facilitation of the green economy to promote sustainable development and poverty eradication, there is some uncertainty over the role and function of environmental education to achieve the goal of pro-poor economic growth. This study examined the effect of environmental education using a framework of sustainable livelihoods at a fish farm located in a remote village in Taiwan. Most of the residents earned a meager income from aquaculture and offshore fisheries. The fish farm adopted sustainable aquaculture practices to lower energy consumption and fodder supply. However, lower productivity resulted, changing the fish farm into a recreational and environmental education center to generate lost revenue. Using participant observation, this study found that a variety of opportunities for economic growth became available after attendance in EE programs increased at the fish farm. In addition to jobs and income, some other positive impacts were observed, such as attention and respect that elder fishers received from program participants. To enhance the relevance of environmental education and poverty alleviation, this study suggests that careful consideration of local livelihoods should be examined before planning and design at EE centers or facilities occurs.

ID: 411: Educar para una Cultura de la Sostenibilidad en Los Centros Educativos de Galicia – España - German Vargas Callejas, ES

El objetivo del presente artículo es fundamentar teóricamente el concepto de “cultura de la sostenibilidad” como una superación de la idea de desarrollo sostenible y, también, describir la experiencia educativa y de investigación centrada en la formación de profesores y alumnos para una cultura de la sostenibilidad. Los datos que sustentan esta comunicación provienen de la organización de grupos de discusión y de la aplicación de prácticas formativas en 4 centros educativos de secundaria en Galicia – España. Las principales conclusiones del trabajo destacan que es preciso superar el sesgo económico del concepto de desarrollo sostenible y todo lo que ello implica; que es importante elaborar nuevas visiones cuyo eje sea la cultura de la sostenibilidad. Desde una perspectiva más práctica, se constata que no se puede abordar la educación ambiental sólo en base a tópicos tradicionales (por ejemplo: reciclar, reducir y reutilizar), siendo preciso enfocar la crisis ambiental y social desde una perspectiva integradora y compleja, que abarque todas las dimensiones de la vida humana (cultura), que definen las formas de relación entre los seres humanos y de estos con la naturaleza.

ID: 737: Environmental ethics and the impacts of mining: the case of Mariana, Brazil - Rosely Imbernon, BR

Sustainable development aims to achieve the quality of life of the community in general, and the need for consumer goods requires the exploitation of mineral resources, which involve processes that are extremely impactful to the environment. Society's perception of the ethical relationship between the use and exploitation of natural resources and the values associated with the impacts of this exploration only emerge in everyday debates when major environmental disasters associated with mineral exploration occur, as in Mariana, Minas Gerais, Brazil. The sea of mud overflowed in one of the most important rivers in Brazil, the Doce river, killing fish and aquatic life hundreds of kilometers away; more than 20 people died; hundreds of people who depended economically on the river had their lives changed; more than 500 homeless people; the community of Bento Rodrigues, closer to the mine may never be habitable again. The sea mud reached the Atlantic Ocean, causing enormous environmental impacts. A group of Brazilian students, future teachers of natural sciences for basic education, was asked about how to measure the environmental impact of the rupture of the Samarco mining dam, in Mariana? The analysis of the students' answers applied the Discursive Textual Analysis (ATD), for the analysis of qualitative data. The answers were categorized and we found two central ideas, one related to the environmental impact, and

another related to the need to exploit the mineral resources to obtain raw material to improve the quality of life. The students' ethical conflict became clear because when they were asked to assess the impacts on the environment, all students were unanimous in pointing out that although there is an intrinsic value of nature, mineral resources have an instrumental value because they are necessary for humanity.

ID: 566: Can we transform Economics into an environmentally-sustainable science? - Calin Gurau, FR

This paper presents an analysis of the main problems related to the principles of the Economics science taught in universities and business school, which are largely responsible for the nowadays predatory exploitation of the natural environment. A comprehensive review of the extant literature evidence the issues related with the central Economics paradigm of unrelenting progress expressed through material growth, the problems created by using performance indicators that do not allow to ethically differentiate between economic activities with positive or negative environmental consequences, and the neglect of the negative externalities created by a predatory exploitation of the natural environment and resources. After an analysis of the present-day shortcomings of the Economics science, the authors propose a series of remedies to encourage the adoption of an ecologic perspective that maps and predicts as accurately as possible the global effect of various human activities on the natural and social systems.

ID: 744: A study on developing a pilot biodiversity educational tool to communicate the discord between wildlife and humans - Shiho Miyake, JP

This study aims to develop a methodology to create awareness for the public on biodiversity and sustainability. Although global and local biodiversity political issues have been developed and announced, few people in Japan are aware of these strategic plans or priorities retaining environmental diversity. The author aimed to spread awareness about biodiversity and environmental sustainability by developing a pilot educational tool of a picture story focusing on the Asian elephant based on collaboration with a zoo. One of the project outcomes suggested that story-telling events for zoo visitors had a significant impact in displaying a shocking unknown fact. In this research, the picture story (the picture and story are separate) was altered to a three-minute animation (the picture and story are combined) evaluating the awareness it promoted among non-zoo visitors. Results from candidates, who were 20-year-old women, revealed that the most frequent impressions described by word associations were sad, pitiful, cruel, painful, selfish people and coexistence. Additionally, approximately 90% of candidates were unaware of the habitat loss of elephants. Candidates' comments of free description also suggest that the picture story animation successfully communicated sympathetic emotions such as compassion for elephants and, an ethical dilemma on discovering that human beings' rich culture was created by victimizing the animal. To conclude, this animation effectively communicated the environmental problem of the discord between humans and wildlife as a 'victim' and 'dilemma'.

ID: 265: Food Consumption Behaviour: A Case Study at University of Gävle, Sweden - Bo Lennart Andersson, SE

Food is a necessity for humans. Since a few decades, it has become common that we consume imported food instead of consuming food that is locally produced. This tends to be an economic issue, as it is often cheaper to buy imported products than locally produced. This situation can be detrimental to the pursuit of sustainable development. This study aims to examine the reasons why imported food is consumed in higher quantities than locally produced food at the University of Gävle. It focusses on three stages: procurement, consumption and waste management. Data were collected using interviews and a survey. Consumption will be tested with the survey. Some of the preliminary findings are: outsourcing obstruct decisions concerning food procurement; food waste is being actively measured and patterns are beginning to appear. In order to contribute to sustainable development, it is important that we consider consuming locally produced food, and for this, it is important that we educate students on the importance of the topic and help them change their attitudes.

ID: 215: Environmental Education, Ethics and Action: Re-imagining critical skills for sustainable lifestyles and global citizenship - Bob Jickling, CA

Open deliberations on values associated with relationships between people, and people and their environment are central to (re) emerging concepts of environmental stewardship, sustainability, conservation, eco-justice and other notions that capture people-environment interactions. This brings values and ethics into focus in environmental education processes and practice. But many educators are daunted by the philosophical and pedagogical challenges of enabling such exploratory,

open-ended learning processes, or integrating them with school or higher education curricula. This workshop responds to these challenges by providing hands-on activities that provide educational entry points into the process of examining environmental ethics as an everyday activity. This workshop explores some of the educational processes that could enable deliberations on values and ethics and how these may foster creative explorations of more environmentally and socially responsible forms of development, environmental justice and social-ecological change. In this sense, ethical thinking is about involving people in processes of exploration and understanding values and how they might transform themselves and their society. Using contemporary examples from newspapers, advertisements, and curriculum guides, participants are encouraged to identify deeply embedded assumptions within these cultural artifacts regarding how we value, represent and act in relation to each other and the natural world. During the workshop, each activity focuses on critical thinking, reflexivity and explorations of alternative ways of thinking and being. This is related to the workshop's focus on 're-imagining possibilities'. Here participants will develop some practical ideas about redesigning their language of instruction, pedagogical orientations, and perspectives on curricula. The ideas and activities shared during this workshop will draw on new activities that have been drafted and are being tested for inclusion in the second edition of the UNEP activity book now titled Environmental Education, Ethics and Action: A Sourcebook for Educators, intended for use in teacher education and other educational settings.

ID: 149: The unspoken place of environmental violence in environmental education - Richard Kool, CA

This session will present an analysis of the unspoken place of environmental violence in EE practice, and offer suggestions as to how practitioners can deal with environmental violence in their classrooms and/or programming. The term "violence" virtually never appeared in the titles or abstracts of any of the major environmental education conferences, and rarely appears in our published literature. Every day, environmental and sustainability educators talk about pollution, extinction, carbon-loading of the atmosphere, ocean acidification and unsustainability. What are these but an expression of the outcomes of violence? Even when as educators we talk about and then go into natural settings with our students and experience the beauty, wonder and awe of the natural world, we all know that what we study, admire, and live in appreciation of is under various kinds of existential threats from human violence; and while we might talk about threats, we never seem to understand them in terms of the threat of violence. My theoretical lens is based on the work of Norwegian peace scholar Johan Galtung., who contrasts direct (the outcome of an actor with intent to commit violence), structural (the result of human systems that cause violence either through intent or unintentionally) and cultural violence (the result of social legitimization and justification of direct or structural violence). Environmental educators can potentially address all of these forms of violence. As well, I will explore concepts of environmental non-violence, anti-violence, and contra-violence. The environmental and social issues that drive our concern for environmental justice in communities oppressed by poverty, racism and inequality are the results of violence; violence towards people and towards nature. But environmental violence is not only felt in those communities. There are linkages between exploration of environmental violence and a range of EE programming, going from the relatively simple 3Rs to restoration ecology and political action.

ID: 644: Caminos Educativos para uno Convivio Mejor Entre Humanos Y Jaguares - Lakshmi Hofstatter, BR

Los jaguares son depredadores que ocupan la parte superior de la cadena alimentaria y son especies claves para lo mantenimiento del equilibrio del ecosistema y de la biodiversidad. Pero a pesar de su belleza y fascinación, hay muchos obstáculos para su conservación debido a conflictos con los seres humanos, por lo que están en peligro de extinción. Esta investigación se llevó a cabo en una comunidad rural en la región semiárida del estado de Bahía, Brasil, junto a un curso de formación en educación ambiental para 25 maestros. Buscamos entender mejor estos conflictos y pensar en posibles vías educativas para una mejor convivencia entre los humanos y jaguares. Utilizamos para la recolección de datos: cuestionario; entrevistas con los cazadores; historias de jaguares; grupo focal. Pudimos observar el predominio de miedo en relación con otros sentimientos, pero el contacto con el jaguar contribuye para disminuirlo. Observamos que hay diferentes motivaciones para la caza, tales como represalia, el entretenimiento y el propósito alimentar. Todos los cazadores que matan el jaguar para su propia defensa no tienen relatos de haber sufrido una amenaza concreta, sólo su proximidad. Nos damos cuenta de que por el hecho de vivir en una región semiárida, con factores limitantes para la vida, contribuye que este animal sea visto como un competidor de los recursos naturales. Por lo tanto, necesitamos una educación contextualizada para construir de forma conjunta con los sujetos las alternativas para asegurar sus medios de vida. La educación ambiental puede trabajar temas del conflicto, como el papel de los depredadores, el uso y la ocupación del suelo, el comportamiento de estos animales para la desmitificación de lo miedo excesivo que despiertan. También puede colaborar en relación con temas sensibles y en el campo de los valores humanos, proponiendo otras experiencias con la naturaleza para despertar otros

sentidos y vínculos con el medio ambiente más allá de lo utilitario y en la sensibilización para coexistencia con las diferentes formas de vida.

ID: 635: Memoria Y Autoconocimiento en las Experiencias Ambientales Urbanas Como Una Propuesta Educativa - Lakshmi Hofstatter, BR

Teniendo en cuenta que la mayoría de la población brasileña vive en centros urbanos, cuyos diseños arquitectónicos dar prioridad al concreto a las zonas verdes, es importante entender cómo se están estableciendo nuevas relaciones humanas con estos espacios, sobre todo el enlace con esta otra naturaleza. Por lo tanto, buscamos entender mejor como son los caminos experimentados por las personas que tienen lazos emocionales con la naturaleza urbana. Nos guiamos por el concepto de topofilia (Tuan, 2012), en la comprensión de la vida en movimiento y como una malla (*meshwork*) de conexiones entre medio ambiente, seres humanos y no humanos (Ingold, 2015) y en el concepto del cuerpo encarnado (Merleau-Ponty, 2000) para explicar la inseparabilidad de la mente, cuerpo y cultura. Trabajamos con 9 personas individualmente, un grupo de estudiantes universitarios. Hicimos uso de una entrevista en movimiento (*walking interview*) y la etnografía sensorial (Pink, 2009) en lugares elegidos por los participantes como afectivo en la ciudad de Salvador-BA (Brasil). Nos damos cuenta de la importancia de estos espacios para el compromiso con el mundo por parte de cada participante debido a experiencias precoces que han tenido con la naturaleza en la ciudad, o que influyó en la elección de carrera y en la forma que cada uno se comporta en relación a la vida. Destacamos el hecho de que la naturaleza urbana tiene una menor capacidad de que la gente se sienta inmersa en el medio ambiente, sin embargo, es ella que lleva la memoria afectiva de las personas cuando volver a visitar las calles, plazas, árboles, parques donde han crecido y han tenido momentos agradables juntos a las familias y amigos. Todo esto nos ayuda a reafirmar la importancia de las áreas verdes urbanas accesibles a toda la población y la importancia de trabajar la memoria y la conciencia de sí mismo en las prácticas educativas como una forma de reafirmar y volver a visitar nuestros enlaces ambientales.

ID: 834: El concepto de sustentabilidad. - Jose Silverio Morales, MX

Es común derivar el término sustentabilidad del concepto de desarrollo sustentable, pero lo consideramos un error. El segundo concepto se refiere a una propuesta mundial de tipo político y económica surgida en 1987 por encargo de la ONU, en la cual se hace un estudio generalizado del ambiente global en sus dimensiones económica, ecológica, de consumo de energía y pobreza entre otras, finalizando con una propuesta que debería ser adaptada y aplicada por todos los países del mundo, situación que no ha ocurrido y solo ha quedado en los discursos. En tanto, la sustentabilidad, creemos y más adelante lo sustentamos, es una característica exclusiva de los ecosistemas.

Al revisar algunas definiciones sobre la sustentabilidad, encontramos poca claridad en el concepto y solamente se le relaciona con procesos o actividades humanas de gestión de recursos naturales, de desarrollo, de intervención gubernamental, o sobre la importancia de crear indicadores de la sustentabilidad. Du Pleiss (2002) afirma que “la sustentabilidad es la condición o estado que permite la continuación indefinida de la existencia de la especie humana a través de una vida segura, productiva y en armonía con la naturaleza y con los valores espirituales”, sin embargo, como se nota, solo hace énfasis en los humanos sin mencionar el resto de las especies.

Shiva (1993) afirma que “el verdadero significado de la sustentabilidad se refiere a la naturaleza y a los pueblos siendo la primera la base de nuestras vidas por lo que no se deben alterar sus procesos, ritmos y ciclos; siendo su conservación la base de la producción”.

Los investigadores Nebel, B y Wrigth R. (1996), sin definir a la sustentabilidad, proponen cuatro principios básicos de ella: Los ecosistemas disponen de desechos y reabastecimiento de nutrientes para su reciclamiento.

Los ecosistemas utilizan la luz solar como fuente de energía.

El tamaño de las poblaciones consumidoras se mantiene de tal manera que ni el sobrepastoreo ni la sobrealimentación ocurren.

La biodiversidad se mantiene.

Enrique Leff ubica al concepto de la sustentabilidad dentro de la Ecología y propone los términos de sustentabilidad ecológica y de racionalidad ambiental para la misma.

Para nosotros es claro que el término de la sustentabilidad tiene que ver con el sustento o alimento o bien con sostener, en este caso sostener la vida en general, pero resulta que en nuestro mundo moderno y desarrollado parece que solo cuenta la vida humana, pero no la de todos si tomamos en cuenta problemas como la pobreza y las condiciones de marginación a la que está expuesta una gran mayoría de la población mundial y mucho menos se toma en cuenta la biodiversidad que constantemente se pierde. Son innegables la deforestación y defaunación, así como la alteración de los ciclos y procesos de

la naturaleza por parte de este mundo moderno con su modelo de desarrollo destructivo.

Por lo anterior, podemos concluir que la sustentabilidad es una característica exclusiva de los ecosistemas con algunos grupos humanos formando parte de los mismos, quienes disponen de lo necesario para vivir sin afectar los ritmos de la naturaleza ni consumiendo más de lo que requieren. Donde la energía obtenida es la solar, con grupos de organismos productores y protectores, en este caso la vegetación con su madera, frutos, semillas, hojas y sitios de anidación que a su vez sostienen la vida de organismos y humanos consumidores, cuyos desechos son reciclados por microorganismos que los transforman en carbono, nitrógeno y minerales y que junto con el agua constituyen elementos capaces de sustentar la vida y de darle continuidad.

En cambio, algo muy diferente ocurre en el sistema urbano-industrial-tecnológico donde la energía se obtiene de combustibles fósiles o bien de fusión-fisión del átomo (energía nuclear); donde los residuos que se generan en forma de contaminantes y de calor residual afectan de manera constante a las sociedades humanas, a la atmósfera y a los ecosistemas y desde luego no sustentan la vida, por el contrario, la enferman o la destruyen.

Dejamos en claro algo, hace tiempo que los seres humanos renunciaron a la sustentabilidad, en el actual sistema urbano-industrial-tecnológico-financiero y su modelo de desarrollo destructivo, con ciudades sobrepobladas carentes de alimentación sana, de servicios, de seguridad, de leyes que verdaderamente los protejan, además con gobernantes corruptos que gozan de impunidad; con miles de industrias contaminantes, con millones de autos circulando y contaminando, o con clases burguesas que realizan un consumo exagerado, no puede haber sustentabilidad más que solo en los discursos.

ID: 860: An Ethic of Belonging for Outdoor Education within a Sustainability Paradigm - Philip Mullins, CA

Weaving together culture and environment requires shifting away from dominant Western approaches to educational thought and practice that conceptualize 'the environment' and human societies as distinct, while still fostering care and respect for socioecological communities. This paper will present a participatory ecological approach to outdoor ethics for field-based outdoor and environmental education. The approach recognizes the mutual participation of people and their environments in shaping one another through their interactions. The ethic is described and put into practice through a set of eight principles that together attempt to weave in recognition of, and responsiveness to, contemporary social, ecological, and economic issues and wellbeing of communities. The ethic also attends to local as well as more-distant relations and impacts (both positive and negative) established though and evident within social, physical, and symbolic activities of participants. Thus, the principles suggest concrete yet adaptable practices that outdoor educators can use to engage with, and better understand, the interweaving of culture and nature in place and on a variety of scales through outdoor education, while at the same time working towards positive socioecological impacts.

ID: 969: Care Construction through Prudence and Benevolence as a Practice for a Harmonic Sustainable Development - Morales Gabriela,

Many countries in the world, including Mexico specifically, are confronting a crisis of ethics, this lack of ethical practice has developed a real scenario where violence, corruption and indifference are 'normal' components of everyday life. This scenario has one of its roots in a false mainstream discourse, often but not always promoted by the media about what is care; that discourse never clarifies the transcendence of this concept or the importance of three types of care: care for oneself, care for the other and care for the environment, which are intrinsically related. Nonetheless, the three are essential for a healthy environmental ethic, and its practice is primal if a community or a society is attempting to achieve sustainable development. Technological tools are needed for maintenance of this paradigm; also, human skills and behaviors are necessary and relevant to the process. We propose that the concept of care needs to be analyzed and clarified, for the implementation of an environmental ethic, in which virtue is the objective and must be achieved through the practice of habits of benevolence and prudence, as care components, where one considers oneself as important and with consideration, but also to the other human and to the non-human parts of nature, where one should not only want one's own welfare, but also the other person's welfare and the environment's as well.

ID: 1022: Nature as Researcher and a Different Approach to Research Review: Living Systems Leading Ethics for Educational Research and Sustainability - Marna Hauk, US

Institutional Review Boards (IRB's) and Research Ethics Boards (REB's) were implemented to curb the histories of unethical treatment by dominant human groups in conducting research. Some times these guardian processes have become curtailment, missing the mark on supporting ethical reflection for research with/by nonhumans. Our time begins with a

briefing about the work of the X College Institutional Review Board to introduce living systems considerations as ethical considerations for research (10 minutes). We describe how theories such as the dignity of plants, ecophenomenology, ecocentrism, biophilia, complex adaptive systems understandings, new materialisms, and other orientations support the inclusion of living systems beyond humans in research ethics. How do we conduct research from within the calyx of nature (Mathews, 2008)? We share instruments and processes such as the 20 Questions for Ethical Reflection for living systems considerations. Then, in breakout teams, we explore several examples of student and faculty research methods in environmental and sustainability education for gaining consent of humans and more-than-humans and engaging the participation of the Earth and particular places, including terrapsychology, Gaian methods, arts based methods, STEM, and contemplative inquiry (15 minutes in small groups with 5 minute surfacing themes in the larger group). Are do no harm and leave no trace sufficient as ethical standards? What does reciprocity look like with the more-than-human? What about regenerative authenticity and catalytic validity? Can place-authored data triangulate findings? After small-group brief discussion, we shift into a novel format inviting attendees as participants in a different form of institutional review process, beyond a Council of All Beings, that involves proxies for representatives from living systems in the review of research proposals (45 minutes). The session concludes with a qualitative discussion teasing apart these issues and considering how they might come alive in our own research (20 minutes).

Global and Cultural Diversity

ID: 652: Educational partnership for regional sustainability - Irit Lador, IL

Education institutions of five municipalities, from different sectors, in Israel (Alona | Binyamina Givat-Ada | Jisr al-Zarqa | Zikhron Ya'akov | Hof HaCarmel) collaborated in order to promote regional sustainability. The cooperation is reflected in number of levels: The head of the education departments of the five municipalities meet several times a year in order to establish a policy for environmental education in the region. The operation of unique educational programs in educational institutions. Brainstorming sessions of educators from the region in order to address common challenges in environmental education. Special platform for local educational initiatives that enables educators to fulfil their dreams to change the environment in which they live in. We have learned that the local human resources, culture and knowledge can be the key to social, environmental and economic growth and development.

ID: 231: Teaching about sustainability in Chinese Higher Education: Obedient autonomy and second-best solutions - Debby Cotton, GB

Sustainability is a global strategic priority which requires shared understanding across different political and cultural contexts. Higher education (HE) is often considered to play an essential role in responding to sustainability issues, owing to its contribution to developing leaders of the future. All disciplines have the potential to contribute to an enhanced understanding and response to sustainability, but Business and Economics have been identified as key for advancing sustainability practices - alongside increases in scientific understanding. Sustainability in Chinese HE has developed significantly since the early 1990s and there has been explicit encouragement for universities to embed ESD in their work (Holm et al., 2015). However, there are some quite significant challenges for sustainability education in the Chinese context, including the predominantly environment focus of Green University initiatives (Zhao and Zou, 2015), and the limitations which are placed upon academics in terms of what they can include in their teaching (Chen 2013). Previous research on sustainability in the Chinese context has largely focused on students' perceptions (e.g. Yuan and Zuo, 2013), and there is little research which has explored lecturers' perceptions of sustainability. In this study we interviewed lecturers from three Chinese universities to explore the following research questions: How do Chinese lecturers in Economics and Business disciplines understand sustainability in the context of their discipline? What opportunities and barriers do they perceive? How do they report integrating sustainability into their teaching? Provisional findings suggest that understandings of sustainability in the context of Business and Economics encompass interdependence and growth, but also strongly integrate with issues such as ethics and Corporate Social Responsibility. These are potentially controversial issues in teaching, especially in the Chinese context. The research suggests that, as in the UK (Cotton et al., 2009), lecturers are often forced to adopt 'second best solutions' as a safe form of resistance within the prevailing culture.

ID: 425: The Global Environmental Education Partnership: Building a diverse network to improve environmental education practice - Judy Braus, US

While geographic and cultural contexts differ, much can be learned from effective environmental education practices across the globe. The vision of the Global Environmental Education Partnership (GEEP) is to build a network that advances effective environmental education strategies in countries around the world. This presentation (preferred format: novel) will discuss the GEEP and how it promotes cultural and global diversity by creating a vibrant learning network. Specifically, this partnership between the Environmental Protection Administration of Taiwan (EPA Taiwan), the United States Environmental Protection Agency (US EPA), and the North American Association for Environmental Education (NAAEE), works to (1) build capacity to advance policy, governance, and practice in environmental education around the world, including at the regional, national and local levels; (2) foster strategic partnerships to create a vibrant 'network for networks' resulting in a stronger global environmental education community; and (3) promote and encourage innovation in EE on a global scale.

ID: 778: Education for Sustainable Development in Brazil - Rosely Imbernon, BR

This research project studied the ways that Education for Sustainable Development was included in the panorama of Environmental Education (EE) in Brazil. We started conducting an analysis that compared differences and similarities

between the 40 chapters of 21 Agenda and the 17 Sustainable Development Goals (SDG) of 2030 Agenda. In Brazil, 21 Agenda was widely disseminated in formal environmental education. It happened mainly because this document was proposed during Rio-92 that was held in Rio de Janeiro. In 2002, UNESCO announced the United Nations Decade of Education for Sustainable Development that was going to happen between 2005 and 2014. In general, effective actions were not taken in Brazil during this time, except a proposal of environmental education for sustainable societies. It did not change the way that EE was taken in formal education. In 2016, we conducted semi-structured interviews with basic education teachers to evaluate their knowledge about 2030 Agenda. We also researched which SDG they considered most significant in educational projects. The results indicated a huge lack of awareness of what 2030 Agenda is. They also confused 2030 Agenda with 21 Agenda. In fact, the goals of 21 Agenda were not accomplished in Brazil, although this agenda had initiated in Rio-92. We identified several SDG of 2030 Agenda among the various chapters of 21 Agenda. However, we emphasize that without more effective work with basic education teachers in Brazil, we will not reach the goals of a sustainable development. We can only see old educational environmental projects that still do not have effective results

ID: 75: The role of culture in Indonesian EE - Kelsie Prabawa-Sear, AU

This paper is based on an anthropological study of EE in senior high schools in Indonesia. The paper will describe how EE is positioned in Indonesian senior high schools and in what way it contributes to the development of environmentally conscious and active schools and students. It will consider the role of government agencies, school communities and NGOs and how Javanese culture impacts on definitions and practice (or lack thereof) of EE. It is based on one year of fieldwork in senior high schools and with NGOs in Yogyakarta and Surabaya, Indonesia, and four years experience working and volunteering with Indonesian NGOs. This paper intends to add to academic discussions on how 'culture' influences environmental perspectives and behaviours and approaches to environmental education. This paper will address the congress themes of global and cultural diversity in EE and perspectives, challenges and innovation in research.

ID: 91: THINK GLOBALLY AND ACT LOCALLY: RETHINKING RELEVANCE IN THE PURSUIT OF SUSTAINABILITY OF OUR GLOBAL ENVIRONMENT. - Chisa S C, NG

It has been acknowledged that the world is a global village and the environment provides that meeting point for all the members of the village to determine how the village would be managed or sustained for all generations present and future. Therefore, every decision concerning the protection of the global environment is a delicate one because of cultural diversity of its members. The issue of climate change and the transition from fossil fuels economy to a sustainable energy path are examples of thorny issues that confronted and have continued to challenge modern global village. This is because climate change is caused by variation on climate due to activities of man and the nature. These activities are carried out in the global space called environment. The environment is inhabited by different people of diverse race and culture whose levels of contributions to climate change predisposing factors differ. Thus, proffering solution for a lasting climate change panacea, would require the factoring of these cultural differences and orientation of the global community. This paper found that cultural perspectives of the causes, impacts differential contribution of various states in the global community, affected the delay in reaching a global deal on climate change. This paper argues that the same cultural differences of the members of the global village affects the transition from a fossil fuels economy to a sustainable energy path. Thus, drawing from a historical perspective of the climate change negotiation and legal regimes, this paper will explain how not 'to think globally and act locally' at all times, would help in addressing a serious issue of global concern like climate change. The author would make recommendations drawing from lessons learned in reaching the recent Paris climate change deal.

ID: 249: Environmental Education in Culture Diversity in Indonesia - Ida Darmapatni, ID

One of the best ways to develop and maintain culture is through education. Education and culture have a strong relationship and influence each other. One goal in education is to maintain and improve culture and, through culture, education will be developed and understood. Environmental education is a new terminology in Indonesia. It was developed around 30 years ago and through attention from government, organizations and universities, it was started to find integration in national curriculum. Schools have begun to implement environmental education in their teaching and learning process. Government has supported this implementation with the Adiwiyata reward for schools that implement environmental education well. Our focus in this paper is the consideration of how Indonesian culture is being integrated into environmental education in order to help stakeholders value and understand what they need to do to help develop environmental education in Indonesian

schools. We examine the challenges that exist when implementing environmental education in Indonesia with and without the integration of Indonesian culture. This paper also reflects on the current progress of environmental education implementation in Indonesia right now. We had a chance to join the Asian Development Bank (ADB) research project in Indonesia in 2012 for two years. The project was called ACDP 010 (Analytical Capacity Development Program 010): Formulation of a National Plan for Environmental Education. Five Indonesian ministries were involved: Ministry of Home Affairs, Ministry of Environment, Ministry of Education and Culture, Ministry of National Education and National Development Planning Agency. The project spanned four provinces in Indonesia with data from each province taken from at least 60 schools across grade levels. This research gives us evidence on how culture strongly influences environmental education implementation in Indonesia.

ID: 345: Decarbonize 2017: A Global Mobilization of Youth around Climate Change - Terry Godwaldt, CA

The Decarbonize project is a global movement to transform our world and safeguard our planet against the catastrophic influence of climate change. As the world prepares for the UN Climate Change Conference (2017) in Germany, we are laying down the groundwork for a collaborative mobilization that will engage over 100,000 youth from every continent on earth in the world's largest consultation of youth on climate change action. Building on the success of #Decarbonize 2016, in which over 10,000 youth from every continent on earth worked together to create a paper that was presented in Marrakech at COP22, #Decarbonize - Decolonize 2017 will synthesize the opinions of over 100,000 youth from all over the world into a statement of action which demonstrates the centrality of climate change and Sustainable Development Goals. Given the devastating impact Climate Change has had on the world's Indigenous communities, this year's paper will focus on telling indigenous stories and empowering young people to act as allies in the fight against Climate Change. The paper will amplify the commitment of young people to this issue and demand that governments set a clear path for action to implement sustainable policies at all levels. This will include a network of connected classrooms, national youth delegations, Indigenous peoples and frontline communities. #Decarbonize has partnered with Full Circle Visuals to transport the students to some of the world's most sacred and vulnerable locations via virtual reality. The creation of a 360 degree virtual reality film at six sacred indigenous sites, from six separate continents, will act as a key barometer for climate change and allow the voices of the people whose lives have been displaced to be heard.

ID: 533: Taiwan Australian Environmental Education Partnership - David Kopelke, AU

Environmental education (EE) is an international phenomenon; its nature reflects the culture of the countries in which it is being undertaken. Consequently, how EE, particularly EE beyond the classroom, is taught and learned varies between countries. Curriculum, pedagogy, as well as attitudes to how individuals connect in/with/to places vary. This can create challenges for place-based educators when attempting international links. This presentation explores one process by which international cooperation in EE can be enhanced to draw upon the strengths of two different education systems in countries that also have different languages and cultures. Latitude 24 is an initiative that arose out of the 7th WEEC between a Taiwanese university and an Australian outdoor environmental education centre. It has expanded to include additional Taiwanese universities. The initiative found that local outdoor learning notions varied between the 2 countries with strong differences in attitudes and practice regarding time spent outdoors (TSO) in relation to in-/non- and formal EE learning contexts. As a consequence, a range of bilingual resources, workshops, and an international visiting intern and scholar program were established. This round table session describes the establishment process, identifies areas of common interest, diversity in teaching and learning styles, and workshop topics based on the cultural impact affecting how individuals relate to both the natural and built environments. To sustain a bi-lingual intern program, the Double Loop Learning Model (Kopelke, 2015) was developed for individuals who engage in place-based EE professional development. This program provides the basis for exploring the implications of Latitude 24 on influencing curriculum, pedagogy, and research in sustainability education, adventure education, science education, teacher education and professional development, health and safety and more.

ID: 632: Del campo a la ciudad: construir una nueva globalidad a partir de nuestra diversidad cultural. Experiencia en la formación de educadores ambientales. - Nancy Benitez Esquivel, MX

Se presenta una experiencia de formación de educadores ambientales en la que el reconocimiento de la diversidad cultural en las prácticas ambientales cotidianas juega un papel central. Ésta se desarrolla en la asignatura de medio ambiente, que se imparte en el primer semestre de la Maestría en Educación Ambiental de la Universidad Pedagógica Nacional, Unidad

Azcapotzalco, Ciudad de México. Desde su fundación en 1992, esta Maestría se ofrece mayoritaria, pero no exclusivamente a profesores de educación básica en servicio; se integra de 12 asignaturas distribuidas en cuatro semestres. Este programa académico se orienta a la intervención educativa.

El grupo participante está integrado por 10 personas: 9 mujeres y un hombre. Siete desarrollan sus labores en educación formal y dos son profesionales independientes, participantes del ámbito no formal.

Los temas clave en la asignatura de medio ambiente giran en torno a medio ambiente, crisis ambiental y sustentabilidad, como fundamentos previos para trabajar la educación ambiental en los semestres posteriores en los que los estudiantes deben realizar un diagnóstico, una propuesta de intervención que desarrollan y evalúan para obtener el grado académico. Frente al tratamiento abstracto de los temas ambientales, se intenta profundizar en el reconocimiento de ellos en la realidad personal y familiar. Esta propuesta parte de considerar el necesario ir y venir de lo simple a lo complejo, de lo abstracto a lo concreto, de lo local a lo global, y pasa por profundizar en la riqueza cultural de los lugares de procedencia. Subyace que: todo el tiempo nos relacionamos con el ambiente, principalmente a través de nuestras prácticas cotidianas, las cuales cambian de acuerdo al momento histórico y la cultura. El cambio crítico está asociado a la imposición de un modelo económico y cultural que ha traído consigo la crisis ambiental global. Ante ello, un educador ambiental debe estar dispuesto a reconocer y rescatar la diversidad cultural en su cotidianidad, transformar sus prácticas ambientales y acompañar a otros en su proceso de cambio.

ID: 667: Different social (group) with different learning: Comparing characteristics and strategies of social learning between urban and rural NGO in eastern Taiwan - Mengyuan Jen,

Although people agree social learning is one of the most significant strategies in promoting Education for Sustainable Development (ESD), it is worth noting that social learning is strongly embedded in the context of culture. In Taiwan, differing from most major environmental NGOs which only focus on their own concerns, NGOs usually have multiple and cross concerns because of the relatively small region that faces many issues. This is the cradle that cultivates the uniqueness of social learning in this region. To understand the characteristics and strategies of social learning applied in specific local and cultural contexts is necessary. The purpose of this study is to explore the themes, process and approaches of social learning in eastern Taiwan by comparing urban and rural environmental NGOs. In the study, participatory observation, document reviews and semi-structured interviews were conducted to collect data. The period of research spans August 2013 to June 2015. Two case studies are presented: Kuroshio Ocean Education Foundation and Qing-yang Ecological Learning Center. Kuroshio is a major NGO concerned with oceans and education and consists of members from art, education and science fields. In contrast, Qing-yang is devoted to bringing environmental education into rural, aboriginal and disadvantaged communities in the countryside. The results show that these two cases both adapt a rolling strategy in program development. The environmental education programs are continually improved by changing issues and new entrants. Despite similarities between the two NGOs, the characteristics of learning are very different. In Kuroshio, new members bring their professionals and connect to organizational missions and tasks so that the context of learning is enlarged. In Qing-yang, members must be empowered and given confidence first so they can adapt environmental learning to their own lifestyle. In the type of social learning by Rodela (2011), the former is network-centric with internal connection and the latter is system-centric with external linkage.

ID: 358: Environmental Identity: considering comparative social contexts - Sarah Stapleton, US

Environmental identity is becoming an increasingly important construct in environmental education research as we continue our quest to account for environmental decisions and behavior. I use social environmental identity (Kempton & Holland, 2003) in my work because identity is an important way by which people orient themselves in relation to others. In other words, identity is a currency we recognize and use in a social context. That said, social contexts vary tremendously from place to place and from social group to social group. I am interested in fostering a comparative discussion about how social contexts may govern environmental identity in participants' countries and communities. I will use the US's ongoing racism as an example in my own country of ways that environmental identity becomes raced and classed as a result of the social climate shaping environmental associations.

ID: 513: Diversifying Environmental Education Practice and Research: Exploring Alternatives Within the Cultural and Social Contexts of Asia - Sachi Ninomiya-Lim, JP

This roundtable will examine environmental education (EE) in Asia, focusing on how to diversify the ways of implementing (i.e., EE practices) and understanding EE (i.e., researching EE) with respect to different cultural and social contexts. The importance of EE and education for sustainable development (ESD) is now recognized globally with EE/ESD practices being promoted at different places in the world. Valuing cultural and social diversity is now crucial for further development of EE/ESD. However, within global EE/ESD discourse and practice, the cultural and social perspectives of certain communities, including many of those in Asia, remain underrepresented. To improve this situation, in 2017 the Japanese Society for Environmental Education, in collaboration with its partner societies and associations in Korea, Taiwan, Australia, and North America, published a special issue of the Japanese Journal of Environmental Education titled "Environmental Education in Asia". The goal of the special issue was to share the discussions on EE that are being held in the various Asian countries and languages and connect them with the global community by using English as the common language. Based on this foot step, this roundtable aims to identify issues and characteristics specific to the Asian EE/ESD context. The discussion will also examine the impact the cultural and social diversity of Asia has on global EE/ESD practice. Comparative EE/ESD studies involving Asia will also be reviewed, and ideas for further studies will be examined. Although Asia itself is vast and diverse, this roundtable will not limit the scope of discussion to any particular part of Asia. Anyone interested in Asian or alternative EE/ESD perspectives and practices is welcome.

ID: 153: Go! Global - *Giovanni Fonseca Fonseca, MX*

The ESD Expert Net aims to improve the implementation of Education for Sustainable Development (ESD) in Germany, India, Mexico and South Africa with a specific focus on SDG 4.7. The Network promotes the international exchange on ESD and develops transnational approaches and strategies, which are then adapted to the national context of every country. The ESD Expert Net advises on the elaboration and implementation of educational policies and provides national and international concepts and training modules. This further promotes the global citizenship among the participants. The initiative "Go! Global" is one of the projects, which the ESD Expert Net has initiated in the priority action area of mobilizing youth during the last two years. "Go! Global" is a programme of virtual school exchanges with two specific thematic focuses. Schools from around the world have similar challenges such as food production or waste management. "Go! Global Garden" gives learners the opportunity to get a broader picture and knowledge in the field of school gardens, food production, cultures and traditions from around the globe. "Go! Global Reclaim the Rubbish" enables learners to understand the problems regarding waste in their own environment and how these problems are similar and/or different in context and settings from around the world. The "Go! Global" participants, which are the learners, communicate with one another on regular basis through videos, photos, videoconferences and other media. "Go! Global" links the actions at local levels with global thinking. Learners get an opportunity to widen their scope through personal interactions with peers from all around the globe and understand that we are more similar than different. So far, learners from India, South Africa, Mexico and Germany are discovering their parallels through "Go! Global", reflecting their own work, learning about different cultures and imparting knowledge related towards sustainability.

ID: 186: Formación inicial de profesores en ciencias: Relaciones entre conocimiento y discurso en Educación Ambiental. - *Maria Mejia-Caceres, BR*

La presente comunicación pretende identificar las relaciones entre discurso y conocimiento, que se manifiestan en el contexto de práctica de un programa de formación inicial de profesores, ya que es uno de los escenarios de interpretación de la política educativa en Colombia. Por consiguiente, se hará un análisis sobre aquello que expresa, presupone, omite y distribuye el programa a través de su contexto de producción de texto, es decir, analizaremos un programa de curso de la dimensión ambiental, para esta comunicación abordaremos el análisis del curso de Historia y Educación Ambiental. Para lograr lo anterior, se usará un análisis crítico epistémico basado en las categorías de análisis planteadas por Van Dijk (2010).

ID: 754: The effect of cultural differences on students' initiatives and contributions: A study of multicultural teams - *Calin Gurau, FR*

This study analyses the influence of cultural differences on students' class initiatives and contributions during an MSc course on Environmental Challenges and Sustainability. Using their geographical origin and the location of their former education institutions, the students enrolled in this course were culturally categorized into five main segments: European, North American, Latin American, Middle Eastern and North African, and South-East Asian. The course presented the problems regarding the natural and the human environment, exploring the causes of environmental degradation and eliciting solutions to restore environmental sustainability. The reactions of students were observed and evaluated in two different

circumstances: (1) individual initiatives and contributions in class and (2) their participation and contribution to group work. The results indicate the need for developing multicultural groups, as various cultural categories of students displayed complementary skills and approaches regarding environmental problems: South-East Asian students were characterized by hard work and conformity; the Latin American ones by initiative and creative participation, based on rather superficial levels of knowledge; the European and North American students were quite similar in their approach, displaying individualism and pragmatism; the Middle East and North African students were perceived as empathic and emotional. The best results were obtained by the balanced groups that included students from all cultural categories.

ID: 760: Environmental Perception and Ecological Concepts by High School Students: Study-Case in Sarzedo City, Southeastern Brazil - Rosangela Borem, BR

A school is a place for the formation of people and ideas. Considering the responsibility demanded when influencing people, it is necessary to focus on the preservation of environment. The use of the discipline "ecology" as a basis for the environment preservation is pertinent and of inexorable value. The theme can be inserted into school planning through discussions about waste minimization and incentives for environmental preservation at school, in the community, and regarding housing. Based on this argument, the present work analyzes the environmental perception and ecological concepts in a case study in a high school Sarzedo city, Southeastern Brazil. The methodology was a quantitative analysis obtained through questionnaires to quantify the knowledge already acquired. After this application, three classes were given the themes: "Ecology, Environment, Environmental Impacts, and Institutions that seek to preserve the Environment" to define the concepts and, after this definition, each theme was discussed, using everyday knowledge. After the classes were completed, the questionnaire was again given in order to verify the main points of learning. It was observed that the students obtained an increase in the acquisition of knowledge. Thus, they understand how their attitudes influence the environment and critical thinking directs them towards preservation. Environmental perception has become fundamental in our times, the use of tools that can provide a better transmission of this perception is important. At school, we can develop environmental awareness in order to make students agents that are environment modifiers and disseminators of knowledge.

ID: 786: The influence of 'leadership workplace' as a practical educational environment on improving culture diversity awareness for students - Mohammed Alkhawlati, MY

The purpose of this research is to investigate the value of engaging students directly with a 'leadership workplace' that has multicultural diversity. The students are those demonstrating high levels of conflict and sensitivity regarding cultural diversity, and that have problems accepting cultural diversity. The objective is to involve the leadership workplace in reducing the conflict, and let those students know how that kind of diversity is important, which will help improve cultural diversity awareness for students. The method is more education-based leadership workplace, which gives students a chance to interact more with and know more about diversity.

ID: 874: What makes your society (un)sustainable? Localized Understandings on Sustainability - Taeyun Kim, KR

How is the globalized term "sustainability" understood differently according to regions, genders or generations? In this study, I aim to explore societal differences in the way of perceiving sustainability by comparing the perceptions of university students from two Asian countries: Korea and Taiwan. Both countries belong to the so-called Eastern-Confucian culture and have faced similar crises of socio-political instability and environmental degradation coupled with the rapid growth of their economy. Through online correspondences with the student participants, the comparative study anticipates discovering which challenges the students mostly care about in terms of sustainability. Ultimately, the research study will shed light on the necessity of contextualized approaches of higher education to make young generations in such industrialized countries more competent in dealing with critical issues of their society.

ID: 141: The case for environmental refugee inclusion in environmental education - Nicholas Stanger, US

200 million by 2050. 200 million humans will be displaced due to environmental and geo-political catastrophes by year 2050. In their new host homes, be they temporary or permanent, these people make up some of the most vulnerable populations. This is not only due to economic and political restrictions, but also eco-cultural restrictions. Environmental refugees can experience environmental disorientation and feelings of alienation, sometimes called solastalgia. Local



environmental knowledge is often learned through intergenerational processes, where family, schools, religious, and recreational organizations support the development of ecocultural competency. When humans are forced to move into new spaces where language and social norms are different, they lose these connections and knowledges of and with specific places. Few researchers of displaced persons explore the socio-ecological and educational dimensions of their experiences. What is particularly absent is an investigation of the effects of displacement from refugees' own voices, lenses, and stories. This work respectfully looks to the knowledge and wisdom of Indigenous populations and their relationships to displacement, reorientation, and commitments to place. It will also study the ethical and philosophical consideration for global refugees' participation and inclusion in the new nature movement.

ID: 335: Challenges and opportunities of an indigenous- non-indigenous environmental partnership - *Chris North, NZ*

With international tourists set to outnumber New Zealanders in the next few years, there are growing concerns about environmental impacts, particularly in the most popular areas such as Tongariro National Park. This session looks at the challenges and opportunities of a partnership between Ngati Rangi (a Māori tribe) and Leave No Trace New Zealand (LNTNZ). Aotearoa/New Zealand was founded on a partnership document called the Treaty of Waitangi, signed between Māori and the Queen of England in 1840. In 1993, Tongariro National Park in the North Island became the first place in the world to be listed as a World Heritage Site for spiritual and cultural values, also establishing grounds for a partnership with Māori tribes in the area. The potential for partnerships to make a difference and improve environmental conditions is great, but a long history shows that cross-cultural partnerships are often fraught with challenges. Ngati Rangi is a tribe with ancestral lands in the Tongariro National Park. Dave Milner of Ngati Rangi will share their strategic plan that places environment and land at the front of their vision. Challenges include the growing impacts of tourists on their land. Chris North (LNTNZ) will describe the beginnings of a partnership between Leave No Trace and Ngati Rangi to educate tourist concessionaires to reduce impacts on their ancestral land. With Ngati Rangi taking the lead and LNT in support, this initiative shows potential, but also some challenges in undertaking such a partnership.

ID: 181: Engaging Indigenous Environmental Issues: A Curriculum Review - *Gregory Lowan-Trudeau,*

In a recent SSHRC-funded study into the experiences of educators across Canada with engaging Indigenous environmental issues in their pedagogical praxis, semi-structured interviews guided by a collaborative ethnographic Indigenous methodology revealed that while many are interested in theory, some are still hesitant to do so in practice. One key finding from this inquiry was the call from several participants for increased resources relevant to provincial curricula to increase educators' knowledge of and confidence with teaching Indigenous environmental issues in a variety of subject areas. Inherent to such an endeavour is the transdisciplinary or "wicked" nature of many Indigenous environmental issues that transcend traditional subject boundaries. In response to these insights, we began a second inquiry which involved the review of provincial and territorial curricula across Canada with a particular focus on social studies and the sciences. Our intention was to identify curricular links to make it easier for educators to envision how they might introduce Indigenous environmental issues into their praxis. This inquiry will culminate with the production of a handbook and associated website that will not only provide suggestions for curriculum-links, but also background information for better understanding foundational conceptions related to Indigenous land and environmental rights, historical and contemporary case studies, and key terminology. In this presentation, we will provide a brief overview of the initial study along with key concepts and terms for contextual understanding followed by discussion of our curriculum-related findings with particular emphasis on nuances of note between and within individual provinces and territories. As such, this session will be of interest to practicing teachers and researchers alike.

ID: 920: Perceptions about the relationship between recovery of riparian forests and production of water by traditional communities' residents involved in a Payment for Environmental Services project - *Rosilcia Almeida, BR*

In the context of a long-term project of forest recovery in areas of permanent preservation of two rivers that supply the metropolitan area of Salvador-Bahia-Brazil, developed by the Bahia Company of Waters and Sanitation in partnership with the Federal University of Bahia, the objective is to develop activities of critical environmental education in association to the payment of environmental services. Through hydrological monitoring, the effectiveness of those associated actions in the production of water will be analyzed. As members of the team, we researched how residents of three quilombola traditional communities notice the relationships between the riparian forests and the production of water. Living close to natural environments, these communities build knowledge about them during their practices. So, we have to consider this



cultural dimension in the processes of decision-making about the techniques that will be adopted. Six experienced residents were interviewed, whose answers were interpreted and introduced to a specialist in forest recovery, seeking to correlate traditional and scientific knowledge about favorable species for local forest recovery. We verified that: the interviewees try to preserve the forests, because they notice the relationship between their actions and the conservation of headwaters and the quality/quantity of water in the rivers; their practical engagement in the daily activities produces a type of knowledge that doesn't separate the natural environment from the social and spiritual dimensions, so they associate the forests to the construction of their quilombola identity; they adopt techniques of sustainable forestry and they know several plants that can increase the rivers' flow have been found. Those results indicate that the dialogue among different kinds of knowledge is a condition for democratic processes of decision-making, based on ecocentric ethics, seeking to overcome the technocratic-utilitarian-anthropocentric logic that dominates in social interventions.

ID: 1048: Connecting Science and traditional environmental knowledge (TEK) of the First Peoples of Trinidad and Tobago: the development of a TEK- environmental science unit. - Rowena Kalloo, TT

Indigenous First Peoples are recognized globally for their extensive knowledge of local flora and fauna, sustainable management practices, and the ethical and cultural norms which support conservation (Berkes 1993; Gadgil, Berkes & Folke 1993; Berkes, Colding & Folke 2000). A need to prevent the loss of traditional ecological knowledge (TEK) has led to its incorporation into formal and informal science education (Mack et al 2010; Hewson & Ogunniyi 2011; Veal & Nagy 2012; Forte 1994). Pure-blooded indigenous populations do not exist in Trinidad and Tobago as they were brutally eliminated by the colonists of the 16th century. However, groups with ancestral blood lines have made a concerted effort to advocate for the recognition of culturally embedded indigenous knowledge (Balkaransingh 2014). Schools, as a repository of knowledge for transmission to young people, should then be obligated to promote TEK. The national Social Studies curricula is the subject through which First Peoples' knowledge is introduced, however TEK is given minimum attention and ecosystems are introduced in Science without regard to TEK. In 2016, I developed an exploratory module for elementary science connecting the TEK of the First Peoples' of Trinidad and Tobago. This module was developed in consultation with the Santa Rosa First Peoples' organisation. The module advanced the concept of First Peoples as scientists and technologists through inquiry based activities such as comparative strength testing, local plant identification and characteristics, and interactions and conservation in local ecosystems. Limited implementation of the module occurred at a July camp for 40 students ages 7-17, hosted by the Santa Rosa First Peoples in 2016. This paper describes the theoretical basis and pragmatic challenges involved in module development, and assesses the potential of the module to fulfill its outcomes based on ratings by campers, camp organizers and educators.

ID: 1053: A Pilot Program on Avifauna that brings force to a peculiar perception of birds in French Guiana: An innovative initiative related to culture and environment nexus for some 11-15 year old students. - Judith Priam, PR

Of our knowledge, this Pilot Program on Avifauna is the first of its kind in France or worldwide. It takes sense in a peculiar part of France, French Guiana. Students demonstrate very high level of perception of their environment and our Pilot Program on Avifauna in that context allows to provide scientific names and methodology for bird studies. These 'place-relational pedagogies' can take advantage by integrating local knowledge of the local territory by these students, and the Pilot Program is a Place-based Education and Local Outdoor Learning way where the keys for interpretation can arise. This can provide voice to marginalized and underrepresented populations who know and feel when Environmental communication tries to highlight some facts. Through the Pilot Program on Avifauna, 11 to 15 years old students will validate a level of knowledge in Avifauna by a special exam at the end of the year, developed by the College and they will contribute in documenting their environment by a Booklet. By spreading this Pilot Program with neighbors and interconnecting their observations with other young students like them, this Pilot Program in Avifauna can contribute to new ways of thinking environmental education.

ID: 869: Assessing The Role of Cultural Activities in Biodiversity Conservation among The Tugen - Lembus Community in Baringo, Kenya - Rebecca Sirucha, KE

Over the past years, local communities have developed indigenous knowledge systems in regard to environmental management and conservation, making them more receptive to changes in the environment. This knowledge is highly accepted among the Tugen community as it has helped them to conserve, preserve and manage the environment as they pursue their cultural practices. The cultural practices have facilitated traditional understanding of some modern scientific perceptions regarding conservation strategies by relating them to the traditional ways. The areas of conservation include: forests, rivers, wildlife and mountains. Cultural activities are dynamic and are continually influenced by internal creativity and experimentation as well as by contact with external systems. The Tugen community elders usually identify a place of

high biodiversity, like the forest, and use it for different purposes including the circumcision of young boys and then continuing to use the space to teach about real life issues. This then means that, at any period of the year, the forest system is not altered in order to give space for such activities. The findings of this study were important in appreciating the role of local communities in environmental conservation and management. The objectives of this study were to determine the effectiveness of cultural practices in biodiversity conservation amongst the Tugen community, to quantify the value of cultural practices in conserving biodiversity, and to establish a long term ethno-biodiversity strategy for biodiversity conservation and livelihood improvement. Data was collected using questionnaires and analysed using analysis of variance. This study found that indigenous knowledge has played a great role in environmental conservation and management practices.

ID: 957: The sacred sites of Dan people in Cote d'Ivoire: factors of environment conservation - Dien Olivier,

The forest region in the western part of Cote d'Ivoire is home to many sacred natural sites that are dependent on the traditional practices of local communities. Based on the case of the Dan populations in the locality of Yorodougou, some fifty sacred sites have been studied. The objectives of this study are: (1) to identify and characterize the functions and the social, cultural and religious value of these sacred natural sites; (2) to characterize the traditional systems of maintaining and perpetuating these sacred natural sites and associated ancestral cultural values; and (3) to propose appropriate mechanisms for the management of these sacred natural sites. The results obtained show that these sites, composed of forests, rivers and mountains, are still intact and are the object of special care because they are perceived by the Dan populations of Yorodougou as houses and places of encounter with ancestors, divinities and spirits. Three areas of environmental management by these populations have been identified through the study: (1) the use of a specific vocabulary to designate these sacred natural sites (in reference to their social, cultural and religious functions and values), (2) the regulation of the relations of individuals to these sites by initiation rites, cults, prohibitive norms and reparation requirements in cases of violation, and (3) the existence of various anecdotes related to the transgression of prohibitions, which contribute to reinforce the power of these prohibitions in the collective imagination. The study concludes with a series of recommendations aimed at the sustainable management of these sacred natural sites. Keywords: Environment, traditional practices, sacred natural sites, local communities.

ID: 102: The Role of Indigenous Knowledge in Sustainable Living in the North Rupununi in Guyana - Paulette Bynoe, GY

Indigenous knowledge is often challenged by conventional science in some parts of the world; yet it remains relevant to many local cultures, particularly in geographically marginal areas where formal education has not been widely available or accessible to local residents. On the other hand, indigenous knowledge has been promoted by proponents of the preservation of indigenous customs, habits, and a general way of life, as a means of safeguarding natural and cultural resources and ultimately, promoting a more sustainable way of living. This study presents a case for the preservation, as well as integration of indigenous knowledge into education for sustainability that targets indigenous peoples. To this end, a qualitative case study design, using multiple data sources and methods of collection, has been employed to examine the role of indigenous (Amerindians) knowledge in Annai. Annai is an Amerindian district in the North Rupununi, Region 9, in Guyana. Importantly, this study will discuss how the Bina Hill Institute, which caters to the educational and training needs of Amerindian youth, has incorporated traditional knowledge into the curricula. A piloted survey questionnaire, complemented by an interview schedule, has been utilised as the principal tool of investigation. Results are discussed around specific themes such as biodiversity, use, climate variability, and sustainable livelihoods, among others. The study concludes with recommendations for scaling-up or the replication of highlighted initiatives.

ID: 226: Interconnected understandings: Exploring Indigenous children's social construction of nature in Latin America. - Monica Yadeun de Antunano, MX

This presentation is based on the belief that children are legitimate social constructors of knowledge. To explore the socially constructed meanings children give to the natural world and their place in it, we conducted a study with the children of three Nahua Indigenous communities in Mexico. Contemporary Latin American environmental education advocates for the incorporation of Indigenous voices however, children's voices are underrepresented. This presentation focuses on two studies that explored the motivations, worldviews, and relationship that both 6-7 year olds and early adolescents had with the natural environment. Decolonising methodologies (visual methodologies and Yarning Circles) were chosen as they

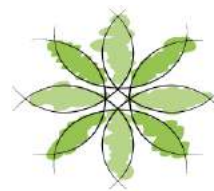
reflect the desire to create a comfortable, relaxed, and caring environment where stories and knowledge can be shared, and relationships built. Discussions in Spanish centered on what the children liked about their community or the place in which they live. The results highlight that regardless of the discussion topic, the children brought the conversation back to the natural environment. Inherently, they had a deep sense of interconnection and interdependence with nature, showing profound understandings of how self, community and nature are part of a whole which embraces the living, was-living and non-living aspects of the world around them. The results highlight the children's capacities to understand, analyse and critique their own relationship with the place in which they live. These results expand on counter-narratives that critique the compartmentalised relationship between humans and the natural environment, while also promoting the idea that the social construction of children's knowledge is as important as that of adults.

ID: 237: Weaving Traditional Ecological Knowledge into Indigenous Youth Education: A Case Study in Eastern Rural Taiwan - Kuang-Chung Lee, TW

Intergenerational learning and the transfer of traditional ecological knowledge need to be built upon the local cultural system of the communities. However, local knowledge transfer systems as such tend to disappear gradually under the impact of urbanization, and are mostly overlooked by formal schooling. After several discussion meetings with local indigenous people in the Cihalaay rice paddy cultural landscape of the Fon-nan village, Hualien, Taiwan in May 2012, they agreed that not only should they develop green tourism to increase income, they should also educate the young of their own village for cultural heritage conservation. Consequently, in September 2012, the National Dong-Hwa University worked together with local people to launch a series of community-based environmental education courses in line with the Satoyama Initiative for the young of the village. Local indigenous elders developed the courses mainly by themselves and acted as supervisors to teach local young people. The study aims to analyze the development processes and outcomes of the program in the first three years. The findings show that the program was planned based on traditional knowledge and involved economic, social, ecological and cultural resources of the whole area rather than a specific professional aspect. Collaboration and complementary relationships between local teachers and the research team was the key to the curriculum development and operation. Most local young students obtained a sense of belonging, cultural identity and confidence through the courses. Continuing notice and involvement of the students' parents in the process and outcome of the courses could get significant supports from the parents. Relevant financial supports from the governmental projects was important to sustain the courses, in particular in the beginning stages.

ID: 192: Aboriginal Community Engagement in Primary School Environmental Education: Promoting Learning about Sustainability through a Cross-Cultural Lens - Judith Wilks, AU

Australian Aboriginal communities embody traditional cultural understandings that involve sustainability, relationship and place knowledge from the land. While Aboriginal societies are very different today compared to their earlier economic, social and demographic characteristics, their connection to land remains intrinsic to their being (Langton, 2011; Langton, Palmer, Tehan & Shain, 2004). This paper will share action research conducted at a primary school in rural New South Wales, Australia. The research responded to an expressed school aspiration to foster a greater understanding of local Aboriginal culture, historical perspectives and knowledge systems within the school. An exploratory model in an environmental education context was developed using a mixed methods research approach. A Bush Tucker Garden was established as a "Pathway of Knowledge" acting as a vehicle for collaboration between Aboriginal and non-Aboriginal stakeholders. Through their participation in this project the teachers were brought together with local Gumbaynggirr Aboriginal Elders, creating a space for the sharing of social capital and culture-based understandings of sustainability. Teacher cultural knowledge and understanding was strengthened, enriching the students' learning experience. Teacher perceptions and their growth in self-efficacy relating to teaching about, for, and with sustainability framed by the dynamics of culture/environment, was documented throughout the research. The findings are of relevance to primary school teachers; teacher educators; curriculum stakeholders and education providers in the broader field of Aboriginal education. Making partnerships with Aboriginal communities brings not only their perceptions (which only they can hold) but their knowledges into the school and this creates a new knowledge set for all. It does not give the non-Aboriginal teachers an Aboriginal perspective, but rather, they acquire a new knowledge set from engagement with and learning from these perspectives and knowledges.



ID: 580: Re-discovery of Kiganda Indigenous Plants - Kevina Kezabu, AU

Plants play a very important role in the survival of the people of Buganda, in central Uganda. Plants are used as medicine for both the physical and the spiritual health issues, food, shelter, fuel and for the numerous cultural functions of the people. However, the Ugandan formal education system continuously devalues the Indigenous Knowledge (IK) and the traditional use of plants in favour of the Western, 'scientific,' oriented ways. This disregard for the IK has led to people's loss of the Indigenous values and respect for their natural environment. This paper demonstrates how a research student, who is also a teacher, worked with a group of teachers and community elders in a Participatory Action Research (PAR) project to integrate IK into the formal education setting. Following the PAR cycle of plan, action, and reflection, the co-researchers set out to systematically and deliberately embrace their IK through the re-discovery of their Indigenous plants. The co-researchers collaboratively work out ways of bringing this IK into the formal education setting. In the process, they not only empower themselves but they help in bridging the school with the community and the curriculum with the true Ugandan life experiences.

ID: 412: Environmental Culture: Beginning and End of Environmental Education in Mexican Agroecological Learning Communities. - Maria Gonzalez, MX

Environmental culture is learned in daily life, in a way that is almost imperceptible, but environmental education is an intentional process to build knowledge, values, attitudes and skills that can lead to environmentally-friendly practices. Agroecology emerged in Mexico in the 70's, as an opposition to neoliberal economic policies, green revolution, and conventional rural extensionism. Agroecology has been strengthened with the environmental education dialogue between peasants and their interaction with academics, researchers, technicians, students and civil society organizations, who, in practice, integrate the learning communities. In this paper, the development of engineers in agroecology and the Movement of Peasant Schools are systematized as two pedagogical strategies that the Universidad Autónoma Chapingo (UACH) has realized. In order to do so, the antecedents of extensionism and the Peasant to Peasant Movement are presented. The epistemic and theoretical-methodological fundaments that support the formation of future leaders, which is based on the paradigm of complexity and the collaborative learning network, are also presented. The method used was Research- Action- Participation. Although rural extension programs promoted by the Mexican government and almost all educational programs value scientific knowledge and undervalue peasant knowledge, we have been able to generate alternatives to positivist science and conventional extensionism. With these actions, the university has contributed to generate an environmental culture that includes the participation and knowledge of diverse social actors. It is an alternative that arises from the environmental culture of the local peasant societies and at the same time is a process of formation of future leaders.

ID: 777: The impact of EE in sustainable development projects in indigenous communities in Mexico - Monserrat Gonzalez, MX

In this paper I will present, discuss, and analyze the evaluation, impacts, and results of the implementation of projects for the promotion of Sustainable Development in Indigenous Communities in Mexico that include a component of environmental education. I focus on projects of transference of clean technologies (biodigesters and rainwater-harvesting systems) that include a systematic and strong component of development of local capacities through EE on communities classified as indigenous by international conventions and national legislation based on language criteria (the Huichol indigenous People and the Mayan Indigenous People). The four main results are that the EE component significantly influenced: 1) the full adoption of the climate technologies implying a reduction of the ecological footprint of the communities, as well as the reduction of factors of vulnerability to climate change, 2) food sovereignty and energy security at the household levels, specifically addressing women and girls, 3) concrete action plans through the creation of local models of sustainable development through a communitarian envisioning of sustainable futures, 4) enriched the material and formal environmental education component. The results therefore conclude that environmental education done through a dialogical open process that allows a bidirectional flow of knowledge results in a significant social, economic, and environmental impact in indigenous communities. The results are different to those obtained from interventions with the objective of promoting sustainable development that for the most part have been imposed over the communities with no dialogical participatory process or component of bidirectional EE. This is relevant due to the systematic exclusion, marginalization and the highest poverty and vulnerability indexes that prevail in these communities despite decades of development interventions, revealing the relevance of EE as a strong component for the promotion of sustainable

development in indigenous communities.

ID: 291: Confronting Multiple Realities: What Ethnic Children Perceive in Learning Their Own Cultures? -
Tassanee Ounvichit, TH

Ethnic cultures are viewed as being created to facilitate harmonious co-existence of people and their environment. Re-learning the ethnic cultures is also believed as a way to prepare populations to take a pro-environment action. However, as the world is getting smaller, young ethnic children cannot be confined to their ancestors' environment. Knowledge as to what they perceive in learning their own cultures would help identify how environmental education should handle indigenous knowledge. This phenomenological study was conducted in a primary school in northern Thailand. Four groups of ethnic students participated in a constructivist learning project for which they chose the topics of their cultural learning. Their feelings were captured to portray their perceptions. Results revealed that although the learning experience contributed to more knowledge and increased ethnic pride, there were points to note regarding helping the students to attain a proper insight. The Tai students whose culture was dominant in the locality and who were most exposed to mainstream culture barely appreciated linking their dessert-making culture with its disappearing environment. The little Lisu student appeared frustrated in a constantly changing environment when he had to switch from life in the plains during school days with life on the mountain during holidays. The Bisu students found that some parts of their New Year's festival could not be rationally explained. The Akha students could not differentiate their traditional egg offering rite from Christianity. Their feelings in the cultural ecological learning revealed that they are living in multiple realities. The unclear relation of the indigenous knowledge and their present environment, the mobility of their life, the elusive myth of their ancestors' spiritual world, and the adoptive integration of other cultures pose a challenge as to how to weave indigenous knowledge in environmental education for proper insight development of these children.

ID: 357: Indigeneity, Aboriginality and Authochthony - Chris Beeman, CA

What is it to be Indigenous? Is it a cultural inheritance or a way of being in the world? During the past several years there has been a gradual shift in ways of referring to First Nations, Metis and Inuit (FNMI) – Aboriginal - people in Canada and First Peoples elsewhere. Nowadays, it is common to refer to FNMI as Indigenous peoples. But Indigeneity may also be thought of as an ontological, rather than an ethnic condition. In this understanding, a particular way of being in the world is enacted. In contrast to a cultural or ethnic description, with world views and cultural practices that vary between nations and peoples, this way of being is characterized throughout by deep knowledge of the natural world and a moment-by-moment awareness of the interdependence of all life, through living in and with the world in a particular relationship of shared vibrancy. In this position, the more-than-human world is not just theorized but experienced as the container and sustainer of human being. What are the implications of FNMI identity overlapping but not necessarily being the same as the concept of Indigeneity? If Indigeneity is ontologically defined, then at least two things happen. First, enacting this way of being and living this kind of life becomes at least theoretically available to all. Second, the necessary correlation between Indigeneity and Aboriginality is lost. Are these effects desirable, or accurate, or both, or neither? This paper proposes a new term – Authochthony - as a meeting and learning place between First Nations and non-First Nations people. In this paper and workshop presentation, participants become familiar with ontological understandings of Indigenous ways of being. Outdoors, we will play a little with this position in order to approximate its (metaphorical) enactment, through experiences relevant to environmental learning.

ID: 374: Garden As Co-Teacher: Incorporating Indigenous systems of knowledge and knowing - Shirley Turner, CA

This project explores how teaching high school science within the living web of a garden offers possibilities to incorporate Indigenous systems of knowledge that shift students into re-imagining what it means to belong to a community. As the teacher of a garden-based course, I trace the parallel journeys of my own, and my students', unfolding relationship with an urban school garden. Our learning experience was informed by the presence of chickens, which moved us towards an appreciation of underlying reciprocal relationship with all members of the community. If working with other living beings in a school garden can move urban students into countercultural space, then perhaps, they might also be able to imagine a more sustainable way to make their place in the world. I will consider the overlap between experiential, Indigenous and scientific learning principles in order to argue that extended daily contact with a particular place has the potential to move



students into receptive modes that allow the garden's more-than-human inhabitants to act as co-teachers. Data from student case studies illustrates the learners' perceptions of their process of coming to know the garden and their experience of positively contributing to the existing web of relationships. These encounters created a third space between the institutional classroom setting and the urban backdrop of the students' lives through which they investigated individual paths that contributed to processes of renewal and regeneration. Overall, this work points to ways that place-based education grounded in Indigenous principles can challenge cultural assumptions through bringing teaching/learning into meaningful and caring relationship with the self-renewing living systems to which we belong.

ID: 610: The environmental education discourse: under-appraisal of the indigenouness - Pallavi Singh, GB

Is globalisation as a concept jeopardising the heterogeneity in the concept of environmental sustainability in school education? This is the centre question of this paper. The paper presents the findings of the primary research conducted in India exploring the environmental education in school and its impact on the environmental behaviour of Indian families through intergenerational learning. In this paper, concept of 'indigenouness' is being explored in the concept of sustainability itself in Indian environmental education at school level. In environmental discourse at school level in India, the discussion imports the western concepts, knowledge and understanding of terms used in environmental sustainability. Like the concept of recycling, if one is not segregating bio-degradable and non-degradable waste, it is not recycling. In this imported meaning of recycling, Indian participants forgot their indigenous practice of segregating waste (newspapers, bottles etc) regularly and selling it to 'kabadiwala' every month as an example of recycling. The primary research done on environmental education in schools in India showed that this indigenous practice of recycling is not mentioned in any of the elaborations of the term recycling in environmental discussion in India. Right from the concept being taught in schools and through the environmental discussion in their families, environmentalism in India is using a borrowed language. The globalised understanding of the terms sustainability and environmentalism promotes homogeneity in understanding and practices, which jeopardises the indigenouness present in the cultural understanding of environmentalism and indigenous practices which are born and gradually develop in particular cultural context. Are we actually promoting homogeneity and in the process overlooking the cultural context of the concept of environmental sustainability?

ID: 625: Actions for Environmental Education on Indigenous Lands - Monica Mesquita, BR

The indigenous peoples have knowledge about the environment, in relation to the forest, the fauna and flora that, passed by the elders, are part of a culture of preservation of biodiversity. There are indigenous peoples who migrate from a village to another new village to guarantee the environmental renewal, necessary for the construction of their houses, concomitant with the impoverishment of the soil for cultivation. We realize that this migratory cycle, guaranteed in Article 11 of the United Nations Declaration on the Rights of Indigenous Peoples - UNDRIP, in addition to the decision-making of the people, is not influenced by contact with non-indigenous peoples. We recognize that this cultural and traditional practice of peoples understands the goal of Sustainable Development - SDG 2 to ensure subsistence food production for its survival and well-being, SDG 4 for favoring indigenous school education and SDG 15 highlighting territorial management and environmental sustainability. As justification for research and having as methodology participatory observation, interviews and informal conversations with the indigenous, we find that despite this guarantee, there is disrespect to the indigenous peoples on their lands such as illegal extraction of wood or other activities that harm the environment. For the sustainability actions used by indigenous people to take effect, it is necessary to combat illegal practices in their territories. In this perspective, the aim is to enable indigenous people to control and monitor their territories. We point out, as a form of innovative territorial management, the access and training of indigenous leaders with technological tools to carry out the satellite monitoring of their lands. Another aim is to raise awareness of the need to preserve the biodiversity of their territories that must be passed on to the students in the classrooms. Our theoretical framework is based on Brazilian laws and international ones.

ID: 826: Relations of societies with their territories - Kamal Boushaba, MA

This work falls within the overall framework of research on the relations of societies with their territories, in connection with the integrated strategies of conservation of biodiversity and sustainable development. While the first protected areas were created on a segregated basis, they are now part of integrative models that are more subtle than expected. The object of the work is a critical perspective of the processes of planning and management of protected areas that generate stereotyped

development models. In naturally heterogeneous and dynamic contexts, the overall objectives of conservation policies struggle to integrate representations of nature, interests and local practices. How then can these strategies be adapted to a convergence of mutual interests, with a socio-cultural reappropriation of the conservation, well-being of human populations and development at the local level? The Mediterranean Intercontinental Biosphere Reserve (RBIM), is subject to the challenges of integration between local, national and transnational. The exploration of methodologies presenting certain attractiveness in the study of the complexity of socio-ecosystems has made it possible to highlight the socio-cultural basis of local populations through which the use of spaces and natural resources passes. The construction of relationships with nature derived from them, anchored in the historical dynamics of societies, reveals the one-dimensional logic of systemic nature-culture reasoning. The implementation of strategies for the conservation and multiple and sustainable use of natural resources requires the integration of all social groups, their cultural and spiritual values of spaces and resources, their endogenous knowledge and practices. When the past intervenes in the present, it can project the future towards a convergence of mutual interests that guarantees the sustainable management of protected areas.

ID: 1002: Explorations in the Practice of Eco-Art: A Phenomenological Arts Informed Research Project - Vivian Wood-Alexander, CA

This study investigated the genre of Eco-art through a phenomenological arts-informed research project to augment current practices and inspire new art and art/science initiatives in schools and communities. Incorporating narrative inquiry and photography, the researcher engaged in an Eco-art practice over a two year period on a Lake Superior shoreline. The work produced took the form of ephemeral paintings done with clay on rocks, both materials found at the site. The intent of the project was twofold: to develop a practice consistent with particular environmental values and to inform Eco-art pedagogy by critically considering the qualities of an Eco-art practice and how they fit in an educational setting. What themes emerge for Eco-art pedagogy from the study and experience of an Eco-art practice? What themes emerge from the study of the work of contemporary Eco-artists? Key findings were: 1) the potency of place 2) value of being alone 3) debating the outdoor studio 4) a sense of adventure 5) ephemeral qualities and aesthetic considerations that challenge the curriculum and 6) the role art can play in ecological restoration. The stories of artists in the Eco-art field emerged as an essential resource that guided and supported the research. The insights gained from this project will resonate with educators from both art and environmental science backgrounds as ways to incorporate art making as an engaging process that supports our journey towards sustainability and atonement. This presentation may an interactive component using a creative technique practiced briefly by participants.

Nature as Teacher / Researcher

ID: 352: A Scientific Tool for Multi-Level Environmental Education in the Peruvian Amazon - *Carmen Chavez, US*

Madre de Dios is the Amazon region of Peru with the highest levels of biodiversity, but the area's forests, rivers, and streams are increasingly threatened by unsustainable activities and pollution. Compounding this reality, primary schools and higher education institutions in the region offer very low-quality education that is mostly unrelated to the reality of the region. The Amazon Center for Environmental Education and Research (ACEER) has been working in the region of Madre de Dios since 2004. As members of the center we designed and implemented a coherent environmental education program, AMIGOS! A partnership for education, that is consistent with the local realities and culturally sensitive. ACEER works in coordination with the Regional Department of Education's teachers and students as well as local and national universities' faculty, researchers and students. The program's content was also designed to be aligned with the public educational system. We provide intensive and experiential training through a field program that immerses teachers and students in learning everything from basic to complex concepts of rainforest ecology as well as the scientific method and its application. Using 'Leaf Pack', a new scientifically validated experimental tool that uses macro-invertebrates living in the rivers as bio-indicators of water quality, we provided hundreds of high school students in the region with a unique experiential and field-based environmental education program. This model has made a significant contribution to the region's education, yielding gains in knowledge from all participants and knowledge of aquatic fauna. The project also provided a high quality education experience aimed at igniting their potential. Using this inter-institutional and multilevel model, we demonstrated the productive and positive synergy between teachers and students, research and education professionals, as well as university researchers, generating valuable scientific knowledge.

ID: 861: Environmental learning on the fly - *Philip Mullins*

This presentation recounts implications for outdoor and environmental education from work done for the SSHRCH-funded research project Living and Learning Social and Environmental Relations: Exploring Skill and Embodied Knowledge for Outdoor Education. The project examined personal, social, environmental, and ecological relations developed by fly anglers at various stages of specialization in the sport. The research was undertaken in northern British Columbia, Canada, in order to integrate scholarly literature into a heuristic model that was then refined by working with local anglers, and by analyzing data from interviews, semi-structured group discussions, and participant-narrated first-person video of fishing on the Stellako River. The findings highlight how different relationships gain prominence through the processes of specialization for our participants, and how their specialization was enabled and constrained in different ways. The discussion will help inform understandings of situated environmental learning through skilled outdoor recreation activities that incorporate significant ecological knowledge and interaction, but also rely on unique social relationships.

ID: 864: The influence Out of Water Diving exhibition has on students' conception about marine environment. - *Naomi Towata, BR*

The marine environment is often neglected in environmental discussions. Though, it is evident the need for environmental education activities about this environment. The interactive exhibition Out of Water Diving (OWD) is inserted in this context. We aimed to investigate the initial conceptions and checked whether and how the OWD activity influenced conceptions of students about marine environment and its relationship with students' daily lives. We used a structured questionnaire, which was applied before and after OWD exhibition and responses were subjected to an open categorization process. 285 students answered the initial questionnaire and 155 students answered the final one. They were from a public school of So Paulo city (Brazil) that participated in the survey. The absolute percentage of students who could establish the relationship with marine environment and their everyday life was low, but with slightly increasing after OWD (from 14% to 23%). When asked about words they could associate with the marine environment, 'curiosity' and 'beauty' categories were the most cited. We also asked about the organism that students expected to find on marine environment. The chordates were the most frequent cited (fishes and sharks). However, the citations of animals not chordates (eg. starfish and sea urchins), vegetables (seaweed) and plankton were higher after OWD. After OWD, students reported that their knowledge about marine environment was medium and they had more interest about this kind of environment. Thus, this study represented an initial effort to better understanding of environment concepts as well as marine environment concepts and with this knowledge we could improve future indoors activities about marine environment. We hope that the data can be subsidy for

the evaluation OWD exhibition by its creators in a continuous improvement process.

ID: 792: Discovering Nature in the Technological aGE - *Dylan Leech, CA*

Mass media and electric technology are changing how humans live. Among the things that may be changing is our relationship with nature. In this paper I explore the relationship, meaning, and qualities of nature and technology using both exploration of relevant literature and my own qualitative experience during two 3-week experiments, one in nature and one in technology. By looking at how digital technology shapes my own life, comparing that to how my life is different in the non-digital natural world, and by contextualizing this personal experience within our culture, I discovered many qualities of natural and technological life that I was not previously aware of. Among the discoveries I develop in my thesis are the sense that life in technology involved a high degree of replacement, while life in nature involved coming into phenomenal contact with the processes and rhythms of the world.

ID: 870: Feeling for Compassion: Visceral Sensing Nature-Culture Justice - *Joy O'Neil, US*

The dominant approach to environmental and sustainability learning remains a cognitive, dualist thought process even though educators seek transformative change. In other words, affect nor material need not apply. What happens if learning is viewed as a human and non-human intra-active learning process in which visceral sensing takes center stage? Visceral sensing via touch, taste, and smell enacts a deep emotive connection to learning. The author, an educator in environmental science and sustainability education, theoretically developed and empirically tested Kitchen-based Learning (KBL) to understand how higher education students and the instructor intra-act with their senses, cooking tools, food and the natural world. Drawing from social and affective neuroscience (Immordino-Yang and Damasio, 2007), and post-humanist agential realism (Barad, 2007), this catalyzed a deep affective learning process. One of the findings of the study revealed that visceral sensing played an important role to live and learn with care and compassion for both the human and non-human world. In particular, living compassionately requires recognizing and facing our responsibility to the infinitude of the other, welcoming the stranger whose very existence is the possibility of touching and being touched, who gifts us with both the ability to respond and the longing for justice-to-come (Barad, 2012, p. 217). The implications for this key finding evidences the need to consider touching, tasting, and smelling living-non-living material discursive intra-actions as mutually important to learning for social and ecological transformative change.

ID: 375: Talking to Trees: Epistemic Navigation in Ecological Systems Education - *Megan McGinty, US*

For many students, understanding ecological systems can be difficult because of the unique behaviors that systems exhibit (Jacobson & Wilensky, 2006). Teachers facilitate student comprehension of ecological systems by guiding student attention and pointing out relationships within the natural world. The effect of cultural influences upon ecological cognition is a topic that merits careful consideration when we acknowledge the links between mainstream forms of ecological education and human exceptionalism (Gough, 1999; McKenzie, 2005; Smith & Williams, 1999). Medin and Bang (2014) demonstrate that epistemological and ontological perspectives of the natural world have a marked influence on conceptions of (and about) science by employing construal-level theory and psychological distance to explain cultural differences in orientations to ecological science. These differences have profound implications for the teaching and learning of science. This study explores the pedagogy of relational epistemologies in a forest environment by focusing on the practices employed when adult teacher-mentors were involved in students' meaning-making relationships with plants. Specifically, we examined the discursive practices teaching adults used to facilitate, support, or resist relational epistemologies in moments of teaching and learning about plants. Utilizing relational epistemologies while teaching science may transform science education. Epistemic navigation creates opportunities for deeper and more profound science education (Rosebery et al., 2010), while an emphasis on the relationships between actors can help students better grasp complex systems. On a wider scale, it is a decisive move toward an arguably much-needed epistemic shift in the natural sciences. The use of relational epistemologies in science education to illuminate the connections between humans and the more-than-human (MTH) can axiologically (re)position the MTH as co-constructors of knowledge and thus expand the opportunities for ourselves to become knowledgeable actors within the ecological systems we depend upon.

ID: 582: Culture, environment and sustainability in higher education: are we preparing the future teachers to lead with a world in transformation? - *Denise Bacci, BR*

This research is about higher education teacher training at University of São Paulo, Brazil, and is oriented by the following questions: Are we preparing future teachers for a culture of sustainability? How is EE present in undergraduate courses? Do students recognize EE as a trainer in the curriculum or in other training settings? First, the investigation identified concepts in the subjects of undergraduate teaching degree at São Paulo campus such as environment, environmental education (EE) and methodological approaches through a documentary analysis of the content from the subjects' syllabus. Second, semi-structured interviews were also carried out with professors and coordinators of different courses, seeking to understand inter and transdisciplinary approaches through the insertion of EE and the challenges and possibilities in different knowledge areas. The third stage of the research was the elaboration of a questionnaire, based on similar studies in the literature, to access students' perceptions of how EE is in their courses, and how the students build the culture of sustainability. After an initial validation process, this instrument was sent, via "google forms" to all students of the undergraduate courses at São Paulo Campus. The preliminary results pointed to a few EE disciplines in curriculum, but was recognized by students as an important contribution to their formation. EE is also present in different extracurricular projects mentioned as essential to encourage sustainability culture. We expect that findings from the project might contribute to USP's EE Policy Management Plan for curricular reform/reconstruction and promoting new ways for citizens/professionals to identify, problematize and to act on socio-environmental challenges. Subsequently, this would lead to the improvement of the culture of sustainability on campus and the creation of subsidies for teacher and students training.

ID: 356: Wilderness Immersion Tuning, Part 2 - Chris Beeman, CA

Recent insights from brain imaging research and applied teaching practice have spurred innovation in the delivery of early childhood education, especially ecological and outdoor programming, but there has been much less adaptation in pedagogy to the significant brain and identity transformation that occurs during adolescence growth surge stage of development. This represents a lost opportunity in adolescent learning potential and timely emotional maturation. The central thesis of this paper is that wilderness immersion tuning makes pedagogical and neurological sense. In earlier work (Part 1) we explored how humans are experiential and mobile learners by evolutionary design and how journey pattern learning supports emotional and cognitive learning. We looked at the working partnership between the brain's neural and glial cells and neurovascular coupling. And we considered the role of dopamine and the essential role of emotions in the learning process. In Part Two, we discuss the theory of Extended Cognition and consider how the process of what we call Wilderness Immersion Tuning can accelerate and enhance adolescent emotional and cognitive maturation. We also highlight the potential of intentional adolescent rite-of-passage experiences to enhance social and emotional intelligence, the force of the hemispheric divide, and reference some insights from Indigenous modes of learning and teaching.

ID: 944: Embodied Ethics and the Urban Environmental Imaginary - Oonagh Butterfield, CA

While much has been done to reintroduce people (particularly children) to the principles of ecology, and to the significance of particular aspects of 'nature', it remains difficult to pedagogically engage the full complexity of environmental concern, or to incorporate the infinite ways in which non-human relations co-constitute our human existence, materially, all around on the land, in built spaces, in our homes, gardens, bodies, work places, and neighbourhood blocks. Contemporary philosophical environmental thought has illuminated the connections between nature and culture, and unveiled a vital multispecies community of agential subjects; but, as this project inquires, what does this philosophical turn look like in practice? In education? Can it be embodied? Responding to the idea that an ethical environmental conscience is rooted in dynamic, personal relationships with the land and the more-than-human community, and to the belief that these kinds of relationships are accessed mainly through outdoor experiences in non-urban settings that is, outside the city, away from home, and separate from the rhythms of daily life this project sought to illuminate stories of relational environmental experience within the boundaries of a highly developed urban space, and to explore the meaning of embodied environmental ethics in the context of the everyday. Through one-on-one interviews, participant stories and conceptions of urban natures were compiled and combined to create a hybrid visual text. With the understanding that arts-based research can mobilize knowledge production, this project aimed to prompt dialogue around urban environmental ethics and imaginaries, as well as educational curriculum, and to promote philosophical reflection at any age.

ID: 373: The Amazon as Teacher - Lee Beavington, CA

The Amazon Interdisciplinary Field School, a collaboration between Kwantlen Polytechnic University and the Calanoa Project in Colombia, offers students the opportunity to travel to the Amazon Rainforest and engage in an intensive cross-

disciplinary field study focused on integrating personal growth, nature experience, and reflective scholarship. The field study site, Calanoa Natural Reserve, is a private natural reserve located at the very heart of the Amazon Rainforest and on the banks of the Amazon River. Calanoa aims to contribute to the conservation of biological and cultural diversity in the Amazon region by providing a setting that integrates art, design, sustainable architecture, scientific research, community education, and a place for encounter and dialogue. Floating down the Amazon River, making pottery with clay from the Amazon riverbed, and trekking through the jungle to visit a shaman are a few of the ways students engage in direct sensorial experiences. The Amazon is rich in cultural, geographical, and biological diversity; what can this tropical rainforest teach us about ecological ethics, sustainability, and interdependence? Imagination and creativity play a key role in this experience, as the Colombian culture, both in Bogota and in the Amazon, opens students to exploring new forms of scholarship, ways of knowing and being, storytelling, cultural expressions, and perspectives on the interrelationship between nature and society. Artistry, imagery, creativity, and thoughtfulness are integral to the Amazon Field School and therefore will be incorporated into the presentation. Participants in the workshop will learn about this unique field school through sensorial engagement with Amazonian expressive modalities, and take part in creative and collaborative activities.

ID: 1004: How peer interactions change through nature experiences: A case of an inclusive class in Korean primary school - Chankook Kim, KR

This presentation shares the story of an inclusive class featured with nature experiences in forest. In seeking for the meanings of changes in peer relationships through environmental education activities, this study involved a class with three disabled and eight non-disabled first grade primary students in Korea. The program was developed based on reviews of research in environmental education and special education. During the program, participant observations and in-depth interviews with students and teachers were conducted. The collected data were analyzed to describe grounded themes after transcription. The changes of students in an inclusive class related to the peer group relations were classified into three categories: The attitude of non-disabled students towards disabled students, attitude of disabled students towards non-disabled students, and the interactions between peer groups in the inclusive class. For example, non-disabled students often provided proper assistance instead of unconditional help for disabled students, and showed patience towards disabled students' disturbing behaviours. The disabled students, who actively participated in activities, expressed own emotion to non-disabled students and recognized his/her meaningful roles in the class. As for the interactions between groups, the students shared their observations and expressions, cared about nature with their peers, and supported each other to overcome difficulties. These interactions deepened the peer relationships by sharing the same space, which in this case is a "forest." In this story, we were able to find positive changes in the peer relationships between disabled students and non-disabled students based on continuous interactions among them. In that, environmental education for inclusive classes may be applied to improve peer relations between disabled and non-disabled students in daily school life.

ID: 504: The Ecological Self(ie): Rethinking Relationships within Environmental Education - Polly Knowlton-Cockett, CA

As our dependence on technology increases, there is a critical awareness that our seeing, experiencing, and understanding of the environment is implicated in how we identify and interact with our surrounding nature. However, is it always true in environmental education that technology increasingly disconnects students from meaningful engagements with nature? Are there ways that millennial generation students could enhance connections to nature through their devices? As practitioners, we share this struggle with the use of technology in our own contexts, though we are aware that any substantial re-thinking of the human/non-human relationship needs to account for the dominance of technology and negotiate how it could instead be used to initiate meaningful relationships. Our interactive presentation will explore the phenomena of the selfie photograph and how it might be used to nurture the ecological self 'our emotional bond and connection with nature. Critical questions around the complex and embodied experience of taking a selfie, considering elements of identity formation, self-expression, and relationality, will be explored. We further ask: How might the use of technology influence students' ability to see, experience, and understand the natural world? How might selfies position the subject and the object? How might the relationship between the subject and object be restored? In turn, we question what Mother Nature's selfie might look like, and what stories it might tell? Might it be possible to shift selfies as a method for engaging students with a sense of wonder and curiosity in the world? Presentation participants will be called upon to bring nature, the body, and place into their consciousness through activities of selfie photography, walking, and embodying the natural world. Participants are asked to bring a cell phone, tablet, or other photographic device (if they have one), and come prepared to venture outdoors, in

whatever weather nature affords that day.

ID: 155: Wild Pedagogies: A Scholastic Experiment in Re-Wilding Research - Michael Sitka-Sage, CA

Wild Pedagogies is a scholastic experiment and alternative to the traditional research conference that brings scholars together to share and create knowledge collaboratively with/in wilderness. Wild Pedagogies began as a graduate course at Lakehead University in 2012 and has steadily evolved, through small conferences (e.g. the Floating Colloquium on the Yukon River in 2014) and ad hoc gatherings (e.g. the on-trail Tetrahedron Dialogues in 2016), into a movement to challenge and rethink the domestication of wild(er)ness, education and human-world relations in the so-called Anthropocene. In 2017, the Wild Pedagogies gathering assembled a briny pod of international scholars on a sailboat off the west coast of Scotland for a Sailing Colloquium, followed by a writing retreat to compose a manuscript inspired by dialogue between human and other-than-human interlocutors. These scholastic experiments are, in short, aimed at re-wilding educational research in order to bring methodologies into alignment with what we view as ad rem onto-epistemologies with/in a more-than-human world. In this session, we will briefly discuss the theoretical roots and some of the contentious terminology of Wild Pedagogies. Primarily, we will reflect on the implications of Wild Pedagogies for environmental education research. In particular, the Wild Pedagogies structure is a response to the 'post-wild' world of human hegemony that aims to make space for novel kinds of dialogue and eco-social understanding. This session discusses the strategies Wild Pedagogies uses to achieve these ends and how we feel they worked. For example, we reflect upon the promise and perils of collaborative writing, and some of the challenges, both conceptual and practice-based, with recognizing and incorporating the 'voice(s)' of place and/or other-than-human beings in and as research. The session will conclude with some speculation and group discussion on what it means to think about and conduct environmental education in a more-than-human world with 'nature-as-co-researcher'.

ID: 686: Blurring the Nature/Culture Divide Through 'Deep Connectivity' - Lee Beavington, CA

Teaching and research in the Anthropocene demands a fundamental re-envisioning of our relationship to the more-than-human and calls us to challenge the divide between nature and culture. To shift from an objective, Cartesian, anthropocentric worldview that reduces the infinitely complex web of the natural world into static subcomponents, we must embrace an ethical-ecological holism, an alternative paradigm that fully honours humanity's deep connection with and moral responsibility toward all earthly beings and our mutual flourishing. In this presentation, we probe into our and the participants' experiences, poetically exploring the lessons and potentiality available when the natural world is foregrounded in our lives. Participants will be invited to take part in experiential activities that embody and apply engagement with elements in the local environment and elucidate the radical interconnectedness of the living world. Through this collective exploration, we ask the questions: How can environmental education be integrated into science, socials and other disciplines in a way that transforms the industrial, colonial worldview endemic in today's education system? How can the natural world teach us about our own prejudice, and help us blur the binary between nature/culture? This session demonstrates ways we can approach learning through a reciprocal lens where nature becomes teacher. We explore how the feminine, interconnected, indigenous worldview that emulates the natural world can influence our pedagogical approach in education. Through a series of experiential processes and group dialogue, we speak to these essential questions and concepts, facilitating a sharing of best practices and visions for the future.

ID: 925: Dynamic Emergence of Kinship in a Global Sanctuary Community of Practice - Joy O'Neil, US

A community of practice is conceptualized as a group of individuals who learn from each other both personally and professionally (Wenger, 1998). The Emerging Environmental Education Research (EEER) global group is cultivated from emerging scholars in the field of environmental education. The group, developed in 2015, has over 70 global members and growing. This alone may not constitute anything unique. What is novel is how members are invited through a dynamic emergence of finding one another and creating a global sanctuary in the world and building kinship through expression of a common language. Our common language, bonding our kinship is relational entanglements of human and non-human (be)coming of the world. It is an emerging language and may be foreign to our daily interactions with the world. Responding to the conference theme, Weaving New Connections, we intend to theoretically and philosophically share this language and invite others to practice its speak. Our aim is to cultivate dynamic emergence of kinship using technology as the connecting point for building a global community of practice and allow our sanctuary to flourish. This flourishing can then be brought out into the world through our own pedagogic engagements with hopes to create a socially and ecologically



just and sustainable world for all. Some of the key points of discussion will include, what is a global learning sanctuary; how do we cultivate its growth; letting go, allowing for emergence; and an exploration of our common language. The EEER group will share their experiences as co-partners. Some kin will be on location and several will join entangled in technology from afar.

ID: 485: Natural World as Co-Teacher - *Laura Piersol, Sean Blenkinsop, CA*

The Maple Ridge Environmental School (MRES) is a K-7 public 'school' rooted in principles of place-based education. The school has no building and instead takes place within various community parks and sites. Over the last thirty years, various forms of environmental education have been present in school programs (Greenwood & Smith, 2008). Yet, current pedagogical practices within public schools still involve limited contact with the natural world and those that do exist show little evidence of long term change in students' relations with the more-than-human world (Rickinson, 2003; Jardine, 1998). Typically, students learn about the natural world and sometimes, on the occasional field trip, they get the chance to learn in it but they miss out on the great potential to learn from it. Such a shift requires reconceiving the more-than-human world as an inert 'background' (Plumwood, 1993) to now consider the active role it could play as a co-teacher (Blenkinsop & Beeman, 2010, Leopold, 1949). At the heart of our research with the MRES is a desire to incorporate this agency of the local land as an active voice within the process. This presentation considers the role of the natural world as a 'co-teacher' and the implications for cultural change. Within our pedagogy and our research, we wish to uncover an 'ecopoetic' understanding which builds upon questions and lessons arising from direct contact with the natural world. We attempt to unpack some of the challenges and questions that have been arising in our research as we ask 'Is our purpose here getting in the way of what the rest of the natural world has to teach?' Attempting to foreground more-than-human voices within pedagogy and research is essential if we are to trouble their silencing within dominant culture and our education systems.

ID: 810: If whales are cultural beings and trees can talk, how can we teach our students to listen to what they say? - *Elin Kelsey, CA*

A plethora of evidence over the past few decades demonstrates the active agency that exists within other species. Recognition of agency in non-human animals (NHA) is driving political and legal reforms. The European Union member states ratified the 2009 Treaty of Lisbon, for example, which grants legal status to animals by virtue of sentience (Robertson, 2015). New Zealand recently followed suit, as did the province of Quebec in Canada. Recent, high profile attempts to grant chimpanzees and killer whales rights to personhood have garnered widespread attention from the New York Times and other mainstream media. So how do we, as environmental educators, respond to these changes? How do we welcome the voices of the hitherto voiceless? The challenge of recognizing other than human voices is not limited to animal species. Suzanne Simard (personal communication, 2012) describes how trees talk in the language of nitrogen, carbon, phosphorous and water, and through defense signals and hormones. Plants, according to Matthew Hall (2011), are not passive beings mute, insensitive, inactive. They communicate. They act with purpose. They are intelligent. As Stefano Mancuso (2012) puts it: "Intelligence is the ability to solve problems and plants are amazingly good at solving their problems" (p. 67). Such discoveries demand that we rise above the anthroparchy that divides us from other species. In this novel session and associated paper I explore how we might help our students to listen to, comprehend and communicate what other species have to say.

ID: 324: Cultivating Slow Knowledge at the Garden: Children's Voices about Learning to be With the More-than-Human World - *Tathali Urueta-Ortiz,*

In this presentation, through children's voices, I share how food gardens, when understood as co-teachers and not as tools, are a bounty of learning experiences where children learn how to relate with the more-than-human world by experiencing nature and its rhythm during a whole cycle of food production (planting, harvesting, cooking, eating and composting) in a one-year garden-based learning (GBL) project. Despite the growing number of GBL initiatives at school grounds, there is still a lack of children's voices in GBL research. This research was a long-term study and I interviewed the children that participated in a one-year GBL project. The interviews were unstructured, because I was interested in children's recollections (memories) about their experiences in the project. After a process of synthesis and analysis of the



conversations that I had with the participants of this study, one of the emergent themes was how children re/construct their identities through relationships with the more-than-human world by interacting with non-human animals and systems at the GBL project. The memories children shared during the interviews regarding their experiences with non-human animals were much more than a list. They were thoughtful portrayals of the children's encounters with non-human animals that in some cases scared them, and thoughts about how those experiences helped them to overcome their fear of, and aversion to, animals. Children's feelings towards animals changed from fear to understanding and tolerance over time. This learning process sheds light onto how children experience the more-than human-world, specifically non-human animals, and how their identities are shaped by learning experiences with the more than human world through the GBL project. This finding highlights the importance of the more-than human-world in the re/construction of identity since the significance of our non-human environment in most theories of identity formation is insignificant.

ID: 781: Animal Assisted Learning Comes to Simon Fraser University - Carolyn Mamchur, CA

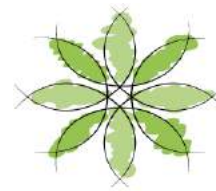
This paper presents the experiences and resulting implications for curriculum, pedagogy and research of four different groups of students registered in the Faculty of Education and the Faculty of Industrial Design at Simon Fraser University. The students participated in varying periods of time at Magic Horse Gardens, the sanctuary of the professor where they interacted with horses, llamas, chickens, ducks, dogs and rabbits and gardens as part of the curriculum. Each group engaged for a specific purpose related to the goals of their program. The PDP students combined personal narrative and animal assisted learning to explore how personal perceptions influenced relationships between student and teacher. An undergraduate class interacted with the creatures in the calming sanctuary as part of a study to determine if a day with nature would increase respect for nature and reduce test anxiety in students, particularly international students. A graduate class of students studying counselling focused on awareness and empathy issues that would affect the quality of interactions with students. Four students doing a directed study in the School of Interactive Arts and Technology spent a month visiting the farm creating a documentary film on the levels of trust existing between all the forms of life on the farm, animal to animal, (four legged and two legged), animal to feathered creatures, and all to the land which they shared. The process of each interaction was carefully documented and examined via photos, student responses to questionnaires, student interviews, and observed behaviour in the classroom before and after the interactions at the sanctuary. Examples of the findings from each group's experience will be explored offering participants the scope and implications of animal assisted learning in a natural setting where appreciation of and respect for nature is a living reality.

ID: 827: Education projects for teenagers to call them to act for nature. A partnership between a zoo (PNV) and a charity organization (GTT). - Katia Dell'Aira, IT

Parco Natura Viva is a modern zoo in Italy highly involved in conservation of animal species, in research and in conservation education. Green Teen Team is a charity organisation with the aim to connect young people and engage them with the natural world. Parco Natura Viva and Green Teen Team are partner in education projects to bring the importance of preserving biodiversity to teenagers. To do that, we engage young people with different actions such as monthly GTT members days hosted by PNV, with focus on acting for biodiversity, and special summer camps at PNV. In this case, teenagers have the opportunity to live behind the scenes of the zoo, in direct contact with nature. We know not all education curriculums include the relationship between humans and nature and that much of the coverage of this in the media uses shock tactics and makes young people feel vulnerable and unable to act. This does not always foster a good relationship with nature especially as many more people live in urbanised areas. During the summer camps at PNV, with the help of expert biologists and educators of the zoo, young people can understand their connection to, and interdependence with, nature and add essential experiences and life skills that might encourage them to be responsible decision makers in adulthood.

ID: 991: Re-framing Adventure Education in the Anthropocene: A topographic ethnography of the embodiment of place and adventure in the Himalaya - Mary Jackson, US

The glaciers of the Himalaya are melting at a rate double that of similar latitudes putting ecosystems, livelihoods, and human and more-than-human lives at risk. Anthropogenic impacts of adventure activities in this region necessitate an understanding of the complex relationships amongst humans and more-than-humans. A research approach decentering human experience allows for an embodied awareness of these relationships to emerge. In this research, I examined the



meaning and experience of place in the context of adventure activities in the upper Solukhumbu District, Nepal through a topographic ethnography and narrative vignettes of the trails in and around Mount Everest base camp. The questions I sought to illuminate examined the agency and relationships of human and more-than-human amongst the dirt, glaciers, and mountains of this area and the vast influence and enactments of tourism. The natureculture of the Himalaya was a co-creator of this research. I asked not what this place is but how, which allowed for an understanding of human and more-than-human contextual experiences and note the reactions and responses of such relationships. The key to my inquiry was an intimate and embodied awareness of place and experience, in turn, developing a pedagogical praxis tool to facilitate such embodied awareness with place. This new materialist framework urges a rethinking of the influence and agency of matter and proposes a multi-species perspective, re-framing human enactments of the Anthropocene and complicit behaviors of this epoch.

ID: 1029: Gaian Methodologies: Meta Methodology of Nature as Researcher and Nature as Teacher - Marna Hawk, US

This session explores which ontoepistemic orientations - indigenous, biocentric, ecocentric, biophilic, more-than-human, kinship, animist, relationality, biocultural embedment, new materialist, ecofeminist, etc. - support research approaches with a recentering of biocultural nature as researcher and as teacher. What confluence of methods demonstrate an increasing use of this research meta-approach? What are the guidelines for practice, vigor, and authenticity for Gaian Methods? Scanning over a decade of published research, the researcher develops a complexity web (network) model for the converging and connected methods and exemplars exploring the emergent practices and approaches of Gaian Methods. From terrapsychology and living systems research ethics, to the explorations of Earthvox, Gaian methods are groundswelling. How can researchers ethically and multifariously entangle scales such as local places and the planetary without reinforcing settler-colonial erasures, conflations, and abstractions? The messy convergence of the creative, collaborative, co-arising, diffractive, poetic, shamanic, depth-dimensioned, and planetary-emergent animate the resurgence of the living earth system as researcher. The four mandates of Gaian Methods (Hawk, 2010) are also explored: connect and collaborate, extend and extol, embed and embody, and thrum and thrive.

ID: 1034: Onward and Inward: Cycling Solo Across a Continent to Connect with Nature and Self - Haley Guest, CA

The work of environmental educators can be emotionally exhausting and philosophically challenging. We are the messengers of bad news, responsible for interpreting the causes and consequences of seemingly impossible wicked problems. We work at the intersection of environmental values and every-day behaviours, where reflecting on our own actions can be painful if they are in contradiction to the solutions we discuss and propose. This can leave environmental educators with feelings of helplessness, frustration, and grief. I feel these emotions deeply and presently in my own work. Furthermore, I have come to recognize a frightening and visceral disconnection between myself and the non-human environment, where I have spent little time in my adult life. Therefore, from May to July 2017, I undertook a solo bicycle journey across the country in attempt to reconnect with my environmental values, practice mindful awareness in my relationship to nature, exercise self-compassion, and reflect deeply on what it means to be an environmental educator in the time of Anthropocene. Drawing on practices in meditation, eco-psychology, and Joanna Macy's Work That Reconnects, this auto-ethnographic exploration utilizes audio journals, soundscapes, and interviews to tell the story of my experience both onward, and inward.

Perspectives, Challenges and Innovations in Research

ID: 646: eeWORKS: demonstrating the impact of environmental education through empirical research - *Judy Braus, US*

When the North American Association of Environmental Education (NAAEE) asks environmental educators about what challenges they face, one of the most common responses is how difficult it is to make the case for environmental education through empirical research and other evidence. NAAEE's newly launched eeWORKS seeks to address that challenge by providing environmental educators with evidence-based research to demonstrate the value and impact of EE. Through a partnership with Stanford University and an advisory group made up of a number of other universities and non-profit organizations, eeWORKS seeks to demonstrate the impact of EE on key environmental and social outcomes, and provide communication tools and training for practitioners. Key areas of research include how environmental education leads to student outcomes (K-12), as well as the links between EE and conservation, the benefits of EE and nature connections in early childhood; and the impact of EE on conservation and environmental quality. This presentation (preferred format: novel) will provide an overview of the eeWORKS initiative, its key findings, and applicability for EE professionals around the world.

ID: 121: A system-change model for embedding sustainability education within teacher education in Australia: Principles, implementation and benefits - *Jo-Anne Ferreira, AU*

The teacher education sector has been notoriously slow at engaging with the sustainability agenda. In an effort to address this, over the last ten years the Embedding Sustainability into Teacher Education Alliance (ESTEIA) has worked with teacher educators in universities across Australia to overcome mostly ad-hoc approaches to embedding sustainability. Informed by organisational change theory and systems change theory, we developed a system-based model of change which has been used to shape projects undertaken in 20 Australian universities. The model is a combined whole-of-system and action-research approach that seeks to engage key actors and decision-makers across teacher education systems in a process of learning and change. The model recommends that key agents of change adopt a participatory action research approach to embed sustainability education within and across a whole initial teacher education system. The system here is broad, and includes Education Departments, accrediting authorities, professional associations, and related NGOs. Our paper reports on three aspects of the ESTEIA work, an analysis of the literature to provide an insight into the key ways in which teacher educators are embedding sustainability in their programs and courses, an overview of the ESTEIA system-change model of change and the range of initiatives that have been undertaken in the 20 universities involved, and the benefits to participants of their involvement not only in projects in their own organisations, but also in the Alliance. We are able to demonstrate that the Embedding Change model has successfully built momentum and capacity for sustainability education in Australia's initial teacher education institutions through a 'joined-up' approach that offers initial teacher education teachers and students the tools to tackle the pressing challenges facing the world today.

ID: 550: We need to change the way we think and act - *Burcu Arik Akyuz, TR*

In the Nordic countries one of the key issues/problems for implementing sustainable development in education seems to be the teacherslack of knowledge and the leaderslack of interest in the issue. "Sustainable development cannot be achieved by technological solutions, political regulation or financial instruments alone. We need to change the way we think and act. This requires quality education and learning for sustainable development at all levels and in all social contexts" (UNESCO, 2017). A recently published article, "High Performance Education Fails in Sustainability? - A Reflection on Finnish Primary Teacher Education" (Wolff, Sjöblom, Hofman-Bergholm & Palmberg, 2017), discuss teacher training in the Nordic countries and especially in Finland and identifies five issues why an exceptionally good education according to the PISA results not successfully integrate sustainability into the education. These identified issues might also be obstacles for implementation of environmental education or ESD in other countries as well. To promote quality education and learning for sustainable development at all levels universities need to overcome these obstacles and become forerunners in the sustainability process. The question, "How do we overcome these obstacles?" is the main focus of this paper. For example, a development of a pedagogy focusing on critical systems thinking to teach the society members to think of their actions in the system and how these actions and choices affect other systems in the society is of importance to develop a sustainable

future.

ID: 590: The leadership challenge of a 'competency-based approach to' Sustainability Education in HE - Paul Warwick, GB

This paper outlines a collaborative research project between Plymouth University, Vechta University, and Western Michigan University. It took as its starting point UNESCO's argument that in HE, 'more than scaling up of good practice' and 'greater attention to systemic approaches to curriculum change and capacity building for leaders' will be needed (UNESCO 2014), particularly in the light of the Sustainable Development Goals (SDGs) and the UNESCO's Global Action Plan (GAP). The project has been a collaborative critical dialogue on the status of work to date on sustainability competencies, and an applied inquiry into how to lead institutional change and innovative and transformative pedagogies around such competencies. In this paper we share some of the key findings from this collaborative project based on the following three questions: 1. What's an essential sustainability competency set to support large-scale, cross-cultural, systemic and transformational change? 2. What kinds of pedagogies and learning spaces are needed to support the development of these essential competencies? 3. What sorts of structural changes in Higher Education systems (leadership, policy and practice, assessment, teacher training, etc.) need to be made to support robust implementation of these competencies in the curriculum around the world? In so doing this paper draws attention to the importance of implementation research strategies for taking this work forwards. It also highlights specific innovation areas such as the potential of systems thinking, anticipatory competence, state of the planet knowledge, service learning and the use of games and simulations in the leadership of educational reform oriented to sustainability education.

ID: 311: Systematic review of environmental education in Latin America and the Caribbean - Lilly Briggs, US

Our systematic review of the peer-reviewed literature seeks to examine the impacts of environmental education (EE) programs and experiences throughout Latin America and the Caribbean on the environmental attitudes and behaviors of youth up to 18 years old. We are including EE programs and experiences occurring in formal as well as non-formal learning contexts, in an effort to: 1) compare EE interventions having positive outcomes versus ones with little to no positive outcomes, 2) identify key aspects of EE interventions leading to desired outcomes, and 3) explore what opportunities exist for increasing the number of high impact initiatives that effect change in youth environmental attitudes and behaviors. This session presents both the systematic review process in general and describes some of the methodological challenges and gaps in the literature revealed by our review in particular.

ID: 1047: The University role for the Environmental Education. Politecnico di Torino, experience, results and opportunities. - Elena Comino, IT

The Department of Environment, Land and Infrastructure Engineering intends to put the knowledge produced through its research activities at the disposal of the society, in order to contribute to the educational, cultural and societal development. Besides traditional education, different activities are organized in order to spread knowledge to society, with particular attention to training activities aiming to improve Environmental sensibility: Open lab, Noon Talk and Green coffee are a few examples. Dissemination, educational and cultural activities are part of our mission. The Department of Environment, Land and Infrastructure Engineering promotes, in cooperation with other institutions, courses and meetings with High Schools. The presentation is focused on practical experiences, obtained results, and on future opportunities. The aim is to share, reflect and discuss the research activities on environmental and sustainability education developed between academic staff and people of different ages and cultures.

ID: 866: Incorporation of Sustainability in the Social Representation of the Development in Students of a Mexican Public University - Antonio Fernandez Crispin

The Meritorious Autonomous University of Puebla (BUAP) has committed, to national and international institutions, to greening the curriculum and the campus. The aim of this work is to evaluate how the BUAP has influenced undergraduate students to assume an alternative sustainable development model to the dominant one. The theoretical model used is the



social representations (SR) one, which allows analyzing the inclusion of scientific or academic models in to common sense. An open survey was applied to 250 students to analyze SR through conceptual networks done with the UCINET program. It is expected that students transition from simple representations to others of higher complexity. Until now, advances have been made to sensitize students on the importance of environmental issues, but they include few academic elements in their analysis, and they don't see them as a consequence of the dominant development model. There are no significant differences between students of different undergraduate study programs or between those who are or are not involved in environmental programs of the BUAP. The SR is more critical with the development model in environmental and economic issues and less when science, technology and development are mentioned.

ID: 205: Higher Education Institutions key players for sustainable development: an example postgraduate course Energy Efficiency Services a catalyst for energy transition in public, industrial and private buildings" - Dirk Franco, BE

The University college PXL is a centre of expertise for innovation, creativity and entrepreneurship. The university college PXL organizes her activities always starting from the quadrupole helix model (interaction between government, knowledge institutes, industry and society). Moreover, the university strives to work in an interdisciplinary way in both teaching and research domains. Consequently, in education the attention is directed towards authenticity (for cases, teachers as well as for students). The interest for environmental aspects is global and general, with a special attention towards global warming and greenhouse gases emissions, with a focus on CO₂. The large ecological footprint in Flanders is mainly caused by inefficient buildings and too much traffic. So a strong effort is needed to reduce the energy consumption in private and public buildings. Besides this reduction, energy flexibility will also help to obtain the climate and environmental goals. Higher education institutions (HEI), are more and more be seen as a key player in the promotion of Sustainable Development (SD). HEI are often performing similar efforts e.g. in terms of campus greening, curriculum renewal and research orientations. But as they try to make advancements in SD implementation at several similar domains, the global rate of success can be rather low. The PXL wants to play an important role in the setup of curricula, dealing with sustainability and energy efficiency. Although sustainable building has evolved to a more mainstream concept, it soon became apparent that even building professionals often lacked specific knowledge and insights. This curriculum renewal should be the result from the quadrupole helix idea and needs interdisciplinary. Strategy The PXL has developed a dedicated postgraduate (PG) Energy Efficiency Services (EES) with the strong interaction of several dedicated stakeholders: BELESCO (association Belgium), Infrac (a public ESCo), Encon (a private ESCo), Dubolim (sustainable building) and the (local) government of Limburg. There should be a continuous interaction between teaching and practice. Moreover, we hope to make our good practices transferable to other (public and private) organizations. Activity 1) There are three obliged modules in this PG EES course 1) Energy efficiency services dealing with buildings (with special attention towards the iterative project cycles including the topics audits, measurements and verification and the role for facilitator). Also the link between building and mobility is a subject, as well as attention for monuments. 2) In the second module the life cycle costing is the main subject. In addition, the aspects of circular economy as well as the green value/added value are explained. 3) Communication. Special attention towards in- and external communication in combination with change management strategy. Besides our own expertise from central staff and the departments PXL Technology, PXL Business and PXL Media and Tourism, we invite also external specialists for each domain (techniques, business and communication) from other knowledge centres, universities and industrial partners in Flanders and the Netherlands. Activity 2 We start with an energy quick scan for all our buildings. In addition, the campus PXL-TECH is used as a living lab to apply sustainable solutions. In projects, lessons, tests and undergraduate courses together with our junior colleagues the campus is as a test area. Activity 3 In collaboration with NTNU Norway we will setup a questionnaire (activity-based) for all building users in view of the energy aspect and control. Result This multidisciplinary project is an example of preach what you teach: teaching, research and service come together in a socially relevant project comprising economic, communicative, legal and technological pillar. Outcomes and impacts Situation: Energy is expensive and use of classical fossil fuels causes, due to greenhouse gases, global warming. We need to develop new energy technologies and energy flexibility, accompanied with new business models. Building standards and obligations are stricter nowadays. Modern installations are more efficient and new building techniques and materials are more durable. These developments make it technically possible and financially advantageous to renovate existing buildings and related installations and renew with the ultimate goal of more sustainable to our environment. Outcome 1 As a result of the first graduates we organised for the first time ESCO-speed dating in Flanders (more than 140 participants (private, industrial and public sector) and 40 knowledge centres. Outcome 2 As a consequence of these internal and external actions we are preparing the first GRI report for PXL-Tech. Outcome 3 The second edition of the postgraduate Energy Efficiency Services is organised. The Flemish network is extended towards new international partners TU Lisbon, NTNU Norway,

Technical University of Denmark, TU Delft and Avans Hogeschool. Impacts (global) 1) Good practices of principle of quadrupole helix: knowledge centre in collaboration with industry, government and society. 2) Dissemination of knowledge concerning Energy Efficiency Services (techniques and developing new business models) 3) Research has been started to eliminate ESCO-barriers for SME and public authorities. These barrier can be mental, organizational and institutional. 4) During the ESCO-Speed dating (legal and financial) barrier were discussed and will be introduced in policy discussions for local and Flemish government 5) Involvement and behavior of future generations 'decision-makers'. In addition 1) Energy savings and flexibility 2) Overall reduction of environmental impact (including materials reduction) 3) CO2 reduction 4) In addition to environmental and energy savings will also gain in comfort. NonEnergetic Benefits (NEB) as they are often mentioned in this context.

ID: 563: Theory and practice in a new environmental education to study on the connectivity of Hills, Humans and Oceans: A case study of Kyoto University, Japan - Miki Miyaguchi, JP

Kyoto University has developed a new research field 'Studies on the Connectivity of Hills, Humans and Oceans (CoHHO)'. The study on CoHHO was developed is based on a research hypothesis that various global environmental problems caused by loss of connectivity between ecosystems of forests, rivers, coastal areas and oceans as well as between these ecosystems and human societies. The study aims to explore methods to restore ecosystem health and quality of life for humans. Based on the research results of CoHHO, Kyoto University established the educational program of CoHHO, which consists of 39 lectures on Hills and forests (Mori), Social science (Sato) and Oceans (Umi). All of the master and PhD students of Kyoto University can register. Since 2013, 336 students have registered in the program and 128 students had been certified. The research study reviews outcomes of the environmental educational program from 2013 to 2016 implemented in Kyoto University, and explores development of the CoHHO research field and environmental education programs.

ID: 878: Design education for sustainable product innovation. - Chiara Silvestri, IT

The paper presents the outcomes of the design laboratories held in the last five years as part of the master of education degree in product design at IUAV University of Venice. The educational programme of the degree has always been focused on the design of sustainable and innovative products, aiming to increase the awareness of the younger generations on environmental issues and to encourage them to look at all the productive processes in a preventive perspective. The topics studied during the courses, have widely ranged from the design of devices for alternative energies such as products for a portable wind turbine or transportation means using hydroelectric power to recharge, to projects for sustainable mobility, such as green cars, electric vehicles for public mobility or intermodal transportation. The purpose of this paper is to present some examples of the products developed by the students and to share their practical learning experience: the teaching approach to the course expects the students to start with an inspirational phase supported by hand sketching, followed by a focus on the existing technologies and the transfer of the figures in a 3D model, leading to a final presentation of a mock-up, a video and a poster representing the process that has driven the student from the inspiration to the product.

ID: 519: Condiciones de efectucción de la Educación Ambiental en egresados de dos posgrados de la Ciudad de México - Oswaldo Escobar Uribe, MX

Con una investigación de diseño cualitativo se indaga sobre las condiciones de efectucción de la Educación Ambiental a partir de las creaciones que potencia el imaginario social e instituyente de este campo en egresados de dos programas de maestría en la Ciudad de México. Se analizan las prácticas, formas de pensamiento, estilos de intervención en el ámbito privado y profesional, valores y discurso, que representan personificaciones de significación dotados de sentido y encarnados en el decir y hacer de este colectivo. El enfoque teórico para el análisis del universo de significaciones contenidas en este grupo de informantes es el de la concepción de las significaciones imaginarias sociales desde la perspectiva de Cornelius Castoriadis (2013), por lo tanto se consideraron a estos elementos como parte estructuradora de los sujetos en lo individual -la psique y el cuerpo- como en lo social 'la naturaleza y la cultura-, que ofrece a la sociedad esta condición de totalidad. El interés de este estudio emerge con la necesidad de conocer las prácticas, posturas y discursos que se generan sobre la educación ambiental en una selección de sujetos partícipes de procesos de formación y/o actualización profesional en el campo y, a partir de aquí, preguntarnos de manera más amplia sobre sus finalidades y concreciones. En los hallazgos se encuentran formas de concreción en una conciencia ambiental instituyente generada en estos profesionales, resultado de una racionalidad reflexiva y crítica que emerge de los efectos ideológicos, institucionales y personales

ejercidos en la formación en el campo y devenir profesional.

ID: 362: Measurement, Evaluation, and Research of Education and the Sustainable Development Goals - Marcia McKenzie, CA

With the launch of the UN's Sustainable Development Goals in 2015, new global targets have been set to catalyse action for sustainability, including through education. Target 4.7 aims to ensure that all learners acquire the knowledge and skills needed to promote sustainable development by the year 2030 (UN, 2016). Indicators to track and measure progress towards this goal include the extent to which ESD is mainstreamed at all levels in education policies, curriculum, teacher education, and student assessment. However, as the recently published Global Education Monitoring Report (2016) concludes, monitoring and evaluating is difficult and more "systematic and rigorous" approaches to monitoring country progress towards target 4.7 are needed to supplement country reports (p. 52). In this session, research, experience, and perspectives on UNESCO evaluation efforts to date to identify considerations in measuring progress towards SDG 4.7 and Global Action Programme priorities are discussed. Key questions to be addressed include: i) What are the possibilities and priorities for measurement of ESD towards SDG and GAP goals? ii) And how can we ensure value, rigor, and action in this? The session includes an open discussion of considerations for evaluation and research in relation to education and the SDGs.

ID: 212: #OrganicLearning - Giovanni Fonseca Fonseca, MX

#OrganicLearning is a way of facilitating meaningful learning processes. It is natural, flexible, and intuitive and it also develops and improves organically itself. A virtual platform (using machine learning algorithms) analyses the learning profile of learners and suggests which interactive 'Mind-Map' is the best to be explored by them. #OrganicLearning (short name: o-Learning) is a way of facilitating learning processes and it was originally thought to improve e-Learning environments, but it is quite easy to adapt it into blended learning (b-Learning) or even face-to-face schemes.

#OrganicLearning is about creating learning atmospheres to foster more meaningful learning experiences. This way of learning is organic in many senses. For example, learning by exploring 'interactive Mind-Maps', means that learners will learn the main topic, not in a linear way like in traditional curricula (Topic 1, then topic 2' and so on), but instead learners will explore a 'Mind-Map' in the most flexible path in order to learn about a specific topic and by so doing they develop the necessary competences to apply what they have learned for solving real problems. The freedom of 'surfing' into this 'Mind-Map' as they choose fosters a meaningful learning process. Learners identify subtopics or activities which they find more interesting at the beginning, those topics where they have already had experience, or those which they have learned before. Subsequently, every single learner has a totally different and personalized learning-experience from others, even if the same 'Mind-Map' is used. In this way the learning process is flexible, based-on-interests, natural and constructivist. In other words, it is organic. This organic learning method is ideal to use in Education for Sustainable Development, because it leads to a better understanding of the complex topics involved in this field.

ID: 415: OCEAN LITERACY OBSERVATORY. When the academy is all of us - Monica Mesquita, PT

In this paper, we present and discuss the process of construction and development of the Ocean Literacy Observatory - OLO, an academic space, which was developed in a bottom up movement by citizens from coastal zones with different socioeconomic classes and different intellectual background. This group was previously networked by national scientific projects and it transversally consists of the extreme attention to the coastal urban conurbation movement. Coastal cities are emergent phenomena of local-scale, dynamic interactions among socioeconomic, cultural, and biophysical forces. The movement of marginal cultural groups into the coastal urban area appeared as a topological answer to the conurbation movement during the Industrial Age. Nowadays, this movement has grown fiercely not only in face of world social clashes but also in face of the current economic crisis and the movement of re-allocation of the human body that characterizes our current age of migration (Fouberg et al., 2012). The OLO assumes itself as a new interdisciplinary and intercultural posture into the academic body; here, members of the coastal local communities are critical active participants. This posture recognizes that (1) humans are components of ecosystems (Pickett et al., 2008); (2) symbiosis among local, traditional, and technical knowledge is an important emancipatory educational tool (Freire, 1970); (3) coastal local communities voices must be considered in local decision-making (Vasconcelos et al., 2012); and (4) interactions between local decisions and local-scale ecological processes can cause large-scale environmental changes (Alberti, 2005). OLO is a scientific space where the academic community is constituted by the part of non-part (Rancière, 1995) of society 'a panoptic team of study and research that works with the integral perspective' (Acosta, 2016), promoting the critical active participation and the

empowerment of the coastal local community's members through their intellectual tools; exploring the encounter of diversity to resignify, collectively, the role of the academy in the society; and encouraging communitarian participation in resource management through a dialogical process inserted in their own communitarian education.

ID: 508: An integrated discipline approach to Peace through Agriculture - Rodney Rylander, BZ

We have made great strides in developing environmental, ecological, social, political, and economical research and education curricula but now we need to develop an integrated discipline system that has the potential for creating a peaceful and environmentally sustainable world. At the Reserach and Demonstration Diversity Farm in Belize I am striving to accomplish this goal. The farm is less than one half acre. The goal is to create a pod that is sustainable with minimum input that will feed and produce income for 5-10 people living a simple lifestyle with 3-4 people working 20 hours each a week. The research involves finding the most economical and suitable plants and animals that together can be a sustainable integrated agriculture system needing little input. The farm currently hosts international students and classes from public schools. Several pods create an association that is able to have processing equipment, marketing advantages, training, consulting and funding for the pods. Associations can form to become larger associations that are able to have larger plants like a sugar mill. The biggest challenge in implementing this system is getting the different cultures to accept it. If the system spreads throughout the world, then fewer resources would be taken from weaker countries and peace could occur.

ID: 707: Creating assessments and authentic learning experiences in informal environmental education programs with achievement systems: Using the creation of criteria for digital badges for program design - Theresa Horstman, US

This proposal discusses a process of supporting informal environmental educators in identifying and defining aspects of their programs to assess participant learning and identity development around environmental practices. This process originates from the design of digital badges for informal youth programs. Badge criteria explain to participants how to complete an achievement or set of achievements. Each badge has its own set of criteria, including a badge name, description of what the participant will do and why the activity(ies) are included, explanation of how to fulfill the badge requirements, and resources to help complete the achievement. The process of defining badge criteria holds promise for designing learning experiences for non-badge driven educational programs as well. In our badge design work with informal environmental education programs, we focus on designing badges that contain rich, complex, and layered criteria. The design principles emphasize that badges can serve as a feedback mechanism to inform participant decisions and bring attention to ways in which the learner can participate in the program. The design principles also focus on creating criteria that serves as a metacognitive cue, prompting learner reflection. Careful attention to requirements built into the criteria and how the criteria is framed can create more meaningful learning experiences than as tracking mechanisms of simple steps, awarding gold stars, or checklists. With these and other design principles, we have found the developing badge criteria process can act as a tool to inform program developers to the organizational structure of the learning content. The process of creating badge criteria specifically seeks to address the challenge of assessment in programs that fluidly interweave environmental education learning with disciplinary practices and participant environmental identity development. Criteria development also seeks to make clear the academic learning that occurs in informal spaces, while retaining the culture of the program.

ID: 462: Developing our young leaders for sustainability: A developmental framework for adolescent leaders for sustainability - Patricia Armstrong, AU

There has been a great deal of research into adult leadership and an increasing amount of research into adult leadership for sustainability. However, there has been far less research in the important areas of child and adolescent leadership and almost none in the area of child and adolescent leadership for sustainability. Although there are many education providers who conduct programs for children and resources for teachers and educators, there is virtually no research underpinning these education programs and resources. This paper discusses the results of a qualitative research study of students, teachers and principals in five secondary schools in Melbourne, Victoria, Australia. The research identified how students understand leadership and leadership for sustainability and what they believed to be the key capabilities and attributes of young leaders. It also provides evidence showing that adolescents use seven distinct styles of leadership, with collaborative leadership the most commonly mentioned style. Other styles identified were authentic, collaborative, commanding, delegating, democratic, directing and encouraging. The study also provides evidence that there are five distinct levels of adolescent leaders for sustainability. Taking a fresh perspective on this topic, the author presents a unique framework for the

development of adolescent leaders for sustainability, based around four key elements (practices, understandings, key attributes and key capabilities). This framework also includes recommendations for motivating and supporting young leaders for each of the five levels around three key areas, (mentoring and supporting, personal development and curriculum and co-curriculum). The results of this study will have wide ramifications for teachers and educators who are working to engage and support young people in leadership for sustainability, giving teachers instruments and tools to foster learning that will facilitate and encourage active citizenship and social responsibility.

ID: 587: Envisioning Futures for Environmental and Sustainability Education - Peter Corcoran, US

Led by co-editors of the book *Envisioning Futures for Environmental and Sustainability Education* (Wageningen Academic Publishers, 2017), this session focuses on envisioning a future for environmental and sustainability education. The co-editors invited educational practitioners and theorists to speculate on and craft visions for the future direction of environmental and sustainability education. The book explores what educational methods and practices may exist on the horizon, waiting for discovery and implementation. A global array of authors imagines alternative futures for the field and attempts to rethink environmental and sustainability education institutionally, intellectually, and pedagogically. These thought leaders chart how current emerging modes of critical speculation might function as a means to remap and redesign the future of environmental and sustainability education today. Seeing the need to develop adaptable pedagogies as a hedge against future ecological uncertainty in the Anthropocene, this roundtable seeks to spark discussion concerning how futures thinking can generate theoretical and applied innovations within the field. Those who attend will be able to engage with co-editors of the book in order to reflect, ask questions, and generate their own ideas about the future of environmental and sustainability education. Through roundtable discussions, attendees will be able to come to conclusions on how they may take these ideas and implement future visions of environmental and sustainability education in their work back home.

ID: 607: Transforming values, ideals and paradoxes to education for sustainability - Marianne Heggen, NO

The increasing interest of sustainability in early childhood education enables new insights beyond common disciplines. Our contribution is an analysis of our narratives while initiating, establishing and teaching the course Sustainable Development by Involvement, in early childhood teacher education at Western Norway University of Applied Sciences. We, the authors, represent four different disciplines. Our altering understanding of education for sustainability through this process challenge dichotomies like instrumental and emancipatory approaches, change and daily routines, learning and teaching, questions and answers. This calls for education that embrace paradoxes, ideals and values.

ID: 899: ANALYSIS OF IBERO-AMERICAN RESEARCH IN ENVIRONMENTAL EDUCATION FROM A DATABASE CATEGORIZATION PERSPECTIVE - Edna Gamboa Porras, ES

This proposal studies the research categories of indexed journals for articles in the Environmental Education area. It was an explorative and descriptive research study that focused on the databases Web of Science and Scopus. The articles selected for this investigation were developed in Ibero-American countries, database subject areas restricted to Environmental Education and Educación Ambiental and published within 2011 and 2015. The information was organized in a data matrix. Web of Science classified the articles in 16 categories, and most submitted articles (80 out of 114) fell under Education and Educational Research category. Distributions by country were: Brazil 55 of 81, Netherlands 1 of 3, Spain 9 of 10, United Kingdom 6 of 10, Colombia 2 of 5, United States and Lithuania 1 of 1; countries that submitted only 1 article in other categories were Venezuela, Cuba and Costa Rica. Scopus classified articles in 24 categories, mostly grouped in Education and distributed by country as follows: Brazil 8 of 28, Spain 11 of 12, United States 2 of 4, United Kingdom 6 of 14, Chile, Netherlands, Poland and Portugal 1 of 1; countries that submitted articles in other categories were Colombia, Germany, China, Lithuania, Mexico and Pakistan with 1 article each, and Venezuela submitted 5. All categories show theoretical and practical resources organized according to total cites and journal impact factor. This investigation suggests that articles classified in Education and Education and Educational Research categories have a pedagogical and theoretical approach rather than emphasizing on science fundamentals, sustainability or conservation. Therefore, this study highlights the lack of scientific studies focused on diminishing the negative effects on the environment by creating awareness and utilization and innovation of new technologies that allow for a more sustainable management of natural resources.

ID: 993: Process and Emergence: New Materialist Research Methodologies for Sustainability Education - Mary Jackson, US

The emerging practices and methodologies of new materialism urge a rethinking of human and more-than-human relationships, decentering human experience and examining entanglements and enactments of matter from the physical to spiritual, emotional, and mental. Humans do not interact with an environment, people, thoughts, and things, but rather they intra-act, and through those actions embody the experiences through which meaning is made. New materialism enables or rather opens, the possibilities of understanding phenomena and learning as cultural, political, social, historical, and scientific entanglements and, in sustainability education, to theorize concepts of climate change and Anthropocene. In this way of theorizing are modes of knowledge production of matter and matter itself; neither ontologically or epistemologically prior to the other. This perspective requires humans to understand that we are in a multispecies community, inseparable from not only other life like bacteria and soil, but also from traditionally non-living matter of the world such as mountains, rocks, and in the material structures of power and politics. New materialist research approaches, such as diffraction, bricolage, and multispecies ethnography, support the development of pedagogical praxis tools that engage with the process and emergence of learning experiences. This presentation reviews engagement with these methodologies through embodied ethnographic research methods in the Nepali Himalaya, presentation of data through narrative vignettes, and development of a praxis tool for sustainability education. The implications of these methodologies provide a hopeful and visionary sense beyond the Anthropocene to sustainable futures.

ID: 264: Towards the Robust Assessment of Learning Outcomes in ESD - Aaron Redman, DE

A transition to a sustainable society will require the creation of a new type of citizenry. The mission of Education for Sustainable Development (ESD) is to foster in future citizens the knowledge, skills, attitudes, values and worldviews that will be necessary to transform the world, in other words create change agents. The various non-traditional learning outcomes of sustainability change agents has inspired new curricula and novel pedagogical approaches. These curricula and pedagogies have already begun to be widely adopted at different grade levels; however, to date there is as yet little empirical evidence about how these approaches might contribute to ESD learning outcomes. This is beginning to change as a diverse array of approaches have begun to be systematically tested and applied to assessing student learning in ESD. Educating Future Change Agents, a joint project between Leuphana University, Germany and Arizona State University, USA, addresses how competence development can best be fostered through novel teaching and learning approaches in individual sustainability courses as well as through an entire sustainability curriculum. Research is focused on the development of sustainability competencies in sustainability programs, teacher education programs, and extra-curricular programs on social entrepreneurship at both universities. A multi-methodological approach is being deployed which combines in-depth qualitative case studies with a quantitative sample study. In order to properly assess competence development in these diverse cases a suite of assessment instruments are being developed, tested and deployed. This presentation shares not only the progress of the project so far in the development of these instruments but also the synthesized results of a symposium from leading researchers in Europe on the topic of assessing learning outcomes in ESD.

ID: 377: Fixing the atmosphere: A collaborative experiential learning pilot project involving bio-fuel researchers and elementary school students - Bonnie Shapiro, CA

Educational institutions and governments worldwide are striving to improve education about Climate Change, a key societal challenge for future generations. This session presents the design of a collaboration between university scientists and elementary school classrooms (11-12 year olds). As part of its Energy Research Strategy, the University of Calgary is pursuing innovation in the field of algal bio-fuel to produce cost-effective, climate-neutral bio-fuel. This work has led to a new, cost-effective process for algal growth involving a growing procedure that can be readily performed by elementary school children. To gain understandings about climate change and biofuels, students will work with materials similar to those in the larger university research project, but specifically adapted for use in elementary classrooms. Students will capture CO₂ from the air using a uniquely productive algae collected from alkaline lakes. They will convert the captured CO₂ into algal 'biomass.' The goal of the university research is to convert biomass into fuel. Students do not convert biomass into fuel but engage in another important aspect of the research, the process of capturing CO₂ from the air. Using the same unique algae used in the scientific research, students learn to place it onto a simple photo-bioreactor system. A fan blows air through a bed of CO₂-capturing beads. Students will control light intensity, temperature and gather data on oxygen production using a Raspberry-Pi device. They send the data to our website <http://www.fixingtheatmosphere.com/> to show how the experiment is proceeding and ultimately, to share with classrooms participating from all over the world. This

session describes the design of the equipment and collection processes, reports on teacher and student experiences with the materials, and invites international participation in the project.

ID: 277: Maryse Clary : L'alliance pour une éducation à la citoyenneté planétaire : mettre les jeunes au cœur du système éducatif - Sylvie Kergreis, FR

La société civile devient une grande force avec de nouveaux modèles de société écologiques, participatifs et solidaires. Face à l'ampleur et la complexité des problèmes engendrés par le modèle de développement actuel, nous avons créé une Alliance pour une éducation à la citoyenneté planétaire (AECp), regroupant 14 équipes de 12 pays de 4 continents, afin de nous pencher sur les questions d'éducation et de formation des générations futures qui devront affronter des réalités biophysiques, économiques et politiques inédites. Prendre cette responsabilité doit se concevoir comme une sagesse, tout changer en se changeant soi-même.

Nous avons lancé un projet de recherche qui met les jeunes au cœur du système éducatif. Favoriser leur accomplissement, abolir la compétition au profit de l'émulation, de la solidarité, de la coopération, de la complémentarité masculin-féminin, afin de s'orienter vers une société plus solidaire et équitable. Leur faire prendre conscience qu'on peut vivre autrement, qu'ils ont quelque chose de décisif à apporter à nos sociétés, que la meilleure façon d'apporter des progrès significatifs en vue de la transition passe par l'implication d'acteurs multiples dans la refonte du système tout entier. Nous préconisons une éducation à la responsabilité et à la complexité par le concret, un enracinement des programmes éducatifs dans un territoire, une coresponsabilité avec les autorités locales, les institutions éducatives, les jeunes et d'autres acteurs locaux, entreprises, associations, services publics, dans sa conception et sa mise en oeuvre.

Un tel effort de refonte requiert la mise en place de réseaux sociaux, de nouvelles modalités de recherche, un haut degré de participation et la mobilisation d'un grand nombre de formes d'apprentissage, interactives, intégratives et critiques. A partir des réalités concrètes et spécifiques, des invariants vont apparaître au niveau de la manière d'aborder la réalité et, de l'échange d'expériences, devraient se dégager des principes directeurs pour l'action.

ID: 708: Separating the inseparable - A seven-scalar laminated system perspective to environmental and sustainability education - Adesuwa Agbedahin, ZA

Broadly, this paper uses the social-ecological seven-scalar laminated system perspective to highlight the need for a more productive paradigm of thinking about and addressing environmental and sustainability issues and risks. This argument concurs with the notion that social-cultural and natural issues are cross-cutting, interconnected and multidimensional in nature. Environmental issues and human involvement in the playing out of events at their various levels of involvement are also linked, either directly or indirectly. Global and local environmental and sustainability problems and phenomena, as well as their corresponding proposed solutions, should therefore be integrated in the light of their pre-existing interlinkages. Specifically, the paper sheds light on the laminated system of factors that contextually constrain and/or enable effective environmental and sustainability education at essentially sub-individual, individual, collective, institutional, national, regional and global levels of reality. It draws on longitudinal PhD research and the case study of a set of educators and higher education institutions in an African country. In this paper, a 'separate but inseparable' analysis of laminated enablers and constraints of learning, change and transformation is done. The explanation of how these have empirically happened and can further happen in higher education at the seven distinct levels of social realities is made. The laminated system (also called the seven-scalar social being (Nunez, 2014), enables the possibility of social explanation at seven distinct levels of agency and collectively that social life is concerned with or related to (Bhaskar & Danermark, 2006; Bhaskar, 2010). The constitution of a laminated system therefore analytically enables the visibility and explanation of the obvious multiplicity and complexity stemming from each level, context and scale. The laminated system shows the patterns of dependency and interdependency of social realities (Bhaskar, 2010).

ID: 322: Evaluation of the preparedness of preservice teachers to teach environmental and sustainability education (ESE): Challenges and Implications for ESE research - Oluwaseun Bandele, NZ

This paper reports on research that sought to evaluate the preparedness of preservice teachers (PSTs) to teach environmental and sustainability education (ESE) in New Zealand primary schools. This evaluation research is relevant as ESE is expected to be taught in New Zealand primary schools through integration into the Core Learning Areas. After completing a compulsory ESE paper in a New Zealand public university, data was gathered from different cohorts of preservice teachers and their lecturers using a mixed method approach that involved administration of questionnaires, focus group discussions,

interviews, observations, and document analysis. The cohorts included Year 1 PSTs taking the paper at the time the research was conducted, Year 3 PSTs looking back on the paper they had previously taken, and beginning teachers who had recently completed the degree. Findings from statistical and thematic analysis of the quantitative and qualitative data respectively highlighted a number of findings and consideration for preservice teachers' education. This paper presents these findings with a focus on the challenges associated with teacher education programs, challenges of evaluative research, the disconnect between preservice teachers' environmental literacy and confidence to teach ESE, and issues associated with the implementation of ESE in New Zealand primary schools. Implications of these findings for the field of ESE research will also be explored.

ID: 189: Una revisión de artículos de Educación Ambiental en el periodo 2005-2015: Identificando conocimientos y escenarios - Maria Mejia-Caceres, BR

A partir de artículos publicados en revistas en el periodo 2005-2015, buscamos indicar tendencias teóricas y de investigación en Educación Ambiental en lengua portuguesa y española del contexto latinoamericano. Por lo tanto, realizamos una búsqueda en la base de datos de artículos en Scopus, mediante el descriptor de Educación Ambiental en dos idiomas, portugués y español, luego se realizó una revisión manual al interior de las revistas para verificar la cantidad de artículos, así como verificar que los artículos fueron reconocidos en Qualis de Capes (Brasil) o Publindex de Colciencias (Colombia). Finalmente, realizamos una revisión de los artículos, para reconocer el público destinatario, contenido de los artículos, metodologías de investigación, así como la concepción de educación ambiental que emerge de las publicaciones, y propuestas de conocimientos y experiencias que aparecen implícitas en el interior de los artículos.

ID: 994: The Uptake of Sustainability in Education: An Analysis of the Relationships between Policy and Practice - Marcia McKenzie, CA

In this presentation, we report on research spanning six Canadian provinces and territories, with data collected from 10 school divisions and 20 schools, and involving a range of participant types. We focus on the uptake of policy and practice indicated in the research settings, as well as the relationship between the two. The presentation will provide an overview findings on: (i) the differing uptake of policy at provincial and school division levels, (ii) the relationships between policy and practice, (iii) the terminology used in policies in relation to terminologies used by participants, and (iv) variations in participant perceptions on (i-iii) in relation to their work roles and demographic characteristics (gender and cultural orientation). Key lessons from the research are highlighted. These include the role of both provincial curriculum and school division policy in determining the extent of sustainability uptake, varying perceptions depending on role (e.g., administrators, teachers, other staff, students), and the how region of the country affected orientations to sustainability uptake, including terminology used and extent of perception of alignment with Indigenous considerations. Possible implications for policy decision-making and future research are also identified, including highlighting promising directions moving forward with ESE.

ID: 471: Sustainability Governance at Universities: Insights from a Qualitative Research Project in Germany - Marco Rieckmann, DE

Universities play a crucial role for promoting sustainable development by addressing sustainability through their major functions of education, research and outreach. The overall aim of the project 'HOCHN, Sustainability at Universities: developing, networking, reporting' (2016-2018) is the promotion of sustainable development at universities in Germany. The project is divided in the following working packages: sustainability reporting, governance, research, teaching, and operation. The working package 'Governance' aims at the identification of governance mechanisms in the implementation of sustainability processes and principles at selected German universities. This analysis is conducted based on a heuristics ("governance equalizer") which covers the following fields of action: politics (How can the relevant decision-makers be mobilised?); profession (To what extent is it possible to collaboratively deal with a topic 'beyond professional and disciplinary boundaries?); organisation (To what extent is it possible to involve different higher education stakeholders?); knowledge (To what extent is it possible to identify, bundle, and integrate useful knowledge?); visibility (To what extent is it possible to make visible the processes and their results?). Data is gained on the basis of literature research, expert interviews, interviews with various representatives of groups of actors at different universities, which are very engaged in the area of sustainability, as well as interactive practice research events and networking days. This paper presents first results of the working package 'Governance'. The results of this research will make it possible to identify sustainability

governance profiles at different universities, which deal with sustainability in research, teaching and operation. This will help to better understand how sustainability governance processes at universities look like and how they can be facilitated more effectively. Moreover, this research will contribute to further developing the theories on sustainability governance at universities.

ID: 16: Deepening Approaches to Teaching, Learning and Curriculum in Environmental and Sustainability Education - Alan Reid, AU

In revisiting whether curriculum should be characterized as largely knowledge or aims-led, Michael Young (2015) raises two challenges for notions of depth. First, whether curriculum can overcome pragmatically and ideologically-driven challenges associated with specialization; and second, addressing the imperative of fostering 'powerful knowledge' in schools. The former increasingly requires acknowledgement of unintended consequences (fragmentation of disciplinary knowledge, the instrumentalisation of school subjects, and the prioritizing of extrinsic over intrinsic value of knowledge and ways of knowing). Meanwhile, the latter (even if ironically) is increasingly articulated against a policy backdrop that champions schools as occupying a unique role in social reproduction and change: 'providing the conditions which enable them to innovate and change' (Young, 2009, p.10). For Young and his interlocutors, a key debate is what we can realistically expect of 'powerful knowledge'. Primarily seen in terms of that which enables individuals to move beyond their experience, develop new ideas, envisage alternatives and think the 'not yet thought', important questions concern the orientation and frameworks for such claims, e.g. from social realist, critical realist and post-realist assumptions. However, a persistent blind spot in such arguments is while powerful knowledge about the social and natural is generally sought in relation to the world we live in and what it means to be human, an ecocentric, or more accurately, more-than-anthropocentric, perspective is largely missing from debate, including in relation to curriculum-making, evaluation and critique (Reid, 2015). This presentation considers the following: What is powerful knowledge in and for schools in relation to the communities they live, live in, live with, live for? What can we realistically expect of powerful knowledge in the curriculum and environmental education in relation to this? What counts as an expanded, engaged, authentic curriculum? What counts as a 'distortion' to the spaces of curriculum?

ID: 84: Éducation relative à l'environnement et alphabétisation à l'âge adulte. Proposition d'un modèle théorique. - Carine Villemagne, CA

Une récente enquête Opportunités d'intégration de l'éducation relative à l'environnement des adultes en contexte d'alphabétisation populaire menée au Québec (Villemagne et coll., 2014) a permis de mettre en évidence que des adultes faibles lecteurs-scripteurs participant à des ateliers d'amélioration de leurs compétences de base, étaient fort intéressés par l'intégration des questions environnementales vives dans leurs ateliers organisés en contexte communautaire. N'ayant pas toujours une compréhension claire des problématiques environnementales, les adultes de la recherche décrivaient également les contours d'un agir individuel et collectif limité et peu signifiant au regard d'une situation socio-économique et écologique jugée complexe, angoissante et aliénante. Il serait pourtant légitime que ces derniers soient accompagnés dans le développement de leur engagement sociocritique puisque les questions environnementales les interpellent au quotidien à titre de citoyens, de consommateurs et de décideurs. Les adultes se retrouvent en effet au front du changement majeur qui s'impose et qui fait appel à des solutions créatives et collectives pour contrer la dégradation de leurs conditions de vie et d'existence. Dans ce contexte, nous avons déployé une recherche visant à donner corps à une éducation des adultes située au croisement de l'éducation relative à l'environnement et de l'alphabétisation des adultes (CRSH, 2014-2019). Notre communication portera ainsi sur la présentation d'un des objectifs de la recherche soit celui visant l'élaboration d'un modèle théorique éducation relative à l'environnement ET alphabétisation des adultes en contexte communautaire. À partir d'une vaste recension des écrits et de l'élaboration d'une carte conceptuelle des champs et courants contributifs, nous avons élaboré ledit modèle selon la démarche itérative de l'anasynthese (Landry et Auger, 2007). C'est précisément ce modèle qui, organisé selon les quatre dimensions formelle, axiologique, praxéologique et explicative de la théorie éducationnelle de Maccia (1966), sera exposé et discuté lors de notre communication.

ID: 997: Climate change education: International commitments, national strategies, and the role of research - Marcia McKenzie, CA

Article 6 of the UN Framework Convention on Climate Change (UNFCCC, 1992) includes a commitment on the part of member states to [p]romote and facilitate at the national and [other] levels the development and implementation of

educational and public awareness programmes on climate change and its effects (p. 17). In addition to ongoing UNFCCC commitments to CETA (Communication, Education, Training, and Awareness), the recently published Action for Climate Empowerment (ACE) Guidelines (UNFCCC and UNESCO, 2016) are aimed at supporting such national and regional activities and strategies. Phase four of the ACE guidelines focuses on monitoring, evaluation, and reporting activities specifically. Such activities include nations developing monitoring and evaluation plans that help generate data and recommendations suitable for decision-making and assist national governments in reporting to the UNFCCC. In this session, we discuss the horizons, achievements, and challenges of such monitoring and evaluation plans. We also address the broader role of interdisciplinary research in shaping understandings of the possibilities, contexts, and priorities for climate change education. A key feature of the session is examining the extent to which education and public awareness must go beyond knowledge of climate change science, engaging with, for example, the social and psychological dimensions affecting citizen mobilization and political action.

ID: 706: Youth co-design in an informal environmental education program - Theresa Horstman, US

This novel format session is a combination of presentation and workshop, focusing on a youth co-design process with the goals of supporting youth climate change advocacy and authentic practice in environmental education. The session will be divided into three parts. The first part of the session focuses on describing an ongoing partnership between an informal environmental education program and university faculty to design digital badge systems that culminate in college credit for high school youth. Next, presenters describe the process of involving youth in the badge design process, highlighting: a) impacted youth engagement with climate change advocacy and environmental identity development, b) impact of the created badge system, and c) impact of the informal environmental education program and the project research. In the third and final section of the session, researchers and youth from the program will lead participants through a badge design process, helping participants reconceptualize the values and aspects of programs they work with. The overall goals of the presentation are: 1) To describe the process, benefits, and challenges of connecting badges and college credit to informal environmental education programs. Specifically, we will discuss assessment of environmental education knowledge and practices, youth environmental identity development, and program development. 2) To describe youth participatory design as a process that impacts youth, the digital badge system that is created, the informal environmental education program, and the research being conducted. In addition to the researchers, program coordinators and youth will also speak to their experiences and the benefits and challenges they see in participatory design. 3) As part of the presentation, we will engage participants in activities we used during participatory design, helping participants think of how to apply badge design and participatory design with youth as part of their own environmental education programs.

ID: 467: Dark Pedagogy - Stefan Bengtsson, SE

A tripartite reaction pattern, when faced with threats beyond our comprehension, form the base narrative of this project. In the classic horror genre, this reaction pattern includes three stages moving from denial over insanity to death (in various forms). In the project, we use this tripartite reaction pattern as a framing narrative, analytical framework, and structure. This is done in the two main parts of the project. In the first part: The horror of education, we will look at the concepts of 'denial', 'insanity' and 'death' from a theoretical perspective and illuminate how these reaction patterns could be useful in relation to an overall perspective on environmental and sustainability education. In the second part, Towards a Dark Pedagogy, we look into specific challenges and potentials when developing a pedagogy and environmental and sustainability education perspective that embraces the darkness of the issues at play when discussing, teaching, and learning about the environment, sustainability, climate change, global warming and the Anthropocene. Not as gloomy bringers of despair and apathy, but as true potentials for understanding, through contemporary philosophy the issues that we deal with and how to better include these into education that deals with environmental, sustainability and climate change issues. This project ties into an ongoing discussion on post-humanism and new materialism, aiming to generate escape velocity for transgressing persistent modes of social production in and through education.

ID: 251: Teaching about Sustainability: Describing Early Career Teachers' Classroom Practices - Eileen Merritt, US

Education for sustainability is an impactful way to transform society, and many teacher education programs are beginning to include sustainability topics in their curriculum. Universities around the world are developing lessons, modules, and courses that are designed to help pre-service teachers develop a sustainability worldview and have the skills and knowledge

to be successful educators for sustainability. However, few studies have examined the extent to which teachers who have learned about sustainability in their teacher preparation programs are actually integrating sustainability into their instruction when they begin their careers. Using Dillman's (2014) Tailor Design Method, we conducted a web-based survey of alumni from Arizona State University who were previously enrolled in a 3-credit course, Sustainability Science for Teachers. This study examines the extent to which elementary teachers are integrating sustainability topics into their classroom, and their perceived barriers and supports at their schools. We summarize results from 63 alumni respondents, the majority of whom are teachers in public schools in Arizona. Most teachers reported modeling classroom behaviors related to sustainability (e.g., turning off lights and reusing drink containers). Six percent (n=4) reported teaching about sustainability to a great extent, 28% (n=18) to some extent, and 48% (n=31) a little. Also, 53% (n=34) reported that they would not have taught about sustainability at all without having taken the course. Barriers reported by teachers include lack of time in their teaching schedule, lack of alignment with curriculum, and a school-wide focus on other areas (e.g. literacy and mathematics). Several teachers expressed the need for better materials for teaching about sustainability to students with disabilities. We reflect on lessons learned from our alumni about what additional supports educators need, both during their teacher preparation and when they begin teaching, as they strive to integrate sustainability into their curriculum in grades K-8.

ID: 755: State of Art and Contribution of Geosciences for Environmental Education - Denise Bacci, BR

This article presents the State of Art in Environmental Education and Geosciences from thesis database of Coordination of Superior Level Staff Improvement (CAPES), Ministry of Education, Brazil. Theses have been mapped and analyzed considering the interface between Environmental Education and Geosciences in the EArte Project, in the period from 1981 to 2012. The EArte Project is a reference in the bibliographic survey on Environmental Education at the national level, being a reliable and easily accessible panorama for the development of state of the art research. The theses are inserted in an electronic catalog (<http://earte.net>) that has classification sheet according to the descriptors defined by the project. Each card has information about the researcher, institution, counselor, year of defense, abstract and key words, as well as other data, for example, on the educational context (school, non-school, generic approach) and the subject of study. Twenty-five studies were identified in this interface and analyzed considering descriptive terms as Geosciences, Earth Sciences, Earth System Science and Geodiversity and related abstracts. The results point to knowledge under consolidation, with definition of three thematic categories based on analyzes carried out. The first category reveals the emphasis on knowledge about the physical environment to contribute to Environmental Education actions in conservation strategies. However, they do not provide an approach to the geological time but comprise an immediate transformation that contemplates human as an agent of transformation; the second seeks to stimulate the insertion of geoscientific contents in school and non-school environments, through dissemination strategies in line with Environmental Education projects; the third refers to research in formal education spaces based on the assumptions of ESD and the insertion of the socio-environmental perspective in educational strategies. This review provided an outline of the main research approaches, indicating the paths and reflections that unite these two areas of knowledge.

ID: 992: Environmental Education: the Major Work of Ensuring Quality and Outcomes in Connecting Environment and Education - Alan Reid, AU

A Major Works is expected to be an authoritative reference work on the wide variety of traditions and perspectives in a field, drawing on foundational and cutting-edge scholarship. In this presentation, the editors of Routledge's (2017) Major Works of Environmental Education discuss key considerations in preparing this 4 volume collection, including the range, focus and limitations of the material it presents. In brief, the collection was developed to illustrate contemporary and historic material on how EE goals, policies and priorities have been variously conceptualized, contextualized, developed and contested since the late 1960s. The presentation illustrates the wide range of contributions selected on the major work of the field, which illuminate: 1) how environment and education have come to be connected and understood in particular ways, including examples of the major 'fashions and fads' in environmental education, if not some of the key candidates for what became the 'roads not taken' as well as some of the 'cul-de-sacs' for the field down the years; 2) key shifts in major patterns of thought and practice, such as in relation to the immediate and longer term impacts of the IUCN and UNESCO-UNEP International Environmental Education Programme in the 1970s; and the emergence and influence of sustainable development as an idea and goal from the 1980s onwards; 3) challenges to some of the key principles and priorities ascribed to the field, primarily from liberal to radical traditions and perspectives on education and environment, as well as some of the main questions arising from their intersection that can also reveal some of the field's 'fault lines'; and, 4) a range of

questions and inquiries about horizons for environmental education, through a focus on core questions about traditions and priorities in research and scholarship, assessment and evaluation, and curriculum and pedagogy.

ID: 996: Influences on the Development and Mobilization of Sustainability in Education Policy - Marcia McKenzie, CA

This presentation shares results from recent comparative research on the uptake of sustainability in education policy in Canada, focusing in particular on factors identified as influencing the development and mobilization of sustainability in education policy. Data were generated through an online national survey as well as site visits to six province and territories. Additional data sources included the views and experiences of students, educators, administrators, and other staff collected through interviews, focus groups, and a range of other innovative methods. In this presentation, we share highlights from some of the results, including on (i) the role of other policies, networks, actors, local place on policy development and uptake; (ii) the role of practices as drivers of policy in some cases in other words 'bottom up' initiatives which function as local policy or drive policy development at higher levels; and (iii) cases where practice appears to operate outside of policy, even 'avoiding' policy, such as the possibility of added regulatory measures that inhibit practice; and (iv) other examples of barriers and resistances to the uptake of sustainability in education policy. We end with considerations for policy decision-making and future ESE policy research.

ID: 558: Exploring student perspectives of learning for sustainability, and experiences of sustainability cultures on campus - Rachel Drayson, GB

The vision of the National Union of Students, UK, (NUS) is for students to leave their time in education with the skills, knowledge, attributes and desire to tackle social, economic and environmental challenges to ultimately create a more socially responsible and sustainable future. Since 2010, NUS has delivered national research to understand student perspectives and experiences of learning to achieve these outcomes, as well as their perceptions of the sustainability culture on campus. Over the past seven years, over 30,000 students (aged 16 and over) have completed online survey research designed to achieve these aims. In addition, the longitudinal nature of the research has enabled us to track changes in perspectives and experiences as cohorts of students progress through education. The breadth of research also means assessment of experiences according to level of education is possible, along with a consideration of the impact of changes in the policy landscape within the UK. The research has consistently found: overwhelming agreement amongst respondents that sustainable development is something that universities and colleges should actively incorporate and promote (87%, n=6457 university students in 2015/16); two thirds agree that sustainable development is something they would like to learn more about (61%, 4439 university students in 2015/16). An understanding of the relationships between humans and nature continues to reflect both perceptions of a lack of coverage in teaching and receive low assessment of importance when considering their future employers amongst university respondents in comparison with other skills/knowledge/attributes. The session presents the findings of this research in detail, as well as outlining how the research has developed over the seven years of delivery. Direction and possibilities for research in the future are also considered.

ID: 463: The emergence of adolescent leaders for sustainability - Patricia Armstrong, AU

While there are many young people who are active leaders in sustainability, we don't really understand how they emerge and develop. New qualitative research provides evidence that there are five levels of leadership for sustainability among adolescents and four main stages through which they pass on their way to eventual emergence as leaders at one of the five levels. This research, based on a longitudinal study of secondary student leaders, teachers and principals in five secondary schools in Melbourne, Victoria, Australia has also identified a number of factors, drivers and barriers that can have an impact at each of the four stages. Ultimately, the combined effect of all these factors, drivers and barriers would determine whether or not an adolescent identifies as a leader and emerges as a leader at one of the five levels. It is believed that this is a cyclical process with feedback from one level contributing to future pathways. This emergence is fluid in nature, with adolescent moving through different levels of leadership for sustainability at school, not necessarily linearly, to other leadership roles and responsibilities both within the school and in the community. The research also noted that not all students who commenced the study as Year 9 students continued to be leaders for sustainability through to their final years of secondary school. The paper will also discuss the key success factors for those students who continued as leaders for sustainability through secondary school. This study has implications for teachers and educators to help them better

understand how adolescents emerge as leaders for sustainability and the factors, drivers and barriers that may influence them. This will help the teachers and educators to better equip adolescents to take on social and environmental responsibility.

ID: 557: THE ETHNOMATHEMATICS POSTURE IN ENVIRONMENTAL RESEARCH PROCESSES- *Monica Mesquita, PT*

Being in small communities of different cultural-geographic contexts: Portugal and Brazil, with transdisciplinary participatory research (Mesquita, 2014, Neves et al., 2016), made us experience socioeconomic, historical, and emerging local political dynamics that refer local sustainable development. Our theoretical and methodological choices as well as the positioning of the bodies and the affectivities, inserted in our different research processes, became dialogic tools for our researches were experienced in bottom-up processes. Based on our experiences as researchers from different backgrounds, we evoke the Critical Social Theory to support our narrative and, at the same time, proves itself as fundamental to evidence the ethnomathematical posture (Mesquita et al., 2011; Silva, 2015) built in our fields: tics (modes, styles, and techniques) of mathema (explanation, understanding) in distinct ethnos (cultural, socioeconomic, political, and natural environments) (D'Ambrosio, 2002). Thus, the goal of this paper is to converge, collectively, a dialogue about (1)the desires, feelings, possibilities, practices, and thoughts as researchers of our own practices ' For whom do we develop our research?; (2)the encounter among knowledges: academia, company, and community ' How does the encounter process occurs in research process?; and (3)the reproduction of the academic system ' Where symbolic violence occurs that hinders local sustainable development?. Our researches are transdisciplinary exercises of local communities empowerment in contexts where the local symptoms have been globally recognized as problems (thinking in Lacanian terms ' Lacan, 1975), i.e. local disordered fishing (Mesquita, 2014); and access to the water both in semi-arid and arid regions (Neves et al., 2016) as in regions spatially and temporally controlled by local governments. We assume the ethnomathematical posture as an counter-idea to the traditional research in the enviromental context, recognizing in its integral context an alternative to humanize the environmental research process and to recontextualize the relationship between different knowledges and researches, and its roles in sustainable communitarian development.

ID: 663: Citizen sciences as reflexive, contextual social movements - *Priya Vallabh, ZA*

This paper is focused on how knowledge is mobilized within the citizen sciences in response to common good social-ecological challenges. The citizen sciences often involve loosely arranged coalitions of volunteers and smaller numbers of scientists working together on an issue of common concern (or a common good concern). Lotz-Sisitka (in press) describes the common good as involving commoning activities towards the management of the commons, and includes a strong interest in social-ecological justice. However, while there are numerous papers reporting on the data-related findings of citizen science projects globally, there has been significantly less research done investigating how citizen science projects differ from each other, nor how knowledge and learning are mobilised within them towards the common good. It is common to refer to citizen science (singular), rather than the citizen sciences (plural) indicated a perspective that the citizen sciences are composed of a homogenous grouping of interests and practices. In response, I have undertaken a social mapping of 66 citizen science projects in South Africa. Through the mapping, I track differentiated project purposes, relationships between project participants, and how knowledge is mobilised towards differing common goods within projects. Research findings are mapped on a heuristic of the range of citizen sciences highlighting the heterogeneous nature of the citizen sciences (knowledge and social practices). The research findings provide insight into how the citizen sciences have begun to collectively mobilise and leverage knowledge towards activities contributing to the common good, and provide insight into how the citizen sciences have become a commoning activity.

ID: 802: Research in Environmental Education from the Quality Perspective of Publications in Iberoamerica - *Héctor Beltrán Gutiérrez, CO*

As a contribution to the state of the art of environmental education research in Iberoamerica, results are presented on the location of publications in quartiles (Q), according to their impact factor and ranking ranking in the Web of Science and Scopus databases. The type of research was exploratory and descriptive. The descriptors "Environmental Education" and "Environmental Education" were considered in the title of articles from 2011 to 2015. In Web of Science, 75% of the journals (6) were located in Q4 and 12.5% in Q2 and Q3. By country of origin, it was recorded that, in Brazil, one magazine was located in Q2, one in Q4 and six did not present quartile. In Spain one magazine was located in Q3, three in Q4 and

three did not register quartile. In Colombia, a magazine was located in Q4 and one did not register quartile. For Cuba and Costa Rica no magazine registered quartile, and in Venezuela one in Q4. In Scopus, 75% of the journals (6) were in Q4, 12.5% in Q2 and 12.5% in Q3. By country of origin, it was recorded that, in Brazil, three journals were located in Q2, ten in Q3, five in Q4 and one without quartile. In Spain two journals were in Q3 and four in Q4. Colombia and Chile presented a magazine in Q3 each. Mexico one in Q4, Portugal one in Q3 and Venezuela one in Q2, one in Q3 and one in Q4. In general, the location of the journals in which the work of Ibero-American countries is published is not in the top quartile (Q1), and many of them do not even own it, suggesting the need for an improvement in the conditions of publication.

ID: 661: Environmental Education as a Catalyst for Curricular Integration - *Constantinos Yanniris, GR*

The Tbilisi declaration, adopted in the context of the world's first intergovernmental conference on environmental education in 1977, describes environmental education as inter-disciplinary and holistic in nature and application as well as, an approach to education rather than a subject (UNESCO, 1978). Forty years after the Tbilisi declaration, the integration of environmental education into educational curricula continues to meet significant resistance. Even in countries (and states) where a favorable political climate has led to the implementation of policies in support of educational initiatives linked to environmental concerns, the integration of environmental education into the schooling system did not proceed with the pace that many of us would have hoped for (Saylan & Blumstein, 2011). This paper presents the argument that the main cause of systemic reaction to the introduction of environmental education is not political, but institutional. Environmental education, as a holistic approach, represents a potential threat to the contemporary subject-based organization of knowledge that was first introduced at the time of the Cartesian scholars. On the school-unit level, the interdisciplinary approaches of environmental education are perceived as incompatible with the existing curricular practice of assigning presumably independent subject-matters to individual timeslots. Since interdisciplinarity is one of the founding principles of environmental education, further conflict with the current educational ethos is to be expected. A clear understanding of the institutional dynamics that are at the root of the prolonged resistance to the implementation of environmental education will facilitate future planning by offering a realistic outlook to a difficult challenge. This will serve the declared goal of environmental education which is no less than the creation a socio-environmentally literate citizenry that will observe the transformation of governance, economy and technology in the direction of sustainability and social peace. It is not an easy endeavor, but the alternative could well be a full-fledged dystopia.

ID: 1041: Challenges for Environmental Education to promote interdisciplinary research and scientific production at times of subordination - *Dulce Pereira, BR*

The challenges faced in Brazil after the most impactful environmental disaster with the mining dam collapse in Mariana, Brazil, (impacting territories along the 663,2 km by the volume of tailings released) created a demand to review the concepts of ethics and responsibility applied in daily technological processes. The fact that neither the mining company Samarco (co-owned by the Brazilian Vale and the Australian BHP Billiton), nor the government agencies have been able to prevent, neither mitigate the impacts of the catastrophe so far, has created a demand for Environmental Education in articulating paths for changes concerning the future of science and technology. Furthermore, national and international laws have not yet been sufficient to subsidy definite negotiations to define, in a just and transparent process, who the impacted people are despite the efforts of institutions to mediate the negotiations. Law relaxation and flexibility to approach ecosystems production as services on the grounds of economic development lead to full submission of institutions and professionals to the projects of expansion and more economic gains. This project proposes to address the issues of 1. Environmental Education and responsible professional practices; 2. The aspects of prevention and precaution based on scientific references; 3. The place for popular knowledge and wisdom on shaping the references for sustainability and, finally, 4. Science and technology for well being, how to make the transition? We have the intention of creating an environment of debate surrounded by the art of the women of the communities affected by dams in Brazil, who have reproduced their history in an artistic scenario. The panel shall include participants from other countries.

ID: 305: Holistic and Transformative Learning towards a Sustainable Life: how can be the Spanish Public Universities inspired for the case of the Schumacher College - *Leslie Mahe Collazo Expósito, ES*

This case study aimed to determine what aspects of the conceptual frameworks, teaching methodologies and learning resources that Schumacher College has been successfully applying over the past 25 years could be applied under current

conditions in Spanish universities. This international center for personal transformation and collective action works to move towards a more resilient, equal and sustainable world. Being members of the Curriculum Sustainability Group of the Conference of Rectors of the Spanish Universities (CRUE), we are working to bring about the training of teachers from the perspective of Learning for Transformation. We are inspired by the fact that the volume of content that is generated on these issues increases continuously, as much as the danger of suffering an ecological, social and economic catastrophe. That's why we should consider an education that takes us to the depth of things. Through personal interviews with lecturers and professors of Spanish Universities and teachers of Schumacher College, the analysis of the documents produced by the center and the field notes of the main author of this work, obtained as a pupil of a course at Schumacher College, we present a teacher training model. This model proposes how to adapt the current Spanish university curriculum to move along towards sustainability changing the egocentric perspective to an ecocentric one, assuming a transforming methodology.

ID: 197: Systems Thinking and Transformative Environmental/Global Education: The Justification of Boundary Judgements - J. Melanie Young, CA

The development of systems thinking is a goal of both environmental and global education. For those whose aim it is to foster change in schools and change in the world, such thinking counters limits of a compartmentalized curriculum, and offers guidance in resisting reductionism. It is necessary for understanding of systems complexity and develops connection to the world and a sense of agency. Systems thinking requires more than its inclusion within a single subject area or a curricular add on; it requires an approach to curriculum and pedagogy across disciplines and situated within all aspects of classroom culture. Objectives: To discover, within systems theory, concepts that would underlie an education which empowers students to transform their world. To identify curricular and pedagogical practices that operationalize such concepts. This is a theoretical development which draws upon the practices of four teachers. Using both qualitative methods (observation, interview, group meetings) and literature review, the researcher engaged in a process of creating meaning through justificatory dynamics (Georgiou, 2007; Stake, 2005). Results: This research explored the potential of systems theory (von Bertalanffy, 1968; Boulding, 1956) to act as an underlying paradigm for a transformative/critical global and environmental education (Doll, 1987; Pike & Selby, 1988; Orr, 1994; Selby, 1999). The critical systems theory concept of boundary judgements (Ackoff, 1974; Checkland, 1981; Ulrich, 1991) was found to be relevant to the study of phenomena as interconnected, the recognition of holistic and multiple perspectives, and a critical awareness of power dynamics involved in such judgements. Teachers operationalized this concept through such practices as questioning, shifting systems boundaries, and making judgements transparent. Conclusion: The purpose of transformative global and environmental education is greater social and environmental justice. Classroom practices which include the justification of boundary judgements encourage a transformative education.

ID: 628: Mise en œuvre et analyse critique de projets transdisciplinaires en éducation relative à l'environnement et alphabétisation à l'âge adulte. - Carine Villemagne, CA

Notre communication présente des éléments d'une recherche intitulée « Éducation relative à l'environnement (ERE) et alphabétisation des adultes: Croisement des fondements et des pratiques » (Villemagne, CRSH 2014-2018), qui vise à donner corps à une éducation ayant pour double finalité l'alphabétisation et l'éducation relative à l'environnement des adultes, et ce, en vue du développement de la capacité d'agir des adultes relativement aux questions socio-environnementales vives. Après avoir complété la première phase de ce projet de recherche, consistant en l'élaboration d'un modèle théorique intégrant les deux champs d'études évoqués dans cette recherche, nous avons amorcé la deuxième phase dudit projet, en collaboration avec des groupes d'éducation populaire du Québec œuvrant à l'alphabétisation des adultes de leur communauté. Cette deuxième phase consiste en : 1/la réalisation d'études de cas de pratiques croisant ERE et alphabétisation d'ores et déjà développées par des groupes d'éducation populaire ; et 2/en l'élaboration de nouvelles pratiques éducatives transdisciplinaires sur des questions environnementales vives (ERE et alphabétisation) qui sont coconstruites avec des groupes d'éducation populaire du Québec. Notre présentation sera donc divisée en deux parties: A) nous exposerons les premiers résultats de la deuxième phase du projet de recherche soit ceux reliés à une étude de cas portant sur l'alphabétisation et l'éducation aux changements climatiques d'un groupe d'adultes ainsi que ceux reliés au développement d'une nouvelle pratique intégrant l'ERE et l'alphabétisation des adultes qui a pour thème l'écoalimentation; B) À la lumière de ces résultats, nous mettrons en évidence les éléments communs et les différences émergeant d'une analyse transversale. Nous confronterons également ces résultats aux éléments de notre modèle théorique intégrant l'ERE et l'alphabétisation des adultes en vue d'enrichir ou d'ajuster ce dernier aux réalités de terrain

ID: 639: Repères contemporains pour une éducation relative à l'écocitoyenneté - Lucie Sauve, CA

Au cours des 40 dernières années, le champ de l'éducation relative à l'environnement s'est largement déployé, s'intéressant aux différents angles du rapport à l'environnement. Ces initiatives multiformes ont contribué entre autres à atténuer les effets de la culture dominante en travaillant à la résolution de problèmes environnementaux, à la gestion des ressources ou plus récemment, à la transition écologique. Mais aussi, au-delà des approches de prévention et de résilience, l'éducation relative à l'environnement a participé à la montée d'une vague de fond, à l'émergence d'une culture sociétale alternative.

Dans le but de saisir différents aspects de cette culture écocitoyenne, ce symposium présente les résultats d'un processus de recherche collaborative menée par plusieurs membres du Centre de recherche en éducation et formation relatives à l'environnement et à l'écocitoyenneté de l'UQAM, et visant à mettre au jour des repères contemporains pour l'action éducative. Nous explorerons différentes dimensions du rapport à l'environnement, en particulier les dimensions ontogénique, critique et politique. Transversalement, nous nous intéresserons aux rapports entre identités et engagements, car ceux-ci contribuent à forger l'écocitoyenneté. Avec ce fil conducteur de l'écocitoyenneté, nous aborderons les questions suivantes : Comment écologiser les rapports entre identité et engagement ? Quels défis pose à cet effet le contexte de diversité et de pluralité au sein de nos sociétés ? Comment aborder les questions relatives à la justice environnementale ? Quel rôle peut jouer l'expérience de la controverse et du débat dans l'émergence d'une écocitoyenneté ? Comment l'ancrage territorial et communautaire peut-il y contribuer également ? Quel lien établir entre l'éducation à la consommation et l'écocitoyenneté ? Quel rapport aux savoirs est de nature à stimuler l'engagement auprès des jeunes ? Qu'en est-il de l'éducation relative à l'environnement auprès des adultes aujourd'hui ? Comment favoriser l'arrimage entre les milieux d'éducation formels et non formels au sein d'une société éducative préoccupée d'écocitoyenneté ?

ID: 559: The Sustainability of Human Intelligibility. Researching to "unhierarchize" the environmental educational processes - Monica Mesquita, PT

Extractivism began to be structured in the Age of Discovery (Acosta, 2016) and is defined here as any activity that removes large amounts of natural resources beyond minerals or oil, i.e. through agriculture, fishing, and considering the human body itself (physical and intellectual labor force in slavery) as part of the natural resource. The perpetuity of extraction has manifested itself as a fundamental human rule for the maintenance of the prevailing hegemonic social life form. The mode of production/distribution/consumption of this form is associated with the imagery of continuous accumulation. Alternatives to the current development, not the development of the current alternatives, begin with the movement to rethink the own dominant notion breaking the old hierarchy between development and underdevelopment (Lang, 2016). This paper invites us to rethink about the space of the human intelligibility-HI, as sustainable -reinhabitation on the basis of other ways of knowledge that coexist in the world. The concept of sustainability is assumed as an alternative to the development of HI, replacing it as a process and not as a principle, as it is now defined (Agenda21). According to the Brundtland Report (1987), the sustainable use of natural resources must meet the needs of the current generation without further undermining the needs of future generations; remembering that in an etymological exercise, this term appears connected to the actions to defend, to support, to preserve, and to take care of. The sustainability of the development of HI passes through the knowledge acquired throughout life and its intersections with the senses and affections diversified in the most different forms of social life (Mesquita, 2016). By adopting an anti-extractive stance, the research into environmental educational processes starts acting as a tool for emancipatory liberation, a philosophical act of our own practice, a collective movement -a common ground for being and acting WITH the other. Let us be intolerant of ourselves as thinkers and pass on to another stage (Balibar, 2002).

ID: 988: A Comparative Case Study Approach to Researching Environmental and Sustainability Education - Marcia McKenzie, CA

Comparative case study research can help inform understandings of the diverse interrelationships between policy and practice in environmental and sustainability education (ESE). In this presentation we will draw on several theoretical and methodological trajectories, including comparative case study research and multi-sited ethnography (e.g., Bartlett & Vavrus, 2014, 2017; Marcus, 1995), literatures on policy mobilities (e.g., McCann & Ward, 2012; Peck & Theodore, 2012); policy enactment studies (Ball, Braun, & Maguire, 2012; Heimans, 2014), network ethnography (e.g., Ball & Junemann, 2012), and approaches to place and materiality in research (e.g., Tuck & McKenzie, 2015; Fenwick & Edwards, 2011). Building on these approaches and using the examples of our own recent comparative case study research, we will suggest how examination of horizontal (across sites), vertical (between scales such as regional, provincial, and national), and transversal (over time) considerations in case study research can enhance understandings of the relationships between ESE policy and

practice. Such comparative case study research can inform the development and enactment of ESE policy and practice within particular sites, as well as broader national and international considerations, including future research and policy decision-making.

ID: 372: Efforts to establish 'Evaluation of Environmental Education Programs' as an academic discipline in Japan - Ryo Sakurai, JP

Environmental education including nature conservation education and pollution education has been implemented in Japan since 1950s. The Japanese Society of Environmental Education (JSOEE) was established in 1990 and papers regarding research and practices of environmental education have been compiled in the academic journal 'Environmental Education' published by JSOEE. Although environmental education is currently well recognized in the country and this field is taught in a decent number of universities and graduate schools, when it comes to evaluation, there are few shared guidelines for systematically assessing the success of the program. Various practitioners and researchers have evaluated the programs by their own evaluation criteria. However, it is important to systematically organize theories and methods regarding evaluation of environmental education so that practitioners and researchers could objectively show effectiveness of the program using the same criteria. Authors launched a new project 'Establishing an academic discipline of evaluation of environmental education' in 2017, funded by the Japanese Society for Environmental Education (JSFEE). The goals of the project are 1) to review studies regarding evaluation of environmental education all over the world, 2) to develop guidelines and methods for evaluating environmental education that could be used in various settings, and 3) to design an undergraduate level academic course regarding evaluation of environmental education in Japan. While we refer to methods and tools developed and well used in North America, we also understand that there are differences in history, society, and culture in terms of how environmental education has been implemented between Japan and other countries. Therefore, we aim to develop the Japanese-style guidelines for evaluating environmental education programs. In this round table session, we would like to explain about our project and case studies of evaluation in Japan, and would like to learn from participants including their experiences of evaluating environmental education programs.

ID: 245: Multi-Stakeholder collaboration for sustainability education: The evaluation and assessment of Regional Centers of Expertise on Education for Sustainable Development. - Junior Ramsoram, CA

Collaborative environmental and sustainability-focused networks (more commonly referred to as Multi-stakeholder Partnerships, Multi-sector or Cross-sector Partnerships) have existed for some time in Canada. Of these networks, Regional Centers of Expertise (RCE) on Education for Sustainable Development (ESD) have sought to promote and re-orient education concerning sustainability (i.e. formal, informal, non-formal sustainability education). Endorsed by the United Nations University, the creation of RCEs coincided with the United Nations Decade for Education for Sustainable Development (UNDESD). RCE networks are made up of individuals and organizations spanning government, educational institutions, private and public sectors and everyday citizens working collaboratively to develop solutions and implement initiatives that address local and regional problems in an effort to enhance global sustainable development goals. While RCEs may be working, little to no academic research or assessment and evaluation exists to validate such a claim. The effectiveness, impact and efficiency of these types of collaborations are not easily understood. Moreover, it is unclear whether the internal working relationship between collaborators/stakeholders has any bearing on success of sustainability initiatives. Drawing on stakeholder interviews with members of several Canadian RCEs, this paper will explore best practices for RCE evaluation and assessment, beginning with a critical examination of the 2014 Hybrid Framework for Evaluation which has sparked great interest. This will be followed by a brief exploration of current research trends on best evaluation practices of RCE networks. This presentation will conclude with insights taken from stakeholder interviews currently underway. It is anticipated that there will be inconsistencies with regards to RCE's evaluation and assessment models/approach. However, results from stakeholder analysis may aid in the development of concrete evaluative framework to discuss collaboration and the collaborative process in Canadian RCEs. This will be significant for understanding RCE's existing evaluation and assessment approaches, governance processes and for sustaining ESD in Canada.

ID: 206: Sustainable Education: An essential contribution in the quadrupool helix interaction towards a sustainable paradigm shift. - Dirk Franco, BE

The interest for environmental aspects is global and general, with a special attention towards global warming and greenhouse gases emissions. Higher education institutions (HEI), are more and more be seen as a key player in the

promotion of Sustainable Development (SD). HEI are often performing efforts at the same level e.g. in terms of campus greening, curriculum renewal and research orientations. In addition, internal and external stakeholders might be involved and special attention should be paid to avoid that this complicated process can reduce the overall rate of success. In this contribution a) different curriculum renewal examples will be discussed for the two HEI in Flanders (Belgium). The University college PXL is a centre of expertise for innovation, creativity and entrepreneurship. Hasselt University is a young, dynamic centre of expertise for teaching, research and service provision. It regards it as its social responsibility to contribute actively to a sustainable and innovative region. It aspires to be a hub in this innovation web. It is ranked in the world top 15 of the smaller Universities. The University College has developed a dedicated postgraduate: Energy Efficiency Services. As the university college PXL organizes her activities always starting from the quadrupole helix model (interaction between government, knowledge institutes, industry and society) this curriculum was developed with a strong interaction of several dedicated stakeholders: BELESCO (association Belgium), Infrac (a public ESCo), Encon (a private ESCo), Dubolim (sustainable building) and the (local) government of Limburg. The University Hasselt organises for years the Postgraduate of Environment Co-ordination Level A (a course which is obliged for industrial companies in Flanders) and recently the new course Cleantech management was developed. For the first course only internal stakeholders together with a monitoring of government developed the curriculum; for the cleantech management course both in- and external stakeholders participate. In the UHasselt the FRIS F(unctional) R(egional) I(nnovation) S(ystem) framework is used for bringing together triple helix actors in a regional and sector-specific setting with the aim of accelerating regional innovation. b) the impacts and results of the courses will be discussed in view of Good practices of principle of quadrupole helix knowledge centre and the FRIS concept in collaboration with industry, government and society. The need for new (energy, material) technologies and energy flexibility, accompanied with new business models (a paradigm shift) Dissemination of knowledge concerning (techniques and developing new business models) towards the (Eu)region but also abroad Research has been started to eliminate ESCO-barriers for SME and public authorities Legal and financial barriers were discussed and will be introduced in policy discussions for local and Flemish government Involvement and behavior of future generations 'decision-makers'. New events (congress, symposia, GRI rapport, '.) Living lab (in collaboration with all users) and stimulating start-ups in the (EU) region.

ID: 217: Entre Natures et Cultures, Individus et Sociétés, construire collectivement la Citoyenneté Planétaire - Sylvie Kergreis, FR

Les avancées scientifiques basées sur la complexité et l'incertitude ont décrit le lien indéfectible existant entre les êtres humains, les êtres non humains et la planète. Elles ont également décrit l'importance des constructions sociales et culturelles, dans les relations à l'environnement comme dans les relations des êtres humains entre eux. Mais cette double perspective contradictoire, naturaliste et culturaliste, n'offre aucune aide pour promouvoir la protection des milieux, l'adaptation au changement climatique ou le maintien de la paix mondiale. Il semble urgent de construire collectivement un cadre de repères partagés, alliant natures et cultures, individus et sociétés, pour construire une véritable citoyenneté planétaire, dans une optique à la fois interculturelle, écologique et solidaire.

L'alliance pour l'éducation à la citoyenneté planétaire, en lançant une recherche-action participative à l'échelle internationale, tente de faire émerger de nouveaux principes directeurs pour les actions éducatives, en s'inscrivant dans des démarches concrètes et multi partenariales, au sein de territoires variés. Parallèlement à cette démarche ascendante, le travail théorique proposé ici convoque plusieurs modèles anthropologiques, alliant nature et culture, pour saisir les faits humains et sociaux dans leurs rapports à leurs environnements écologiques et sociétaux. Les lignes d'analyse dégagées se veulent suffisamment larges et consensuelles pour créer les conditions d'une véritable rencontre interculturelle, dans le processus de recherche entrepris, en respectant les références de chacun. Ainsi, en confrontant les théories et les pratiques, il semble possible de faire évoluer ensemble la recherche, l'éducation et l'action, pour redéfinir notre avenir collectif, à l'échelle de l'humanité et de la planète, en respectant chaque être humain, chaque peuple et chaque culture, et l'ensemble des formes de vie présentes sur la terre.

ID: 990: Towards an ABC of what matters in research about climate change education - Alan Reid, AU

In 2010, the sociologist of everyday practices, Elizabeth Shove, noted a yawning gulf between the potential contribution of the social sciences and the typically restricted models and concepts of social change embedded in contemporary environmental policy in the UK, and in other countries too. She argued that, as well as making a strong case for going beyond what I refer to as the dominant paradigm of 'ABC': attitude, behaviour, and choice. I discuss the attractions of this model, the blind spots it creates, and the forms of governance it sustains. In this presentation, the concerns about the ABC

model are relocated to education, to ask critical questions of the research literature on climate change education, and how it can be approached. An alternative, healthier ABC is proposed, that shows how a model for critically reading the literature in terms of what is: A Researched, B Shown, C Argued, might raise key questions of what matters in climate change education. The presentation starts by illustrating the following: Where might it be found? How can it be recognised? What might be learned from it? What might happen next? It continues illustrating key examples that identify the following key 'matters' for climate change education: Framing of the issues, Public engagement, Accessible storylines, Psychological mechanisms, Professional development, Partisan identity, Common ground, Race and ethnicity, Visualising granularity, Predisposition or testimony. The presentation concludes by examining why there are no 'silver bullets' for climate change education from a research perspective, why professional judgement is key, and why research must continue.

ID: 690: Wild Pedagogies: Reflections on Writing a Manifesto at/with Sea - Michael Sitka-Sage, CA

Wild Pedagogies is a scholastic experiment and alternative to the conventional research conference that brings together scholars to co-create knowledge with/in wild places. Wild Pedagogies began as a graduate course at Lakehead University in 2012 and has steadily evolved through small conferences (e.g. the Floating Colloquium on the Yukon River in 2014) and ad hoc gatherings (e.g. the on-trail Tetrahedron Dialogues in 2016) into a movement to challenge and rethink the domestication of wild(er)ness, education and human-world relations in the Anthropocene. In 2017, the Wild Pedagogies gathering assembled a briny pod of international scholars on a sailboat off the west coast of Scotland for a Sailing Colloquium, followed by a writing retreat to compose a manuscript inspired by dialogue between human and other-than-human interlocutors. These scholastic experiments are, in short, aimed at re-wilding pedagogy such that environmental education comes to mean learning from/with the 'voice(s)' of place(s). This session will include the organizers of the Wild Pedagogies gatherings, as well as two of the editors/contributors of the forthcoming book: *Wild Pedagogies: A Manifesto*. We will briefly discuss the theoretical roots and research methodologies of this approach, but will primarily focus on the key features and findings of the conference and collaborative writing project. We will discuss the move to reclaim the language and meaning of wild(er)ness in a 'post-nature' world and its implications for pedagogy. The session will conclude with some reflection and discussion on how Wild Pedagogies has developed over the past 40+ years in environmental education and what it might offer the field moving forward. This will include an overview of six touchstones for educators interested in re-wilding their practice to think through. These touchstones will focus discussion on the following issues: the agency and pedagogical role of 'nature,' wildness and freedom, domestication and control, complexity, time and the significance of 'nature-based' practices, and cultural transformation. With respect to conference strands, this session will obviously appeal to those interested in 'inspiring connections to the outdoors,' but Wild Pedagogies is also very much interested in issues of conservation, educating for sustainable communities, and linking research and practice to deepen the impact of environmental education.

Place-based Education and Outdoor Learning

ID: 435: Where STEM binds, and ST(eee)EM flows: A case for where in STEM discourse and practice - Hartley Banack, CA

STEM may encounter issues of educational relevance as the concept of STEM proliferates, generalizes, and becomes disconnected with interdisciplinary notions of curriculum and pedagogy. This work suggests that by reconceiving STEM as STeeeEM, through the insertion of three additional e's (environment, ecology, and ethics), that a complex, non-linear sense of STEM re-emerges, capable of infusing educational meaning and significance back into a rigidifying STEM concept. Environment, ecology, and ethics are positioned within STEM and explored in relation to where STEM education happens. The concept of the where of education is developed as a unique ontological category, connected to curriculum and pedagogy, and as an epistemology imperative for STEM. Particularly, when outdoors where is an elaborated and outdoor learning and STEM educational aim are aligned.

ID: 487: Using Digital Tools to Engage Teachers & Students in Climate Change Education - Stephen Sheppard, CA

The Collaborative for Advanced Landscape Planning (CALP) at the University of British Columbia has developed a place-based educational videogame 'Future Delta 2.0 (FD2)'. This innovative learning tool encourages inquiry learning by allowing students to explore local climate change challenges and solutions. The publicly available beta-game (visit www.futuredelta2.ca) was co-designed and evaluated with students and teachers from Delta, a Metro-Vancouver municipality interested in planning for climate change impacts. Players explore current conditions and simulated future scenarios in the students' own neighbourhoods motivating interest, learning and fun, while promoting discussion on youth civic engagement and personal and community behavior change. Students learn how their choices, and the choices of their communities, are connected to climate change. CALP is currently developing an instructional resource package for teachers and educators for use and adaptation by schools beyond Delta. We are interested in how games and other digital tools can help promote learning through interactive exploration. The team is also exploring how big, interdisciplinary issues like climate change fit within the new B.C. curriculum. Our research on climate-change related resources available to teachers showed that there are '1) few educational place-based games; 2) limited instructional resources for teachers on climate change, and even fewer for using games; & 3) little guidance on how to embed or mainstream climate change games into curricula and schools/districts. The novel format presentation and discussion (60 mins) will appeal to teachers who are interested in innovative ways to teach climate change or are curious how they might better address socio-environmental issues in the classroom. During the presentation, teachers will explore new digital tools and participate in a facilitated discussion about the successes and challenges they face when using digital tools for teaching. They can expect to walk away with resources related to climate change science as well as strategies and materials that can be used in the classroom.

ID: 767: Using on-line virtual reality and community based learning as a vehicle for sustainability and climate education - Frank Granshaw, US

This presentation outlines two distinct yet structurally similar projects that aim to provide students and the general public with opportunities to see and explore the following: 1) Examples of sustainable development and habitat restoration in a region (the Portland Metropolitan area) 2) How glacial research in the national parks contributes to our knowledge of climate change. These projects are designed to provide these opportunities in a way that addresses the issue of accessibility to field sites that are physically challenging, remote, or logistically difficult to get to. Furthermore, each project is being designed to encourage students and the public to get out into the field to directly experience the type of community and/or natural resources presented by it. To accomplish these goals, the author has worked with National Park staff and community groups to develop a series of desktop virtual reality environments that showcase glacier-climate research sites, developments designed with environmental sustainability in mind, and urban watersheds being rehabilitated by volunteer groups and public agencies. These environments provide the user with a chance to take a virtual walk through a site of interest, access data collected at the site, and even listen to researchers and site stewards talk about key activities taking place there. Though they are often used as proxies for actual visits via independent on-line exploration, media for public talks, or the framework for student lab exercises, these virtual environments have also been used to encourage and guide actual site visits. An important facet of the creation of these environments is the increasing involvement of student (G8-12 and college) teams, community resource stewards, and park staff in their construction. This involvement is not only critical



to the development of these virtual environments, but also provides students with an opportunity to work with community stakeholders and government personnel in the development of a public resource and gives them the opportunity to engage in project-based field learning. The two projects outlined in this presentation: Digital Walkabouts for sustainability <http://vfepprojects.research.pdx.edu/DWS> - A library of virtual field environments presenting environmental sustainability projects in the Portland Metropolitan. This project is being developed under the umbrella of a UN University affiliate (Greater Portland Sustainability Education Network). Glaciers of the National Park of Washington State <http://vfepprojects.research.pdx.edu/GNPWA> - A library of virtual field environments presenting glacier-climate research on key glaciers in the three national parks of Washington State USA. This project is being developed with the cooperation of the US National Park Service.

ID: 805: Environmental Education as a Management Tool to Minimize Human-Macaque Conflicts in Shoushan National Nature Park, Taiwan - Yun-Hsuan Chiu, TW

Shoushan National Nature Park, also known as Macaque hill, is located in southwestern Kaohsiung City, Taiwan. There are nearly 1,500 Formosan macaques living in the park, many of which interact with approximately 4,200,000 annual tourists. As the number of park visitors increases, so does improper feeding behavior. Most conflict scenarios involve macaques stealing food from visitors' backpacks or directly from hand-feeding behavior. However, macaques are becoming more aggressive with tourists, resulting in many physical conflicts. Some visitors are injured each year from animal altercations. Park authorities suggested using environmental education as a management strategy to defuse the situation. Possible actions included; verbal dissuasion, law enforcement, and environmental education practices. Numerous stakeholders, consisting of students, families, and hikers were identified as target audiences for EE programming. During the past four years, a variety of activities were created with these visitor segments in mind. For example, a long-term EE program was created in partnership with an elementary school near the park. A roving EE program was designed specifically for hikers. Regardless of the audience, key concepts, including macaques' facial language and behavior, as well as proper food storage options were included in the programs, but using different teaching strategies. Details of program design and teaching methods are discussed in this presentation.

ID: 863: Environmental Perception of students from Ubatuba (Brazil) about marine and coastal ecosystems measuring by a research instrument based on Wiseman and Bogner's Model of Ecological Values - Naomi Towata, BR

Understanding the Environmental Perception of a local population is a key step to elaborate Place-based Education Programs. Some of the most emblematic approaches in Environmental Perception research aim to understand how individuals are distributed on a continuum of biocentric-anthropocentric views. The Wiseman and Bogner's Model of Ecological Values can be considered an evolution of this approach, which has a two-dimensional nature. The model postulates that Preservation and Utilization are two important but not necessarily related components of Environmental Perception. Preservation is a biocentric dimension and Utilization is an anthropocentric dimension. The model allows for individuals to be placed in one of four Cartesian quadrants. We used a research instrument based on an adaptation of "The Environment Questionnaire"- TEQ (Johnson and Manoli, 2008) specifically to evaluate the perception about marine and coastal environments. Our instrument consisted of a questionnaire with 16 items with 5 Likert-type responses. The items were grouped into 2 secondary factors: Preservation (composed by 3 primary factors - intent of support, care with resources, enjoyment of nature) and Utilization (composed by 2 primary factors - altering nature, human dominance). The questionnaire was applied to 314 students from 3 basic education schools from the coastal city, Ubatuba (Brazil). Most students were located at the Preservation+Utilization- category (81%), followed by Preservation+Utilization+ (16%). Only few students were located at Preservation-Utilization- (2%) and Preservation-Utilization+ (1%). We believe that the results were positive, in particular in relation to the Preservation component. However, they also highlighted that local outdoor activities that focus on marine and coastal environments, besides sensitising about preservation, should also pay special attention to promote reflective discussions about the utilization of those ecosystems, trying to minimize consumerist and utilitarian views.

ID: 213: The Sense of Place of Internationally-Mobile Adolescents - Sarah Urquhart, JP

The study to be presented explored how international relocations impact the environmental identities of mobile adolescents, popularly known as "Third Culture Kids." In a mixed methods approach, the Nisbet, Zelenski, and Murphy (2008) Nature

Relatedness Scale and aspects of the Raymond, Brown, and Weber (2010) Place Attachment Scale were used to survey students currently attending international schools in Hong Kong. Follow-up interviews provided insight into the adolescents' experiences, feelings, and processes of identity formation and sense of place upon relocation. Findings indicated that international mobility does not negatively impact an adolescent's relationship with nature and may enhance adolescent understanding of the interconnection of global systems. Adolescents were found to incorporate several locations into their sense of place and environmental identities through an ongoing process of negotiation. This calls for the expansion of the concept of sense of place to be inclusive of multiple locations that form an individual's environmental identity. The implication is that place-based education can play a significant role in developing the sense of place in adolescents who experience frequent relocation.

ID: 108: Finding your place in Place-based education: Strategies from the Place Learning and Civic Engagement Program - Kate Welsh, US

In Place Learning and Civic Engagement (PLACE), Teton Science Schools (TSS) and the University of Wyoming facilitated professional development for teachers from rural Wyoming on interdisciplinary place-based education, science content and inquiry. Using place-based education methods, the three-year PLACE program focused on the yearly content themes of watersheds and hydrology, energy, and weather and climate. These topics are relevant and controversial in rural Wyoming communities and required PLACE to focus on community partnerships by learning, using, and sharing in an inclusive environment that supports equity in rural schools. PLACE is a program built on collaboration and community partnership - modelled at all levels by PLACE staff, PLACE teachers, and PLACE communities. The partnership includes K-6 grade schools in four high needs, rural Wyoming school districts, Teton Science Schools, and University of Wyoming. The collaboration is based on long term relationships between the TSS and the K-6 schools and blends learning in the classroom, in the schoolyard, and in the local community. In this hands-on session, presenters will facilitate a mapping and a journaling activity to explore participants personal connection to place and will share key learnings and place-based principles from the PLACE program. Participants will: experience two sense of place activities, discuss how connection to place blended with science content can promote student learning and civic engagement, and learn more about place-based principles that promote successful collaboration and inclusivity in rural communities. Participants will leave the session with strategies for leading engaging place-based professional development for teachers and learners in rural communities.

ID: 134: Curriculum innovation for sustainability in higher education: the University of Bristol's Green Apple Scheme - Aisling Tierney, GB

For many higher education institutions, the development of sustainability action and thinking within the formal curriculum responds to both demand from students and institutional priorities. The question of how to implement curriculum innovation for sustainable development is addressed by reviewing the framework advanced within the University of Bristol's Green Apple Scheme. Since 2014, ten projects have received small grants through the scheme to develop projects that are discipline specific but also relate to Education for Sustainable Development at undergraduate and postgraduate level. The small-scale scheme is used as means to test new concepts and teaching approaches. It is particularly appealing to early career researchers as the process of application and delivery of each project is fully supported. From medical sciences to drama and archaeology, the range of projects demonstrate the many ways that academic subjects can engage with sustainable development and improve student learning. This session will outline the Green Apple Scheme model and lessons learned from three years of delivery. Two projects that engage with the theme of Place-based Education and Local Outdoor Learning will be detailed: DigBerkeley, England, UK; and DigHatteras, North Carolina, USA. Both projects encourage student-led public engagement that develops transferable skills through sustainability action. Local schools and the community are welcomed into the research process as participants and contributors. This engagement encourages greater bonds of trust between all stakeholders. Through their learning, participation and subsequent public engagement events, the local communities become the vehicles of knowledge transfer and take ownership of their past.

ID: 276: Community field trip learning and the development of undergraduate students' responsible action toward ocean stewardship - Chi-I LIN, TW

Sustainability education practitioners have observed that the place-based fieldwork approach encourages students to exercise a plurality of thinking about the diverse opinions and needs of the community. In light of research by Christie et al. (2013), Remington-Doucette et al. (2013) and Walshe (2016), this study explores the potential of engaging undergraduate



students in reinvention projects related to the local fishing community in Taiwan. It investigates whether including field trips in the sustainability course would promote students' understanding of the multi-dimensional nature of real-world issues and empower them to take action toward protecting the oceans. It also investigates students' free-learning experience based in the local community and how that may help to advance their sustainability agenda. The primary objective of this study is to examine the effectiveness of field trip learning and the ways in which the approach facilitates undergraduate students' sense of responsibility and pro-environmental behavior with regard to sustainable oceans. A qualitative research approach was employed in this study. Data was collected for two consecutive years during the semester of 2014/2015 and 2015/2016. Ninety-nine university students from various disciplines enrolled in the interdisciplinary course entitled 'Sustainable Oceans'. Three field trips were arranged in each semester as an integrated component of the course's thematic units. Data was collected following each field-trip using the students' written reports and focus group interviews to explore the students' on-site, free-choice learning experience. The collected data was then analyzed using content analysis focused on four aspects: the extensiveness of the comments, the intensity of the comments, the specificity of the responses, and the bigger picture. The results of the investigation show that community field trips are positively related to students' responsible action toward ocean stewardship. The students recognized the correlation between socio-economic development and environmental problems. For instance, they saw the difficulty of life in fishing villages, the impact of reduced fishing resources, and the imbalance between ecological conservation and industrial development. It is observed that the students started to initiate substantial actions about what they could do or felt empowered to do something which might lead to change. This paper concludes that community field trips that engage students in learning in a multi-dimensional context will be more likely to engage them in ocean protection behavior. The development of self-transcendental thinking is an implicit underlying force that leads students to pay more attention to the lives of others and to know what to protect and how to act to change the current situation. This paper maintains that community field-trip learning initiates self-directed learning regarding personal meaningful action, so it may be beneficial to include the learning experience in the early sessions of an environmental course curriculum.

ID: 501: Pre-service teachers' difficulties in planning and applying the Field Study strategy. - *Naomi Towata, BR*

Field Studies are important strategies for environmental understanding. However, planning and conducting a Field Study is not so simple for teachers. The objective of this work is to raise the difficulties in the elaboration and application of two Field Studies carried out by eight pre-service teachers on Atlantic Forest and Restinga (both kinds of Rainforest in Brazilian coast). The pre-service teachers participated in the Institutional Scholarship Program for Teaching Initiation (Pibid, from University of São Paulo). The data was part of a PhD thesis and was collected by a semi-structured interview conducted individually. The data was analysed by content analysis, according to Bardin (2009). At Restinga, there was as an obligatory external monitor, who accompanied and guided the group of students during the Field Study. During the preparation of the studies, the greatest difficulties are related to the planning of the activities and in the bureaucratic part of the studies (transportation, authorizations and logistic). About the application part, for the Atlantic Forest study, most of the pre-service teachers reported difficulties related to students' behaviour. The greatest difficulties presented in Restinga were related to the roll of the external monitor, who guided the group most of the time. They reported that they did not have many difficulties, but they did not have the liberty they wanted to conduct their activity. Another point that we want to emphasize was the interaction group - external monitor, although all the pre-service teachers had agreed that the external monitor was fundamental to present the socio-environmental problems, they were not able to adapt their activity with the proposed activity of the external monitor. To reduce these difficulties, we should try to include strategies for elaborating a Field Study during the teachers' training.

ID: 507: Indigenizing Experiential Learning through Transformative Third Space: A Case Study of the University of Winnipeg - *Natalie Bartmes, CA*

Natalie Bartmes and Shailesh Shukla, Indigenous Studies, University of Winnipeg. This paper is based in an examination of experiences at the University of Winnipeg in facilitating land-based experiential learning courses in Manitoban First Nations communities, with the goals of strengthening students' connection with the land and with Indigenous ways of knowing. The case study utilizes a review of literature, participant observation and interviews with faculty instructors, University administrators, participating students, as well as Indigenous elders and community members, to explore the potential of land-based courses in creating a transformative third space (Bhabha, 1994). Transformative third space weaves together Indigenous knowledges with formal Western knowledges to nurture transformative learning outcomes and cultivate a stronger sense of environmental stewardship within students. Preliminary analysis suggests that transformative learning

was evident among participant students as evidenced in a deepened relationship with the land, a greater appreciation for the validity and significance of Indigenous ways of knowing in today's world, and an ongoing commitment to critical reflection on their role in a reconciliatory relationship with First Nations communities. In addition to the institutional, logistical and curricular challenges that have been encountered in developing and implementing such courses, its potential in creating transformative third space is being presented for discussion. Practical strategies and recommendations for creating transformative third spaces to enhance students' environmental stewardship will emerge during discussion and through the proposed research.

ID: 517: University Education for Sustainability and Resilience Through the Linking of Local and Global Contexts - Sachi Ninomiya-Lim, JP

In this presentation, the author will report on on-going action research and explore the prospects and challenges related to the linking of local and global contexts to empower university students for creating sustainable and resilient societies. In a previous study reported at the 8th WEEC, the author interviewed students enrolled in the two international environmental education programs of a university in Japan regarding learning outcomes and context and found that learning experiences within the specific context of local environmental problems and solutions stimulates student learning for sustainability and resilience in cognitive, affective, and social aspects; that effective integration of both specialized education based on scientific knowledge and experiential education acknowledging local knowledge/wisdom allows students to take actions for creating sustainable and resilient societies; that awareness of a diverse range of local contexts is important to prevent students from applying inappropriate actions in the wrong context; and that educators play a key role in realizing education for sustainability and resilience through experiences that emerge from specific local contexts. Subsequently, the author has expanded the scope of her educational research and practice to focus on the link between local and global contexts not only with respect to on-site experiential education but also to classroom-based education. In this presentation, the author will introduce how students in her general education courses connect local and global contexts by using the United Nations' Sustainable Development Goals as a tool, and how this empowers students to create sustainable and resilient societies. Based on the findings of previous and current action research, the author will discuss her idea for a model of sustainability and resilience education at the university level that focuses on linking the local and global contexts through a combination of classroom-based and on-site experiential education.

ID: 678: An Evaluation of the Impacts of the Teton Science Schools Place-Based Education Professional Development Workshops for Teachers in Bhutan - Leslie Cook, US

This study has implications for school leadership, national educational policy, and professional development strategies as they relate to enabling teachers and schools to develop place-based practices. Current education reform efforts in Bhutan include attempts to create an educational system that promotes Bhutan's unique cultural and environmental landscape. Since 2008, the Teton Science Schools (TSS) has partnered with the Ministry of Education and the Royal Education Council of Bhutan to conduct workshops to teach place-based education (PBE) to Bhutanese educators. TSS inspires curiosity, engagement and leadership through transformative place-based education in independent schools, field education programs, and educator development. PBE is an educational philosophy related to environmental education, experiential education, and outdoor education which emphasizes the connection of students and curriculum content to the local natural and cultural environment. The primary research question of this study was, "What impacts, if any, do the TSS place-based education professional development workshops have on Bhutanese teachers?" The study focused on fifteen primary school teachers and used qualitative and quantitative methods to analyze surveys, interviews, observations, and examination of extant documents during two workshops in January, 2016. Key findings from the study included positive impacts of the workshops as well as challenges facing teachers. Positive impacts included greater connection to place, new teaching strategies, and improved quality of teaching. Three challenges to implementing professional development were time constraints, lack of support, and large class sizes. Additionally, this study investigates cultural connections between PBE and Bhutan's measure of Gross National Happiness, which relates to national educational, environmental, and cultural policy. Findings also revealed the ways the workshops influenced course design at the Samtse College of Education and national curriculum development.

ID: 981: How Do We Train Our Graduates Ready for Transdisciplinary Projects? - A Case Study of Fieldwork-based Education in Sustainability Science Program - Shogo Kudo, JP

This study addresses the question of how a graduate level program in sustainability science can provide training of the required competencies to be ready for transdisciplinary projects through fieldwork-based courses. Sustainability science takes a problem-driven and interdisciplinary approach to address various sustainability challenges. For developing and implementing possible solutions to sustainability challenges, sustainability scientists are expected to initiate transdisciplinary projects with non-academic actors. Such a transdisciplinary approach requires particular coordination skills. This study identifies a set of skills, knowledge, and competencies for implementing a transdisciplinary project. This is done by reviewing earlier literature on sustainability science education and reporting a case of fieldwork-based training course in the Graduate Program in Sustainability Science, The University of Tokyo. The case study empirically examines the communication among those members who hold different academic disciplinary bases and the communication with non-academic and local residents of the area where the fieldwork-based course is implemented. The study suggests that researchers in an interdisciplinary project need to accept methodological pluralism when structuring a joint project and also need to be flexible when interpreting inputs from non-academic members. These are necessary to avoid a situation where researchers dominate conversation during a project based on their disciplines. The case study also presents that a photo exhibition can be an effective way to deliver academic messages to non-academic actors. The study suggests that sustainability science education should enrich fieldwork-based contents with an emphasis on the communication with non-academic actors through strengthening network of sustainability education programs.

ID: 1003: Contribution of field work to student learning: A Case Study of the Environmental Studies and Geography programmes, University of Guyana - Denise Simmons, GY

Field work is central to education in the environmental and geographical disciplines as it is the study of the environment that takes place outside of the classroom (Dunphy and Spellman, 2009; Scott et al., 2011). A study on the value of fieldwork from universities in three continents reveals that field work provided first-hand experience of the real world, skills development, and social benefits (Fuller et al., 2011).

In February 2005, the School of Earth and Environmental Sciences, which was essentially a merger of the Departments that offered Environmental Studies and Geography, was formed. On October 1, 2016, the School was transformed into the Faculty of Earth and Environmental Sciences. An evaluation of the Environmental Studies programme revealed that one of the major strengths of the programme was the opportunity to participate in field trips, with students and graduates recommending an increase in the number of field trips available as part of the programme (Simmons, 2008). It is therefore very timely for research to be conducted on the role field work plays in student learning within both the Geography and Environmental Studies programmes.

The main objective of this research is to investigate the contribution of field work to student learning in the Geography and Environmental Studies programmes at the University of Guyana. Through the use of a cross sectional design, the specific research objectives are to assess the knowledge, attitudes and experiences of lecturers and the experiences of students to field work. A content analysis of course outlines and documentation on field work will complement the survey. This research therefore provides critical information on the benefits of and challenges related to field work in the Environmental Studies and Geography courses at the University of Guyana, as well as practical recommendations for maximising the benefits of the field work to the programmes.

ID: 586: Students as catalysts of change- the call for and challenges of service learning within a sustainable ocean city initiative - Paul Warwick, GB

Increasingly it is argued that from the perspective of sustainability, what is required is a radical new vision that embraces applied learning, with student centred and experiential problem based approaches, and greater use of place-based learning (UNESCO 2012). This paper presents a case study of a place-based approach to Sustainability Education developed at Plymouth University, UK. It highlights key findings from research with current students and alumni that has supported the need for step change in place-based learning opportunities in sustainability education. This research has sought to capture the 'stories' of the students' experiences of sustainability education whilst studying at Plymouth and in many cases their perspectives on the value of serving as catalysts of change. In so doing, light is shed on students' perspectives on what constitutes vital and core elements, processes, and learning spaces in Sustainability Education. Upon this basis and informed by international literature and practice in the field a new service learning initiative has been devised and piloted. Drawing

from an implementation research study, this paper will provide a summary of the lessons learnt from this initiative to engage students in partnership with community organisations in the city, with the campus as a living lab, and with the outdoor environment as a deep learning space. In so doing this paper will conclude by arguing on the importance of staff serving as learning moderators within the service learning process; helping students to draw out the learning potential of place based learning through reflection on action, and being reflective about their own agency and competency development. In so doing this paper concludes with a renewed vision of Sustainability Education; one that highlights the importance of engaging students as 'compassionate critical creatives'.

ID: 19: The Development of Chinese Nature Schools (ziran xuexiao) - Rob Efrid, US

Drawing upon ethnographic fieldwork in three countries, this presentation considers the challenges and opportunities of nature schools in China, and compares them with environmental learning centers in Japan and the United States. Although the governments of Japan, China, and the United States all have policies promoting environmental education, research shows that public school teachers are rarely willing and/or able to offer hands-on environmental learning opportunities. This is particularly true in China, despite the fact that “in response to severe environmental challenges,” China’s Ministry of Education mandates environmental education at all grade levels in the public school system (Efrid 2014). In North America and Europe, however, school-based efforts to deliver environmental learning are supported and supplemented by environmental learning centers in the local region or neighborhood. Similarly, in Japan, the public education system is complemented by a nationwide network of more than 4000 nature schools (shizen gakk). What are the prospects for the development of similar nature schools and environmental learning centers in China? This presentation introduces the development of Chinese nature schools in their international context, with specific reference to empirical examples of nature schools drawn from recent fieldwork in Yunnan and Beijing. In addition to profiling global and cultural diversity in environmental education, the presentation connects to a number of other conference themes including place-based education and local outdoor learning, nature as teacher, indigenous knowledge and EE, and global policy and environmental education.

ID: 122: Connecting classroom with community: the effects of community forest trip on student's learning achievements and motivation - Surin Onprom, TH

Place-Based Education (PBE) boosts student achievement and improves environmental, social, and economic vitality. This approach has been employed in many countries. In Thailand, although this learning approach was introduced for some years, the practice is still limited particularly at tertiary education. This paper analyzes and presents the effects of community field trips on students’ achievements and motivations. Also, it presents the challenges facing by university programs to employ and implement this approach. It seems that the university policy and curriculum rarely support the PBE approach. Briefly, in November 2016, a team of instructors initiated and organized a one day trip for 110 forestry students, who enrolled into the core subject of Introduction to Social Forestry at Faculty of Forestry of Kasetsart University, to visit a Community Forest site in Ratchaburi province. The site is located approximately 110 Km west of Bangkok, the capital of Thailand. There were four major topics the field trip program offered to students including 1) roles of community forest in biodiversity conservation, 2) forest products and local livelihoods, 3) agro-forestry practice and 4) community organization and networking. The community representatives were invited to be resource persons and key informants in each topic. According to student assessment, the students reflected that the field trip enhanced their understanding on the relationship between people and forests, where they experienced the real case study. The stories of community forest history and management presented by local people inspired some students who will apply for a job as forest officials when they graduated. More importantly, some commented that the trip has contributed to alter their attitudes about the relationship between local people and forests. However, students commented that a one day trip was too short in order to learn all the topics and to share their views with local communities.

ID: 200: Measurement of Educational Effect by using Text Mining Technique - AKIHIRO IJIMA, JP

The role of environmental education (EE) is becoming increasingly important to respond to worsening environmental issues. On-site education in nature is particularly important because early experiences in nature are believed to influence environmentally responsible behaviors. However, there are few studies focusing on the educational effect of experience-based EE so far. In this study, we applied text mining technique to measure the effect of education quantitatively. We facilitated a junior environmental research club which is organized by 10 to 12 year-old elementary school children. The

club has a mission to monitor the differences in ecosystem between the upper and lower streams in a river environment. In this process, members learn the close relationship between nature and human activities. After finishing this program, we collected diaries from 184 members and text mining analysis was performed. Text mining allows syntactic and semantic analysis from the frequency of phrases and their co-occurrence relation. The contents of freely described diaries were coded into 6 categories (1: specific species name, 2: observation of species, 3: biological index of water quality, 4: number of individuals, 5: number of species, 6: result prediction and discussion) according to the keywords defined. Then the frequency of the code in respective categories was analyzed. The descriptions of the number of species accounted for the large portion of diaries. Text mining analysis revealed that the members quantitatively reported the changes in river environment between upper and lower streams of river ecosystems.

ID: 307: Exploring the influences of outdoor learning on students' learning attention and pressure by using neuroscience technology - Yi-Hsuan Hsu, TW

This study aims to use neuroscience technology to explore the influences of outdoor learning on students' learning attention and pressure. Eighteen 5th and 6th grade students participated in this study (mean age = 11.4 ± 0.5 years old; female = 8; male = 10). These eighteen participants were asked to join a water conservation programme both in a classroom and in a wide lawn by wearing a brain wave cap. When the students were conducting course activities, their brain waves were simultaneously monitored by the neuroscience technology developed by Sheng Hong Precision Technology Co. Ltd. The raw brain wave data was then translated into the impacts on individuals' attention and pressure. The data analysis showed that the students' learning attention was higher in learning outdoors than in the classroom ($t = -5.97$, $p < .001$). The students' pressure was also higher while learning outdoors than in the classroom ($t = -35.51$, $p < .001$). Furthermore, the results from the neuroscience data indicated that there were no differences on gender learning attention and pressure when students were learning in the classroom. But, the female students appeared to have higher attention and pressure than males when they learned outdoors. Generally speaking, when students were learning outdoors they would maintain higher attention and pressure than when learning in the classroom, and the difference in females was more obvious. It could be inferred that information outdoors is more numerous and unfamiliar to the students than inside the room, and the students need to pay more attention to guide themselves through the challenge in the environment, and this also induces higher pressure. Further implications will be discussed in the study.

ID: 327: Cross-curricular connections: Envisioning embodied outdoor learning in primary school - Son Truong, AU

The call of the Anthropocene challenges outdoor educators and researchers to focus attention on the ways in which children may bridge the culture-nature binary through their own engagements in, with, and as part of the human and more-than-human world. In addition to the learning opportunities that emerge through children's nature play, outdoor learning when integrated with the primary school curriculum creates links that span formal classroom subjects. In this presentation, I draw from fieldwork conducted with Australian primary school students exploring their outdoor school environments, in order to envision possibilities for integrating sustainability as a cross-curricular priority. With a playful sense of analytical flexibility, I will discuss my ventures and emergent thinking as an outdoor educator/researcher with re-reading the visual data collected with students using posthumanist and relational materialist perspectives. The overarching approach challenges anthropocentric ways of seeing by rejecting the authorial relationship between humans and nonhumans. For educational research, a posthumanist approach recognises that there are human and more-than-human interactions occurring all of the time at schools. I will discuss the importance of being attuned to particular places where children feel a sense of connection, relatedness, or enchantment to create opportunities for meaningful place-based education. In particular, I will highlight examples of school gardens to reconsider how posthumanist ethics can influence educational practices and wonder about their potential to bridge traditional disciplinary boundaries, leading to creative pathways and cross-curricular connections that foster embodied learning experiences for students, which may be catalysts towards deeper connections with self and others.

ID: 353: Growing Green Hearts and Minds at NEST, a Nature-based Public School - Laura Piersol, CA

In 2013, in the community of Davis Bay, B.C., a small group of committed individuals started a public elementary school (K-3) devoted to nature-based education. Today NEST (Nature Education for Sustainable Today's and Tomorrow's) has expanded to include an intermediate class up to grade six. This school has eco literacy at its core and is working to grow green hearts and minds through offering hands on, experiential learning opportunities in both outdoor and indoor

classrooms. Inquiry, play and child-centred learning are all important pieces in the program, while continuing to honour the B.C. curriculum and its guidelines for learning. Children and nature guide the lesson planning in this multi-age approach, as classes will often find themselves digging deep into learning in the forest, at the beach or the estuary close to their home base. In this interactive presentation we plan to share, explore and experience some of the daily ways that environmental stewardship and place-based learning is fostered at this school. We aim to inspire others to dream big and take direct action to promote meaningful connections with the earth. This workshop will offer stories and lessons from a school where connecting children with nature is at the heart of learning. This represents a paradigm shift in education, moving away from a field trip model where nature is seen as something far and away, to be experienced in one-off experiences, and instead, toward a model where teachers and students are learning how to deepen their connection with nature on a daily basis over the long term. This idea, that a central part of education is learning how to help ecological communities to flourish, is a major shift that is needed in public schooling- a story to inspire.

ID: 428: The ACEER Foundation's Conservation Learning Web in the Peruvian Amazon - Paul Morgan, US

The Amazon Basin in southeastern Peru, an epicenter of biodiversity, is under pressure from illegal logging and other extractive practices that threaten ecological and human health. The local population is hampered in its ability to respond to these challenges due to generally poor formal education opportunities, little to no informal education, lack of local environmental literacy, and few opportunities to participate in sustainable economic development. Using the model of a Learning Ecosystem (originally developed for STEM learning but adapted for environmental and conservation education), the ACEER Foundation is responding by creating a Conservation Learning Web focused on developing leadership for conservation, restoration, and sustainable economic development. The Learning Web will, when fully implemented, integrate experiential school-based environmental education programs and field-based teacher training with out-of-school programs, higher education, sustainable businesses, families, and local and global conservation NGOs. The unique contributions of these diverse settings, working in symbiosis, will effectively deliver transformative learning experiences and tangible outcomes in the service of conservation, restoration, and sustainable economic development. Over time, the Learning Web will enable young people in the region to become engaged, knowledgeable and skilled as they progress through childhood into adolescence and early adulthood. This project explores the extent to which formal and informal environmental and conservation education can serve as a catalyst to improve student learning by inspiring and mobilizing a wide range of stakeholders to create and realize a vision of a sustainable future. ACEER (Amazon Center for Environmental Education and Research) is a non-profit organization that has focused on rainforest conservation for more than 25 years, with a mission to design and implement transformative, experiential learning that develops local and global environmental leaders who work to conserve and restore functioning landscapes in the Amazon Basin.

ID: 453: Green Curtain Projects as Placed-Based Education for Sustainable Development - Ikko Tucker, AE

Declared at the 57th United Nations General Assembly in 2004, and led by UNESCO, Education for Sustainable Development (ESD) has been globally implemented into a multitude of educational systems and communities. ESD encourages global citizens to recognize the importance of sustainable development, and to adapt changes in their lifestyles, to achieve a more sustainable society. Since the mid 2000s, a grass-roots movement known as the Green Curtain Project has been exponentially spreading in the eco-conscious nation of Japan. A green curtain is a biological shutter, made of vertically grown green plants to cover windows/walls thereby, blocking the sun's radiation and heat during summer. The project is implemented, particularly in primary education systems in Japan (as a hands-on learning experience in science programs), to develop a sustainability mind-set, and foster an intrinsic appreciation and value for nature. Considering the implementation of green curtain projects as a possible means of placed-based education (PBE) for sustainable development, I have implemented several experiments in the UAE (a country with the largest per capita global carbon footprint). The results of my experimental findings indicate that the green curtains are an effective way to reduce the surrounding micro-environment temperature during mid-day. Individual efforts, by themselves, might be globally insignificant; however, if bundled, the effects can be dramatic as 57% of the ecological footprint is from household energy consumption. The green curtain is a fun and practical PBE project to spread sustainability awareness among children, young adults, and the general UAE population. By merely changing a few routine habits through PBE, children and young adults will become more cognizant of the positive influence individuals can have on building a sustainable global environment.

ID: 476: Outdoor education in Slovenian school system support cultural and environmental education - Darja Skribe Dimec, SI

In Slovenia, the Basic School Act defining the curriculum for primary schools was adopted in 1996. According to this document, outdoor education is integrated into the national curriculum for lower and upper primary schools, materialized by the days of activities and outdoor schools. Curriculum defines 15 days of cultural, sport, science and technical activities per year while an outdoor school is an activity that takes place for three or more days in a row outside the school area. Every student must attend outdoor school at least twice in the 9-year compulsory education. To implement these activities in primary schools, Slovenia has a network of 23 outdoor residential centers which are funded entirely by the state (they are part of the Ministry of Education, Science and Sport). In the centres place-based educational programs are implemented, fostering outdoor learning in the natural environment. Most centres are in abandoned and renovated military buildings, in deep forests or in mountains, mainly along the border with Italy, Austria, Hungary and Croatia. Slovenia is characterized by extremely diverse and relatively well-preserved nature. All programs in the centres are strongly connected to the local environment and cultural traditions. The globalization increases the risk of neglecting historical tradition and the loss of cultural identity therefore it is extremely important that outdoor education emphasize locality, which allows us to stay connected with the tradition, natural and cultural heritage and by that successfully weaving culture and environment.

ID: 541: Forest Jump: Schoolchildren leading design for school ground greening - Susan Wake, NZ

One way to help develop a sense of empathy towards the environment in this era of change inevitability is to involve children in projects that improve their schools in ways that they can relate to, such as providing for activity as well as learning. The project being presented here was a co-design process between a landscape architect and a class of schoolchildren aged 9-11 years at an ethnically diverse, West Auckland primary school. Together they determined the location for the design, carried out a site analysis, determined the attributes of the new landscape through negotiated group work and made models of their desired landscapes to inform the design process that was carried out by the designer. A feedback loop was established to ensure the final design met the initially set brief and represented the ideas and views of the students. The process that was applied was developed as a hybrid method from the literature and other case study examples, since a single detailed method was difficult to glean, so in part the project sought to address the dearth within journals and books of readily transferable methods. The aim of the project was to develop a simple method for engaging landscape architects in school ground greening to engage the profession in education about design and the environment. Also, by using a skilled designer and plants person, the resulting design would build in resilience and contribute useful ecosystem services such as shade, shelter and habitat corridors for birds etc. The success of the project can be measured by the evaluation carried out by the students at the end (when the final plan was presented). This presentation will focus on the process and analysis of data that was collected throughout the stages of the project. This illustrates useful results from this trial of a simple method. It is recommended this could be developed further to connect practitioners with schoolchildren in ways that result in positive outcomes for all participants, including environmental learning.

ID: 547: Children, Adults and Classes in Turkey are becoming playmates with nature via My Nature Friend's Box game - Burcu Arik Akyuz, TR


The practice I will be sharing is an example of how using a simple game and empowering people in their own learning supports environmental/nature awareness and building sense of place. I started this game in the summer of 2015 to support reclaiming nature as a playmate, to re/deconstruct the general understanding that nature is somewhere out there and knowing about nature is only expert's work. For the 2015 summer equinox I opened a call via social media. People who submitted then and each season afterwards are matched together. Throughout the season, 5-6 weeks, the participants are requested to spend time in nature as many times as possible and prepare a box of nature, including leaves, seeds and stones and anything that inspires them from the flora and natural surroundings of their neighbourhood, their street, their city. You get to go out on nature walks and observe your surroundings while your paired partner does the same in their own region only to share with one another through gift boxes what they love about the nature around them. These boxes of artefacts of nature are then sent by post to the name 'drawn' along with a personal letter connecting people, children and families all over the country. Starting with 80 people, the game reached over 6000 followers from all around Turkey in a year's time. Now 400 participants play the game every season. There are three categories to apply: Children aged 3-11, adults, and pre-primary school classes. The game presented a new way of making a special connection with others and nature through discovering your own and other's natural surroundings. There are ethical principles of the game such as "no picking live

plants, no plastics when packaging, preferring always less and already used packaging, etc.", which helps build an ethical relation with nature. The photos of the nature boxes received are shared via social media and the community of the game then discusses the similarities and differences in various parts of Turkey. The game has its own community now who learn from each other, by themselves, learn the names of the trees, animals, etc, have a strong sense of place, value every small part of nature and exchange ideas and resources.

ID: 567: Project Emc2 - Exploring white crowberry coastal habitats - *Corema album* (L.) D. Don - an environmental outdoor education project as a lever for cultural initiatives - M. Alexandra Lima, PT

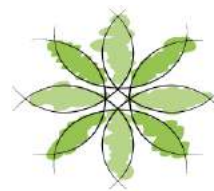
Plants are at the center of two salient environmental issues of our time - global climate change and biodiversity loss. Within this context, environmental education projects about endemic coastal plants are of actual relevance due to increasing coastal development and changing coastal dynamics worldwide. We developed an outdoor education project held at Portuguese North, Centre and South sand dune systems, with 8-10 years old pupils from 6 schools, during 2016-17 (Funded by MARE-FCT UID/MAR/4292/2013). The project aims to explore not only *Corema album* (L.) D. Don, as an Iberian endemism (known as White crowberry, due to their white edible fruits); but also the worldwide invasive plant *Carpobrotus edulis* L. (known as Hottentot fig). Outdoor visit methodology is centered on a playful, multi-sensory approach, allowing learners to re-engage with the world as they actually experience it. Students observe different plants and gather some material to do a *florini-herbaria*. The project's interdisciplinary methodology combines dune visits with science and arts activities (e.g. poetry; drawings based upon *C. album* herbaria specimens pictures dating back from 19th century collectors at each school zone). Outputs include project participant fulfilled survey and worksheet analysis. First results from North schools surveys revealed not only increased student knowledge acquisition about white crowberry (previously unknown for the majority) but also a rich mobilization of the six main pathways to learning: - to see, hear, taste, touch, smell and do. Outcomes include partnership establishment at international and local level(s), for cultural events to showcase students' drawings and poems about visited dune habitats (poetry and video workshops; e.g. White crowberry <https://vimeo.com/156099137>) From Emc2 project results it is concluded that coastal outdoor learning projects provide support for other curriculum areas beyond science; can be an opportunity to build bridges between schools and communities, young people and their futures, and enrich the cultural landscape.

ID: 569: OUT OF BOX - Environmental Outdoor Education in Finland - Anna Kettunen, FI

SYKLI Environmental School of Finland (SYKLI) has a national project for environmental outdoor education called ULKOLUOKKA -project (Outdoor Classroom -project), that started in 2016. Over 2000 pupils and 100 teachers participates in the project, from 50 different schools and ten cities around Finland. SYKLI trains teachers to use outdoor classrooms together with the experts from, among others, Suomen Latu, National Adventure Education Network, LYKE -network and The Finnish Association for Nature Conservation. Nature is a diverse learning environment for schools. Outdoor learning is experimental, experience-based, hands-on learning in authentic learning environments. Outdoor learning also gives healthy physical exercise. The joy of learning is created through a wide range of outdoor practices. Also social skills are strengthened outdoors. A good relationship with nature creates nature awareness - a first step toward a more sustainable way of life. Outdoor classrooms also make it possible for the teachers to realize the new curriculum in multidisciplinary way. The goal of the project is to get pupils OUT OF BOX! Participating teachers will be offered many outdoor learning  workshops, tools, materials and examples. Teachers are encouraged to do outdoor learning with the class and increase physical activity at school by being outdoors. The teacher is required to search for an outdoor classroom near the school and participate in training sessions and meetings. Then the teacher will start enhancing outdoor learning in small steps - first once a month, then weekly/daily, and by documenting outdoor learning and sharing the ideas on website via Instagram, YouTube and seminars. The project can also help schools to develop their own plans for outdoor learning. In this project competencies and skills for outdoor education will be enhanced among involved teachers and schools. The next step is to extend the project to the Arctic region.

ID: 853: Place-based Education for Sustainability and Local Outdoor Learning Within the Schools Curriculum. - Allain Chimanikire, ZW

Both formal and informal education plays a vital role in encouraging the lifestyles required to care for the environment and environmental education aims to achieve sustainable environmental management by integrating environmental education into the national curriculum through place-based and outdoor learning to foster the the development of children's potential



by exposing them to new situations. This study analyzes the current environmental education symbiosis development and application in Zimbabwe. Outdoor learning provides school children with hands-on experience and opportunities to tackle issues and concerns in their own environments. Learning in the outdoors has significant advantages for children in both primary and secondary school levels and does not advocate a particular viewpoint or course of action. Rather, outdoor learning teaches individuals how to weigh various sides of an issue through critical thinking and it enhances problem solving and decision making skills in learners, develops a sense of relationship with the natural environment and constructs a deep environmental knowledge and understanding of the world that surrounds them. Learners tend to understand concepts by applying pro-environmental behaviour, especially in the early years with connectivity with the natural environments. Place-based education creates opportunities for both teachers and learners to think independently, collect, analyze, synthesize, and critique information, and address community opportunities and concerns. This case study would allow me to explore the complex factors that influence the way learners understand and adopt critical place-based approaches. In particular, I explore how critical place-based pedagogy fits in education for sustainability within the school curriculum, and the use of school grounds as a learning resource.

ID: 1019: Permaculture Ethics and Principles: Curriculum Design Framework for People and Planet - Shelley Serebrin, CA

The purpose of this project was to design a series of lessons to teach the ethics and raise awareness of the 12 principles of permaculture to elementary school children within a nature garden learning environment. Four lessons were developed by a group of teachers and a local permaculture practitioner for Gabriola Elementary School on Vancouver Island. In the first year of the project the three ethics lessons were taught during May and June, 2015 to students from K-7 and lesson four was taught as a whole school activity over three mornings outside in the forested area surrounding the school. The success of the project has led to a second and third year of teaching the program in 2016 and 2017 respectively. We have found that teaching permaculture ethics and principles addresses several of the new British Columbia Core Competencies (Thinking, Communication, and Personal and Social Responsibility) in a holistic way, giving students a language they can use to be advocates and stewards of the environment. In addition, it empowers teachers with a cohesive framework for visioning environmental education and curriculum design.

ID: 304: Children's access to gardens in Norway, India and the United Kingdom - Barbara Maria Sageidet, NO

This study will compare children's access to gardens in Norway, India and the United Kingdom, and investigate the potentials of these practices for sustainability learning with children. While recognizing great varieties within these countries, the focus is set on urban gardening in Stavanger, Mumbai and Cardiff. Conceptualized in theories of situated learning, and by means of literature reviews, in addition to conversations and observations within an hermeneutical framework, this study will present the situation in each of these cities concerning characteristics, practices, activities and values related to gardens in general, and will investigate opportunities available to children to interact in different ways with and in different kinds of gardens in particular. This study illuminates convergences and differences between the three cities, related to the role of gardens in the lives of children, and investigates challenges and opportunities for the use of spaces for gardening with children. The study will offer avenues that are worth consideration through perspectives of sustainability. Narratives of the three cities elucidate that gardens are associated with differing practices and educational goals in the three countries. While gardens in Norway typically are large and close to nature, gardens in India appear to be very small and like 'windowsills', while in the United Kingdom, historical botanical gardens are more prevalent. The study describes the various garden spaces, and especially alternative spaces, available to children in the three cities, and discusses the potentials these spaces hold for offering learning opportunities and the potentials lying in mutual inspirations between these three perspectives for promoting sustainable living.

ID: 450: Significados y conexiones de estudiantes de educación primaria con los lugares habitados - Karina De Alba-Villaseñor, MX

Presentamos resultados de una investigación que tuvo como propósito el analizar cómo los estudiantes de tercer grado de educación primaria perciben y se conectan con su entorno local y, qué significados de lugar construyen en él. Desde los

planteamientos de la Pedagogía Crítica de Lugar utilizamos el concepto de sentido de lugar como principal referente teórico-metodológico. En la investigación participaron 35 estudiantes quienes realizaron 35 dibujos: del medio ambiente, de sus lugares favoritos de su casa y de los lugares preferidos en su escuela. A partir de los dibujos se desarrollaron entrevistas individuales para que explicaran cada uno de ellos. Consideramos los dibujos y las entrevistas como artefactos mediadores de significado. Se realizó un análisis textual de la imagen y un análisis del discurso de las entrevistas. Los resultados muestran que el sentido de lugar esta vinculado a lo local y no a lo global. Su visión de medio ambiente refleja un “ideal optimista”, dibujan gran cantidad de componentes naturales inexistentes en la colonia en que habitan (principalmente urbana sin áreas verdes). Prevalece una relación antropocéntrica y asumen que la degradación ambiental se debe a la ausencia de reglas y penalizaciones. La conexión con los espacios habitados, casa y escuela, presenta tres etapas: es percibido a nivel sensorial, fortalecido a nivel emocional y habitado a nivel cultural. La familia aparece como un promotor importante del cuidado ambiental. Dentro de la escuela el huerto escolar es principal promotor del sentido de lugar. Finalmente identificamos que el género es un indicador de sentido de lugar que se manifiesta diferente en niños y niñas. Los resultados permitieron diseñar estrategias didácticas para fortalecer el sentido de lugar a partir de los espacios preferidos por los estudiantes.

ID: 511: Exploring the Potential for Place-based Climate Change Engagement in New Zealand National Parks -
Karen Hytten, NZ

National parks around the world play an important role in promoting public awareness about the environment. This study involved a comprehensive analysis of the educational materials provided to the public in four New Zealand national parks: Egmont, Tongariro, Whanganui and Westland Tai Poutini. It was found that these were primarily focused on explaining the natural phenomena within the parks. Some also provided insight into the cultural and historical significance of particular sites and species. However, where conservation narratives were presented they were heavily dominated by the detrimental impact of introduced species on New Zealand's native biodiversity. These narratives framed introduced mammalian predators as the ultimate threat to the integrity of New Zealand's unique environment. Absent from almost all the materials analysed was any reference to the current or future impacts of climate change. This was particularly surprising in Westland Tai Poutini National Park where the Franz Joseph and Fox Glaciers are both rapidly retreating. Many studies highlight the potential of place-based environmental education to increase the understanding of issues like climate change and promote the development of a sustainability ethic. This paper draws upon this literature to argue that New Zealand's national parks offer a unique opportunity to actively engage and inspire both domestic and international visitors to be concerned about climate change and take greater responsibility for their personal contribution to the climate crisis.

ID: 524: Social-Ecological Dynamics and Local Knowledge on Islands: A Case Study of Dongjiyu in Taiwan -
WEICHIEH LIN,

Islands are commonly considered as places with high vulnerability for being isolated in the ocean as well as with limited natural resources, so the interactions between how to use those limited resources in a small island will be much closer. Human behavior and the environment interact reciprocally. In the process of the interaction between the human society and the island, it will evolve into the Social-Ecological System (SES), and the island residents are growing local knowledge in order to face the changing ecological and social environment. This study is a 50-year historical review of Dongji-yu, Taiwan. From data analysis and interviews, it tries to understand how the island residents survive with their understanding of the local environment in order to face the changing ecological and social environment. Dongjiyu is located at the southern sea of Penghu on Taiwan Strait, once the most important midway for trading between Taiwan and China. However, globalization, the innovation of navigation technology and the changing of environmental resources make the population in Dongjiyu decrease continuously. The results show the social development in small islands is limited by external resources: the less resources it owns, the smaller scale it is. Human activities are easy to change the ecosystem and structure, but the development on the island is still restricted by clan, religion and other social system norms. Local knowledge is the key for the inhabitants to live. Both cultivation and fishing require full understanding of the local environment. So does tourism, in order to provide tourists and anglers the best place to visit, the local guide must understand the fishing ground well. The more complete local knowledge one has, the more ability one has to face the changing environment.

ID: 573: A model of immersive environmental education: The Lost Valley Education and Events Center in Dexter, Oregon - *Calin Gurau, FR*

This paper presents an outstanding example of immersive environmental education: The Lost Valley Education and Events Center, located in Dexter, Oregon. This center is built around, and functions through, the efforts of a local staff community, the Meadowsong Ecovillage, which is home to 40-50 educators and of their families who live permanently at Lost Valley. The flagship course of Lost Valley is the Holistic Sustainability Semester, a transformational 12-week program that teaches five main spheres of sustainability: personal, social, ecological, economic and worldview. It integrates classroom learning with a full environmental immersion experience. The model of the Lost Valley Education and Events center should be replicated in various countries/regions, developing a multi-cultural, geographically-dispersed network of environmental-oriented education institutions that combine contemporary and practical science, traditional/aboriginal knowledge, and an immersion in the natural environment, facilitating observation, experimentation, and a holistic personal development.

ID: 820: Reef Education to Sea Country connections: Innovation of co-learning for a sustainable future. A success story for tourism and environmental education on the Great Barrier Reef. - *Marie Taylor, AU*

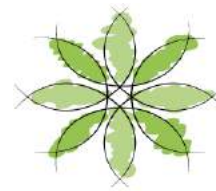
Projects allow for students, their teachers and parents, pre-service teachers, academics, science undergraduates, marine biologists, researchers and sea country rangers to work together, allowing for participatory action and the sharing of stories. Engaging youth and particularly Indigenous youth is the objective of using the Great Barrier Reef as an immersive education experience, showcasing the natural and cultural assets as a key aspect of an innovative tourism strategy, sharing local education, training and career pathways. Reef education is run by marine biologists, providing transport, food and drinks with stinger suits, wetsuits and snorkelling gear and research resources included. Students have access to 8 outer reef sites and islands in the Cairns region of North Queensland, Australia. Off shore reef education can be logistically difficult and challenging, however, partnerships between tourism, universities, Traditional Owners, government agencies and local stakeholders promoting the importance of productive education relationships has allowed for the innovation of co-learning on the Great Barrier Reef. Concern about the effects of climate change, the loss of Indigenous values and connections to the Great Barrier Reef and the recent mass bleaching events in 2016 and 2017, have presented the question of how we can best contribute to the custodianship of the Great Barrier Reef, promoting inclusive and sustainable communities. The reef education programs highlight the social, cultural, environmental and economic benefits of the reef landscape, encouraging students and teachers to look at the larger entity of the reef as an extension of their community. Reef Magic Education is an intentional engagement tool focused on the reef as the teacher and the community as her students. Co-learning projects promote exploration and a sense of adventure and new understandings that create a lifetime of memories.

ID: 1052: The Lagoon that Unites Us All - *Liliana Pulido, MX*

Bacalar has a spectacular lagoon; its landscape consists of seven different shades of color in its water, channels that connect to the ocean, mangroves, stromatolites and a history that tells us about the Mayan Civilization, pirates, the Spanish Colonization and the current struggle of its economic and sustainable development. This lagoon has united both local teachers and environmental educators to come up with alternatives to build up projects that leverage its inhabitants to a more positive scenario against climate change. In the past, we have designed and proved a place based educational program to educate teachers on the specific characteristics of the hydrologic system in the Yucatan Peninsula. This system includes underground rivers, cenotes, karstic soil and ecosystems such as jungle, mangroves and coastal dunes. The educational program enables the teacher to use pedagogic tools: mathematical, scientific and artistic thinking in practical projects that promote local actions to raise sustainability indicators. This time we will put together this experience to work in a new setting: the Bacalar Lagoon located in the southern part of the Yucatan Peninsula, where the basin has very different aspects. It is important to stress that all teachers from the State of the Quintana Roo have their basic formation in the municipality of Bacalar. The program will make visible the invisible facts: we focus on the energy flow of the natural and social landscapes and its connections in order to enforce sustainability. We are taking in consideration factors such as the different stakeholders' behavior, public politics, money, technology, local ecosystems and its biophysical and chemistry cycles.

ID: 70: Effectiveness of a Marine Education Program on Junior High School Students with a Specific Focus on Satoumi: a case study of a sustainable coastal community development in Japan - *Ryo Sakurai, JP*

In many coastal areas of Japan, local fishermen and community residents have managed fish and other marine resources in a sustainable manner. Such areas are referred to Satoumi, which is defined as “a coastal area where productivity and



biodiversity have increased through human interaction.” In order to sustainably conserve and manage Satoumi, education is needed to help increase people’s understanding of and interest in the oceans, however, in practice, schools do not have enough teachers and educational materials to do so. In this study, we focused on Hinase Junior High School (HJHS) in Okayama Prefecture, Japan, which is implementing proactive marine education program in collaboration with local fishermen in order to maintain Satoumi. HJHS offers marine education classes, such as experiencing oyster cultivation, conducting interviews with local fishermen, collecting and sowing seaweeds (eelgrass), to students of all grades throughout the year. We conducted interviews with students (n=108) to identify the effectiveness of this program. Results revealed that the program appears to have changed some students’ awareness and attitudes (e.g. recognition about the importance of the sea and eelgrass), and also their behavior (e.g. no longer throw waste into the sea). The higher the grade, the more students who felt close to the sea and had willingness to take care of the sea. Our study suggest that the program has helped develop human resources who will continuously support the community in the future with a sense of attachment in the region. The marine education program at HJHS was effective in changing students’ mindset and behaviors because the program successfully incorporated culturally, traditionally, and historically specific features of Satoumi management, and thus, we believe that such programs could be named as Satoumi Education which is potentially different from traditional ocean literacy education.

ID: 85: Exploring Tools of Imaginative Ecological Education - Gillian Judson, CA

Imaginative ecological educators are weavers. With their students, they weave relationships that connect knowledge, the body, and nature. They weave wonder into the everyday experience of students in schools. This interactive session will describe tools imaginative ecological educators use to weave the richest pedagogical relationships for their students. Participants will learn how to centralize emotional and imaginative engagement in their practice. Specifically, participants will see how the guiding principles of Imaginative Ecological Education, or IEE, (a K-12 imagination-focused approach to ecological education <http://gillianjudson.edublogs.org/imaginative-ecological-education-2/>) translate into useable teaching tools that can increase engagement and learning in all subject areas. Participants will leave with resources for teaching, a deeper sense of the role of imagination in ecological education and, importantly, an understanding of how thinking about teaching as weaving can support their nature-based practice.

ID: 182: Stories of advocacy in place-responsive pedagogy - Peter Renshaw, AU

In this round table we open up for consideration the dilemmas of designing pedagogies that advocate for the environment. Advocacy pedagogy is eschewed by educators committed to a neutral chair notion of dealing with social issues, and it is regarded as problematic by many environmental educators who regard advocacy as simplifying complex environmental problems. To open discussion we introduce a narrative pedagogy called Storythread and illustrate this place-responsive pedagogy by describing two programs that engage students dramatically and emotionally in stories and dilemmas of advocacy. The aim of the programs is to move students to commit to new identities and new dispositions with regard to protecting and valuing natural places, the more-than-human-world. We show how advocacy can be an inherent aspect of place rather than imposed through the status and authority of the teacher. The key to our pedagogical approach is the notion of place as unfinished, overlapping and contested stories.

ID: 225: PEDAGOGY + PLACE + PEOPLE Critical reflections on an interdisciplinary Amazon field school experience through a Lefebvrian lens. - Lucie Gagne, CA

The poster will present research from my thesis for the Doctor of Education degree in the Faculty of Education at Simon Fraser University. The focus of the research is to examine undergraduate students' perspectives on their experience of the Amazon Interdisciplinary Field School (AIFS), a short-term interdisciplinary study abroad program offered by Kwantlen Polytechnic University (KPU). The AIFS provides students the opportunity to travel to the heart of the Amazon Rainforest and to engage in an intensive, cross-disciplinary field study. The Amazon region houses the greatest biodiversity on the planet; it is a place of fertility, interconnectivity, and nourishment. One of the goals of the field school is to promote a contextual understanding and appreciation of nature, its ecosystems, and socio-environmental sustainability; and the need for a sensitive and informed approach toward developing a responsible stewardship of our planet. The research seeks to answer the questions, “what are the students’ perspectives on their experience of KPU's Amazon Interdisciplinary Field School, and how can they be described?” The case study examines the ways short-term international experiential education can contribute to a full-spectrum education by exploring the practices of experiential learning within a non-formal and

cross-cultural context. The study also seeks to understand to what extent and in what ways participation in the AIFS and the time spent in the Amazon has been transformative and/or has had an impact on their daily lives and/or their worldview. Drawing from philosopher Henri Lefebvre's triad of social space to conceptualize the AIFS in terms of interlinked academic events or moments, the study explores the conceived, the perceived and the lived dimensions of the field school experience. Lefebvre's conceptual triad is useful in thinking about educational practices, and offers possibilities for better understanding educational moments and the interrelationship between pedagogy, people, and place.

ID: 244: Hogar, escuela y espacios de recreación: El sentido de lugar en jóvenes universitarios - Yolanda Feria-Cuevas, MX

El estudio tuvo como propósito identificar el sentido de lugar de dos grupos de estudiantes universitarios de Jalisco, México. Recurrimos al concepto de sentido de lugar y a un marco de salud ambiental que plantea que para analizar el bienestar, es necesario conocer los lugares habitados por el ser humano (hogar, escuela-trabajo, y espacios de recreación). Participaron 68 estudiantes, 37 de una zona costera y 31 de una zona urbana; quienes mediante textos narrativos describieron los lugares con los cuales se sienten vinculados, las sensaciones que experimentan y las actividades que realizan. Dichos textos fueron analizados siguiendo los planteamientos del análisis de contenido. Los resultados muestran que los lugares para la recreación están más asociados al sentido de lugar (65% en ambos grupos), seguido del hogar (25 % para la comunidad costera y 22.5 % para la urbana) y por último los lugares donde se estudia (10 y 12.5 % respectivamente). Los lugares recreativos más mencionados fueron: playa, cerros y parques (por estudiantes de zona costera) y ciudades turísticas (por estudiantes de zona urbana). Ambos grupos asocian el hogar con celebraciones familiares. Por último, asocian los espacios educativos con actividades extraescolares como visitas a zoológicos, exposiciones, etc. Los jóvenes están más vinculados con lugares recreativos, donde disfrutan con amigos. La escuela es donde menos conexiones tienen, su relación es solo con actividades de exploración con el entorno. Planteamos transformar los espacios informales de recreación preferidos por los jóvenes, en lugares con potencial didáctico. Establecer vínculos entre la escuela y estos mediante el diseño de experiencias de aprendizaje, facilitará que los estudiantes aprendan en los lugares que disfrutan y valoran. Para fortalecer la conexión jóvenes-lugares habitados, es necesario salir de las aulas utilizando el territorio como oportunidad de alfabetización (lectura del entorno), así la educación ambiental fortalecerá la formación ciudadana.

ID: 328: El trabajo de campo como complemento de la educación ambiental con niños, en un campamento de protección de tortugas marinas en México- Blanca Bojórquez Martínez, MX

Esta ponencia cuenta la experiencia vivida con niños de comunidades costeras de Nayarit, México cuyas familias han depredado a las tortugas marinas de generación en generación; aquí se muestra como la educación teórica y la experiencia de campo han tomado gran relevancia para mitigar el grave problema que tenemos pues las siete especies que anidan en nuestro territorio son especies amenazadas o en peligro de extinción. Nuestro país llegó a contar con las mayores poblaciones de tortuga marina en el mundo; en los años sesentas se podían encontrar millones quelonios en las costas mexicanas, no obstante, en los últimos 30 años, han sido objeto de una intensa explotación por parte del hombre. Nuestro proyecto de protección y conservación de las tortugas marinas incluye una parte muy importante que es la educación a las nuevas generaciones; el material didáctico diseñado, está mayormente enfocado a alumnos de primaria (de 6 a 12 años), pues encontramos una mejor respuesta en este nivel educativo, para llegar a los adultos en casa; es por ello que cubrimos especialmente estas escuelas. Al trabajar en su entorno, podemos hacerlos partícipes de las actividades realizadas en el campamento (limpieza de playa, patrullaje, colecta de nidos, siembra, limpieza de nidos y liberación de crías), en donde toma gran relevancia esta última actividad, pues hemos notado a través de los trece años de trabajo que tenemos en la zona, que una vez que tienen una cría en la mano para liberar, dejan de consumir el huevo de tortuga en su casa, lo cual también a través del tiempo, cuando ellos sean adultos, ayudará para romper con el esquema de extracción clandestina de huevos. Este tipo de proyectos (aprender haciendo) conduce a los niños a investigar la realidad ambiental de su comunidad y trabajar los temas desde esa perspectiva.

ID: 351: Emociones e interacciones que caracterizan el sentido de lugar en jóvenes universitarios - Yolanda Feria-Cuevas, MX

Desde una perspectiva sociocultural analizamos el sentido de lugar de estudiantes universitarios del estado de Jalisco, México. Participaron 68 jóvenes, 37 de la costa y 31 de ciudad. Se les pidió describir, en textos narrativos, sus lugares

preferidos y su sentido de lugar. El análisis de contenido de los textos permitió identificar que el sentido de lugar está asociado con las actividades que realizan, las personas con quienes conviven y las emociones experimentadas. Los resultados muestran que los lugares recreativos son los que tienen mayor sentido de pertenencia para los jóvenes de ambas localidades, ahí realizan actividades tanto motrices como contemplativos acompañados principalmente de amigos. El hogar fue otro espacio importante, donde conviven con la familia a través de pláticas y juegos. El espacio escolar también fue mencionado y se asocia con actividades motrices y convivencia con los amigos (estudiantes de la costa) y actividades recreativas-reflexivas en compañía de amigos y profesores (estudiantes de la zona urbana). Identificamos que el sentido de lugar está asociado con sentimientos de alegría-felicidad en los tres espacios (recreación, hogar y escuela). Los estudiantes de la costa asocian la tristeza y soledad al hogar y la escuela, mientras que los de ciudad relacionan el hogar con paz, bienestar y cariño y la escuela con bienestar, seguridad y agradecimiento. Concluimos que aunque en los espacios recreativos se pasa menos tiempo, son los más asociados al sentido de lugar y los jóvenes perciben mayores beneficios para su salud física, mental y socioemocional. Asimismo, las estrategias didácticas para fortalecer las conexiones de los individuos con el/los lugares habitados, deben considerar sentimientos y emociones como elementos determinantes. Finalmente consideramos que indagar sobre el sentido de lugar de los estudiantes, permite realizar adecuaciones curriculares para desarrollar experiencias de aprendizaje basadas en el lugar y de pertinencia social.

ID: 616: Educación Ambiental para la Paz - Sindy León, CO

En los últimos 10 años Medellín ha recibido cerca de 69 mil personas desplazadas desde áreas rurales a causa del conflicto armado. Ahora, tras la firma del acuerdo de paz en un escenario de postconflicto, miles de familias desplazadas siguen viviendo en la periferia de la ciudad en condiciones de vulnerabilidad, situación que podría generar nuevas formas de violencia. En este contexto ARTEFACTO utiliza el arte y la educación ambiental para construir una cultura de paz. Hace dos años estamos trabajando con algunas familias en un proceso educativo que usa el arte como puente entre creatividad y conocimiento científico. Con grupos de niños exploramos el territorio desde aproximaciones pedagógicas alternativas, que en Colombia con frecuencia están limitadas a familias de alto poder adquisitivo. Esta exploración insitu promueve en los niños y sus familias lazos de convivencia, fortalece la noción de vida y su valor supremo, lo que facilita la paz en sus comunidades. Nuestra propuesta documenta el proceso y cuenta algunos resultados en la mejora de la autoestima, formación de liderazgo en los niños, fortalecimiento de redes de vecinos entre los padres y participación política local. Hemos descubierto que estos elementos generan un ambiente de acogida a la diferencia, en donde el concepto *bio-diversidad* cobra validez porque reúne la noción de vida y diversidad

ID: 938: The Ability of Nature to Foster Growth - Maddie Dineen, US

Research on foster children in environmental education either doesn't exist or is very hard to find. While there is ready information about ADHD (attention deficit hyperactive disorder) in foster children (Benedict, Zuravin, Somerfield, & Brandt. 1996; Pecora, Roller White, Jackson, & Wiggins. 2009; Oswald, Heil, & Goldbeck, 2010; Malone & Tranter 2003; Pilowski 1995; Garland et al, 2001; Price et al, 1998), and the ability of environmental education to reduce impacts and symptoms of ADHD (Kaplan, 1995; Wells, 2000; Strife & Downey, 2009; Jackson, Tester & Henderson, 2009; Dadvand et al, 2015; Louv, 2008; Kuo & Taylor, 2004; Taylor & Kuo 2009; Hacking, Barratt, & Scott, 2007). Therefore, I will create a study that measures the impact environmental education programming will have on foster children with ADHD. The question I will attempt to answer is (1) Can environmental education programming cause a reduction of ADHD symptoms in foster children? And (2) if so, to what extent?

ID: 42: Living Wild - Daniella Roze des Ordon, CA

This is a story that will take you into the high mountains of the Sawtooth Wilderness in eastern Washington, where a group lived for one month as humans have for thousands of years, nourished by wild foods, walking the mountains with pack basket, buckskin clothes, bow and arrow, and digging stick, while finding shelter in cave and hand-made debris huts. Living Wild touches the depth of our humanity, illuminates the possibility for thriving community, resilient culture, and personal transformation, while fostering a life sustaining relationship with the mountains. Daniella will share a journey based on rekindling ancient knowledge and honoring the earth as a living organism, while transforming the gifts of the natural world in order to provide food, shelter, and clothing (Vilden, 2010). The presentation weaves together photography, story, and poetry, breathing life and personal experience into the foundations of deep ecology, eco-psychology, ethnobotany,

anthropology, and sociology, offering a refreshing and profound account of Living Wild.

Policy and EE

ID: 114: Environmental and Sustainability Teacher Preparation: A Global Perspective - Maurice DiGiuseppe, CA

Worldwide efforts to reorient initial teacher education (ITE) programs toward environmental and sustainability education (ESE) have met with limited success (Ivarez-Garcia, Sureda-Negre, & Comas-Forgas, 2015; Nolet, 2009). In this era of ever-increasing environmental degradation "where the need for proficient pre-college ESE educators is so great" one wonders why ESE in ITE continues to be so greatly marginalized on a global level? Although many have called for enhancing ESE in ITE (General Teaching Council for Scotland, 2012; Ontario Ministry of Education, 2009; UNESCO, 2005), information from many parts of the world clearly indicates that ESE is accorded neither the comprehensive programming prominence nor the curricular importance it deserves (Lozano et al., 2013; Mills & Tomas, 2013; Swayze, Creech et al., 2012). Needless to say, ESE in ITE is a global concern, and while many highly localized enhancement efforts may be found (Abramovich & Loria, 2015; Author et al., 2016; Summers, 2010; Varella-Losada, Perez-Rodriguez et al., 2015), these have not resulted in the comprehensive improvements needed to adequately prepare schoolteachers to address ESE in the pre-college classrooms of the world. Effective solutions to this urgent global problem continue to elude us unless we acknowledge that a serious problem exists; join hands on local, regional, national, and international levels to discuss and analyze the issues in a global context; make reasonable and attainable plans for improvement; and take decisive action. In Canada, a National Roundtable focused on enhancing ESE in the nation's faculties of education (Roundtable 2016) was held in June, 2016, at Trent University in Peterborough, Ontario. Roundtable 2016 involved a broad range of sustainability educators, non-profit organization representatives, and policy makers from across Canada who engaged in keynote presentations, research colloquia, panel discussions, and best practice workshops aimed at finding solutions to the ESE in ITE conundrum. Roundtable 2016 resulted in a national action plan for enhancing ESE in ITE; a declaration (the Otonabee Declaration) articulating the group's core ESE in ITE values; a resource-rich website (www.esefacultiesofed.ca); and, a number of relevant publications for disseminating and mobilizing the roundtable's outcomes (e.g., Author, 2016). Roundtable 2016 organizers and participants continue in their efforts to share the proceedings with others around the world, and to find ways to transform the roundtable's outcomes into tangible products that may be used to enhance ESE in ITE in Canada and beyond. Although Roundtable 2016 stands as a resoundingly successful effort in helping to enhance ESE in ITE on a Canada-wide basis, there is an urgent need for grass-roots efforts such as this to not only be shared and discussed widely, but also to be repeated and broadened to an international level where ESE in ITE stakeholders from around the world may come together to find solutions to this unrelenting, worrisome, and vexing problem. In this session, we will share insights from Roundtable 2016, and discuss ways in which we may join hands to further the cause internationally.

ID: 50: Environmental and Sustainability Education in Canadian Teacher Education: National Agency and Activism - Maurice DiGiuseppe, CA

The need to prepare young people to become effective stewards of the environment has never been more pressing. Enthusiastic teachers are in an ideal position to promote and advocate for environmental and sustainability education (ESE) in the school system. There is an urgent need to effectively prepare pre-service teachers (student teachers) to take on this role and to help them build effective praxis. Historically, Canadian pre-service teacher education has largely neglected this realm, with good practice being patchy and inconsistent, and dedicated instructors often thwarted in their attempts to get such work prioritized. In June 2016, our team hosted a National Roundtable on Environmental and Sustainability Education in Pre-service Teacher Education in Peterborough, Ontario, Canada. It brought together a range of stakeholders interested in promoting ESE in teacher preparation. Teacher educators, researchers, policy-makers, Aboriginal scholars, K-12 teachers, graduate students, and community partners met to establish a new Canadian network dedicated to strengthening ESE in pre-service teacher education. The Roundtable provided opportunities to analyze ESE in Canadian teacher preparation programs, share existing research, exchange teaching strategies, and identify challenges and barriers to more effective programming. A collective Action Plan emerged from the event with the aim of catalyzing curricular, pedagogical, and professional responses that can improve ESE in pre-service teacher education programs across Canada. The Roundtable also resulted in the Otonabee Declaration, a document written and signed by participants, calling for Canadian Deans of Education, Ministers of Education, and Colleges of Teachers to make environmental education a required component of initial teacher education across all of Canada's provinces and territories. The focus of the presentation will be the outcomes of the National Roundtable and the path it is creating through its Action Plan, for embedding ESE into teacher education in

Canada.

ID: 387: Bridging relationships between university and educational settings by supporting Environmental Education for Sustainability (EEfS) implementation - *Sylvia Almeida, AU*

Graduate teachers who seek to implement environmental education for sustainability (EEfS) receive little support (Barnes, Moore & Almeida, under review). A lack of support has been identified as one of the key reasons for leaving the teaching profession in the first few years after graduation (Fresko & Alhija, 2014). While EEfS still sits as a cross curriculum priority in the national curriculum it has disappeared from the newly introduced Victorian curriculum.. As a consequence, a mismatch is apparent in the emphasis Monash University places on teaching EEfS especially in its Education (Early Childhood/Primary/Masters) degree courses compared with many everyday classrooms. An important avenue for supporting new teachers is to establish collaborative communities that offer a supportive space to learn and work together, which in turn, reduces attrition rates amongst early graduates (Darling-Hammond, 2011). This paper draws on an ongoing research program aimed at developing collaborative spaces oriented towards professional learning communities that capitalise on existing relationships between teacher educators and new graduate teachers. It attempts to bridge the theory-practice gap by developing opportunities for teacher educator-graduate teacher partnerships that go beyond university education into the field. On the one hand it will foster communication with other teachers and teacher educators thereby offering avenues for sharing and learning. On the other hand it will also provide expertise, advice and resources in EEfS from partner community organisations. These teachers-teacher educators-community leaders partnerships would foster the confidence of new teachers alongside developing pedagogical skills and content knowledge to engage students in EEfS. Involving experts from community organisations will also help foster graduate teachers' links with community as well as model use of real world learning and teaching situations. While being beneficial to new teachers it also supports teacher educators in further developing university content that better addresses the current needs of practitioners.

ID: 561: Responsible Futures: embedding ESD throughout the culture of universities and colleges - *Quinn Runkle, GB*

To ensure all students leave formal education with the knowledge, skills, and attributes to tackle the world's greatest challenges, educational institutions need not only to transform individual courses but to transform the culture of institutions themselves. Research conducted by NUS over the last 7 years demonstrates significant demand from students to see sustainability content and pedagogy embedded across their learning experiences. This demand, coupled with the need to provide fit-for-purpose 21st century educational experiences, provided the impetus to design a framework to assist institutions in creating change. Responsible Futures is a programme developed by 13 UK universities and colleges, in partnership with their students' unions, and facilitated by the National Union of Students. It enables whole-institution change by embedding education for sustainable development (ESD) throughout the formal, informal, and subliminal curricula. 24 institutions, working in partnership with their students' unions, have taken part in the programme. Collectively, they have completed over 500 actions to embed ESD throughout the culture of the institution. These actions cover a range of themes including: establishing baselines and benchmarking existing activities; developing strong internal leadership for ESD; enhancing institutional policy and achieving high-level commitments; and measuring and evaluating the impacts and outcomes of this work on the institution and its students.

ID: 850: The Community Sustainability Incubator: A New Model for University-Community Collaboration and Resilience Building - *Harold Glasser, US*

This presentation will outline Western Michigan University's progress creating a Community Sustainability Incubator-a "do-tank for thinkers"-that serves as a regional hub for reimagining and reinvigorating community and economic development. It serves as a living, learning laboratory for building of new forms of cross-institutional collaborations, design and evaluation of green products and social innovations, testing new of technologies, rapid prototyping, policy testing, and training. We desperately need examples of tangible, inspiring spaces that buck conventional wisdom and demonstrate how we can catalyze large-scale transformative social change and leverage collective impact by focusing on the root, systemic, and intertwined causes of problems and breaking down the disciplinary, organizational, cultural, and institutional silos that limit collaboration, foster bias, and sap our energy and creativity. The Community Sustainability Incubator is grounded in

the belief that the solutions to our community's problems lie in creating a safe and inspiring environment where the right questions can be asked and we can create new partnerships that tap into the collective wisdom, creativity, and energy of our community. It's a promising and transformative vision akin to Andrew Carnegie's culture shaping effort to build and equip public libraries throughout the United States to advance the public interest and we believe that it has similar potential and opportunity for replication.

ID: 552: Proposing A Global SDG Charter for Universities, Colleges and Students - Iain Patton, GB

As an alliance of the world's higher education sustainability networks, we invite the participation of institutions to co-create an international charter to better integrate the Sustainable Development Goals with education programmes and activities. This interactive session will hold discussion on a potential SDG-based international Charter, and other possible ways in which the national and international tertiary education community can take collective action and leadership for the goals. There is great potential in finding a way all of us can easily and openly communicate, collaborate, and share knowledge and experience on regional, national and international levels. Such synergy around the shared language of the SDGs could unlock highly diverse and productive sector and cross-sector collaborations. If we can speak with one voice our transformational contribution to global sustainability will be better recognised and supported at national and intergovernmental levels. As educators for future generations of leaders, Further & Higher Education (FHE) institutions have a critical responsibility for the successful implementation and realisation of the SDGs. Education is a transformational element in realising all goals. This responsibility should be seen a significant opportunity for FHE institutions to be recognised as the catalysers and leaders of action.

ID: 43: Environmental Education of Rural Farmers in East Africa and Its Implications for Sustainable Development. A Case of Uganda - Gerald Ssengendo, UG

This paper dealt with environmental education of Rural Farmers in Uganda and its implications for national sustainable development using primary data. The study used survey research design and questionnaire was the instrument used for the study. The sample size of 526 was randomly selected from four communities in the two Local Government Districts of Mityana and Mubende from the total population of 1,210,519 rural farmers. The findings revealed the presence of the environmental problems such as erosion, unprotected water sources, the indigenous practices used by their elders has been abandoned such as use of dug wells in their compound to collect water during raining season; cutting down trees from the forest reserve for sales, they have not been involved in mixed cropping and crop rotation, bush burning and cutting down of trees in the old forests for farm land, they have not been involved in any lecture about the environment and they will like to participate in any of the seminars on environmental issues. The paper concluded that inclusion of rural farmers in the environmental education will encourage the protection and conservation of the environment and that the rural farmers stick to environmentally friendly style for more economically beneficial agriculture and recommended among others that environmental education through seminars and workshops, that monthly sanitation exercise should be encouraged to enhance environmental protection, planting of trees by the rural farmers will go a long way in protecting the environment which enhance sustainable development.

ID: 125: Study on the Cases of China-Africa Environmental Education and Technical Collaboration - Fengting Li, CN

To meet the requirements of the UN Sustainable Development Goals (SDG) and the needs of African countries, China have been promoting China-Africa cooperation through South-South Cooperation. This proposal will explore how environmental education and technical cooperation reach a wide range of beneficiary communities to help address environmental challenges and play a fundamental role in the achievement of the Goal 4 Quality Education and Goal 6 Clean Water and Sanitation of SDGs with pilot projects and case studies. The joint programme by the United Nations Environment Programme (UN Environment) and China's Ministry of Science and Technology has completed the two phases cooperation focusing on strengthening the climate change adaptation and mitigation capacities of African countries and raising awareness of climate change technologies and their impacts among decision-makers, with research and pilot projects in 16 African countries on drinking water, effective water quality monitoring and combating desertification in Sahara desert, Nile river catchment and Tanganyika lake. Around 1,000 technicians, officers and farmers in African countries have benefited from workshops, training programmes, study tours, on-site training and scholarship sponsored postgraduate programmes. Meanwhile, environmental education and capacity-building are also practiced widely for African governmental officials,

technicians and professors, through training for indigenous communities, information exchange, seminars and field trips for high officials in charge of environment and planning, and above all, master and Ph.D programmes on the environment hosted by Tongji University. It is proposed to probe into the flagship projects hosted by UN Environment-Tongji Institute of Environment for Sustainable Development (co-established by UN Environment and Tongji University), including African mayors workshop on green city planning and degree programmes to host African officials and students to find out how environmental education cultivate leadership for future decision-makers.

ID: 482: Pit Latrine Harmful Effects on Groundwater and Water Source Quality in Rural Villages: Awareness and Education Combined with Action to Minimize the Impact - Stanis Koko, CD

Most of rural area people uses either groundwater or source water for drinking water and pit latrines for sanitation. Most of wells and water sources are not protected. Some of people lives at the waterside and near, and their latrines are constructed too near wells and water sources. The purpose of this project was to make people aware of the impact of pit latrines on environmental and human health, and determine whether awareness and education combined with action could protect groundwater and source water from contaminants originating from pit latrines. Door-to door awareness and education of people, construction of adequate pit-latrine that are environment-friendly and water wells protected and protection works of water well and water sources in partnership with households were implemented in the villages Ntondo, Mpaha and Mabinza in the territory of Bikoro. Through these interventions the populations reached are aware of harmful effects of pit latrines on quality of groundwater and water sources by manifesting the wish to get adequate household pit latrines and protected wells, and make their own initiatives to protect these sources of water. The approach of environmental awareness and education in combination with actions ‘ provision of adequate pit latrines, water wells protected ‘ appears to reduce harmful effects of pit latrine on groundwater and source water and improve environmental and human health.

ID: 729: Environmental education for sustainable societies - The Ecosystem Services and Environmental Services of the Water Producer Program (PSA) in the city of Salesópolis, São Paulo, Brazil - Rosely Imbernon, BR

Ecosystem Services are those provided by natural ecosystems and the species that compose them, in sustaining and fulfilling the conditions for the permanence of human life on Earth (Daily, 1997). In this way, the Environmental Services are configured as individual or collective initiatives that can favor the maintenance, recovery or improvement of ecosystem services. There are several definitions for ecosystem services, and they all invariably show the benefits generated by ecosystems to society and guarantee human life on the planet. The bad use of the soil caused by the unsustainable agricultural practices, among which the deforestation and the fires, together with the impact of the infrastructure works. Failure to comply with agricultural zoning criteria have been pointed out as the main causes of the degradation of areas in Brazil, and the main consequences are the fall in food production, the fall in soil productivity, and the production of water in large River basins due to lack of conservation of riparian forests and soil erosion (Shiki, 2015). As a result, a process of marked reduction of ecosystem or environmental services, with great damages for landowners and for society. Environmental services are incorporated into the concept of sustainable economy, so as to provide not only human well-being but at the same time to protect the environment in an economically balanced way. In Brazil, Public Laws and Policies for the protection, conservation and environmental repair have several economic incentive instruments. Among these instruments, Payment for Environmental Services (PSA in Portuguese) is an innovative policy whose main objective is to transfer resources, monetary or not, to those who help conserve ecosystems, thus benefiting the community. In the state of São Paulo, the State Policy on Climate Change establishes the Forest Remnants Program, whose objective is to promote the delimitation, demarcation and recovery of riparian forests and other types of forest fragments. The program provides payment for environmental services to beneficiaries, as well as economic incentives to voluntary policies to reduce deforestation and environmental protection to encourage the preservation and restoration of native forests. The PSA is an example of a project aligned with this policy, as an initiative of the National Water Agency (ANA), and aims at water protection in Brazil through initiatives to reduce erosion and sedimentation of water sources in rural areas. The projects, of voluntary adhesion, involve rural producers who propose to adopt practices and conservationist management in their lands aiming at the conservation of soil and water. The PSA provides a bonus to users that generate positive externalities in the country's watersheds. One of the main objectives of this project is to raise the awareness of water producers and consumers of the importance of integrated river basin management and their protection. The research involves interviews with local political managers (mayor, environment directors) and integration workshops with the rural producers of the community of Salesópolis, 50 km from the city of São Paulo (above 12 million inhabitants), and the source of one of the Main rivers of the state, the Tietê river. In addition to workshops focusing on environmental education for sustainable societies, two

parameters will be discussed that involve the management of water resources in Brazil: quantity and quality. Concerning quantities, the practices of land use, maintenance of vegetation, silting of water courses will be discussed; In terms of quality, it was proposed to monitor the quality of physical and chemical parameters as indicators of environmental improvement.

ID: 252: ESD Policy and Implementation: Practices that Work - Melanie Parker, US

In 2015, Maryland (USA) received the Future Policy Silver Award from the World Future Council for their state policy of an environmental literacy high school graduation requirement. From policy to implementation, countries, states, provinces, and districts are enacting policy to implement education for sustainable development (ESD). With various successes and struggles, ESD implementation across a range of continents and countries has some notable commonalities. Using a distilled framework of strategies compiled by the World Future Council and the real experiences of a Maryland school district in putting policy into practice, participants will have the opportunity to engage in a working session to review and share these common practices that include policy formation, adoption and implementation.

ID: 555: Nationwide LYKE-network promoting local environmental education in Finland - Niina Mykra, FI

There have been Nature Schools in Finland for 25 years. Their task has been to promote nature and environmental education: they don't have pupils of their own, but they offer educative day programs for groups from normal schools and kindergarten, and training courses for teachers. LYKE-network was started in the project year 2010. Visitor Centres of national parks, Youth Centres and Camp School Centres has joined Nature and Environmental Schools in the LYKE-network. Every one of these has already before LYKE-network provided services for the groups from kindergartens and schools in the field of nature and environmental education. Also others, who have objectives of the same kind, are welcome to be a member in the network. The goal of the co-operation is to communicate together as LYKE-network to the customers and to the policy makers, give support to the members of LYKE-network (for example training courses), deliver good practices from professional to professional and help in co-operation with municipalities and schools. There is a certification system for LYKE-network. It is based on the self-assessment on the first hand, the confirmation from the board of association on the other. There is also a peer reviewing system. The aim is to improve the quality of the services. The customers get help from the experts of LYKE-network for their daily job with pupils in the field of environmental education. The day programs and trainings are based on the national core curriculum of compulsory education. Learning is experimental, experience-based, hands-on learning in authentic learning environments. The final goal is that every kindergarten and school in Finland have a possibility to get professional help with their environmental education from LYKE-network. The resources for building the network has come from the Ministry of the Environment and the Ministry of Education and Culture.

ID: 774: Impacts of the Environmental Education Policy Framework in Ontario: A 10 year perspective - Elanor Waslander, CA

In 2007, the government of Ontario released the Bondar Report which outlined 34 recommendations to support environmental education in k-12 schools in Ontario. From this report, Acting Today, Shaping Tomorrow was implemented as the Environmental Education Framework for Ontario schools. A decade after the framework was implemented, much is left to address. This session will examine how the Ontario EcoSchools program is implemented as a support to Acting Today, Shaping Tomorrow and how the framework has both allowed for improvements to the integration of environmental education, but has also left large gaps to be addressed.

ID: 784: Integrated instructional programming models for development of 21st century education core competencies - Walter Gooderham, CA

According to the international Assessment and Teaching of 21st-century Skills (ATC21s.org) project, students require specific core competencies to be successful in an increasingly uncertain future. It recommends pedagogical frameworks that promote integrative approaches to educate for a critically minded, creative, and conscientious citizenry. Integrated secondary school courses (i.e. 3-6 curricula interwoven; often through experiential methods), specifically those focused on Outdoor, Experiential, and Ecological Education (OE3), provide a high-value alternative to the conventional education model for '21st-century competency' development. The research applied an adapted Knowledge Building Analytic



Framework (KBAF) Template for Analyzing Environments and Assessments, to gather data from secondary-level students in Whitehorse, YT, Canada. It found that students reported on average that Integrated OE3 programs were 71.3% successful in developing their 21st-century competencies vs 47.8% success for those in conventional models. Ecological Literacy, added by the researcher, returned the highest gradient (54.7 points) at 88.2% for the former vs. 34.5% for the latter. The findings show how student-centred educational policy, like that enacted by Yukon Education, can be highly effective at fostering 21st-century competencies while concurrently promoting environmental and sustainability education. Yukon Education's Wood Street School is a long-standing exemplar of government curriculum policy that both reflects and encourages a meaningful engagement with community and place.<http://bit.ly/2p2j5VT>

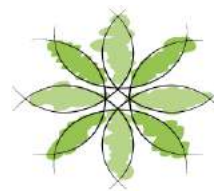
ID: 799: Why and How PISA Distorts Environmental and Social Goals - Alberto Arenas, US

The Programme for International Student Assessment (PISA) is the world's most widely disseminated test, administered in its most recent reiteration (2015) to about 540,000 students in 72 countries. Administered triennially, the exam tests 15 year-olds in a multiple-choice format in three main domains: Science, Reading, and Mathematics. According to the Organization for Economic Cooperation and Development (OECD), the test's creator and manager, PISA is important because it may contribute to the UN Sustainable Development Goals of ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. In this roundtable I offer an analysis as to why PISA, instead of promoting such lofty goals, actually does a disservice to environmental and social justice. By means of in-depth interviews with 20 low-income students from various Latin American countries who took the test when they were 15 years of age, along with a literature review as to the effects of the test on the educational systems of participating countries, I offer a somber picture of the test by explaining the negative consequences of the PISA rankings as it relates to environmental and social sustainability. Some of the findings of my analysis include: (1) By emphasizing a narrow range of measurable aspects of education, PISA takes attention away from less measurable educational objectives like environmental, physical, moral, civic and artistic development. (2) As an organization of economic development, OECD is naturally biased in favor of the economic role of public schools. But preparing young men and women for gainful employment should not be the only or even the main goal of education. Instead, in the words of the philosopher Glenn Gray, education should "prepare students to grasp the simple fact that their selves are fully implicated in those beings around them, human and non-human alike, and have learned to care deeply about them." (3) While standardized testing has been used in many nations for decades, PISA has dramatically contributed to an escalation in such testing, leading to an overreliance on quantitative measures. This has seriously distorted the concepts of inclusivity and equitable education for the most marginalized populations in society.

ID: 823: Redefining EE in urban setups in the UAE - Ajita Nayar, AE

In the UAE, the level of economic development in just about 42 years can match that of other countries which have achieved the same after more than century. Hence it becomes more challenging to prove the relevance of EE and integrate it with conventional education. One such initiative with this agenda was undertaken in a group of high school students and teachers in the UAE. They had the rare opportunity of going on industrial visits to local cement and glass designing factories and observe how businesses can be rendered profitable yet environmentally and socially sustainable. The opportunity to see a furnace firing the raw material for cement at temperatures above 1000 degrees C and also understand why coal (despite being a fossil fuel) is still a more preferred source of concentrated energy in the cement industry as compared to other alternatives was understood. They also studied how large clouds of dust, inevitable during cement production, are captured to the maximum extent with technologically advanced contraption. These experiences proved to be eye-openers both for the teachers and students. The real-time experience of a commercial industrial activity maintaining their environmental standards changed their perception about these enterprises being merely profit-driven, a consumer of resources and a source of pollution. They were able to appreciate the role played by technology and environmental stewardship in shaping the future of sustainable development. In the backdrop of more than 66% of the world population living in urban areas (Affairs, 2014), this study explores a different approach to urban EE in the future. This approach suggests introducing policies within educational systems that encourages greater collaborations between educational institutions and other organisations in urban areas. This could offer learning experiences to promote renewed thinking processes to achieve sustainable development. Only then can EE hope to remain relevant in the future.

ID: 143: Transforming Sariaya, Quezon, Philippines Into A Climate-Smart Eco-Town - Ronnie Lindog, PH



This research looks into ways of transforming Sariaya, Quezon into Climate-Smart Eco-town. Philippines is an archipelago within the 'Pacific Ring of Fire'. It also home for bio diverse species, majority of them are endemic in the country, which are being threatened by the effect of climate change. Sariaya, Quezon is a major agricultural town that serves as the food basket of its surrounding municipalities. Forest area in Mount Banahaw within its territory is flourishing with different species of wildlife, and an ecosystem that essential to environment. Marine resources that provided by Tayabas Bay are among the prime commodities of its local residents, with its vast municipal water and lengthy shorelines. It lures numbers of locals to reside along its coastlines to be close on this livelihood, eventually exposing them to storm surge and sea level rise risk. In the midst of climate change, the National Government of Philippines mandated the Local Government Units (LGUs) as the frontliners in climate change adaption and disaster mitigation. The goal is to prepare their constituents to be resilient and ensure the LGU can response to the climate change challenges. The LGU-Sariaya has enormous task that includes environmental protection and provision of essential needs to its citizens. With more than 2000 vulnerable families, the LGU-Sariaya should have plans and programs to transform their town as Climate-Smart Ecotown. Geohazard Mapping and identification of the vulnerable families are among the steps that the LGU must do. Appropriate land uses and its corresponding ordinances will be the key in achieving this goal. Capability building of personnel is essential to ensure the readiness of LGU's to response and lastly, the education of its citizens on the effect of climate change and how can they adapt to its impact.

ID: 420: The role of open distance education and e-learning in developing climate literacy in South Africa -
Muchaiteyi Togo, ZA

This paper builds on previous research on climate change education in the South African curriculum ' (Togo, Zhou and Kahn, 2015). The 2015 research established the presence of climate change content in the school curriculum. However, the challenge was in dissemination of that content due to a number of factors including capacity and resources. The research also established that in higher education in South Africa, climate change content is not integrated in many university programmes and chances are many students leave these tertiary institutions without having been exposed to climate change issues as part of their education and learning. The purpose of this paper is to determine how distance education can help as a medium for delivering climate change education and hence developing climate literacy in the higher education sector. A qualitative research design informs this research. The methodology for the research follows a critical analysis of the openness dimensions of distance education to determine how they play a role in developing climate literacy. These include open access, geographical reach, learning pace, learning context and equity of access. Open distance education instruction design and technology, particularly e-learning is also critically reviewed to establish its pros and cons in developing climate literacy. This research is still on-going. However, it has been established so far that delivering climate change education via distance education has the advantage that the curriculum is most likely to reach many people who would otherwise not have been able to study. This is because distance education offers flexibility in terms of time and space. In addition the e-learning is based on a blend of instruction media which cater for diverse learning needs which, when used to deliver climate change education, increase the chances of developing climate literacy among students. Future research can focus on specific cases of ODeL to establish climate change content in learning programmes and how the openness dimensions of distance education and e-learning are facilitating the delivery of the content as well as whether they are effectively developing climate literacy among students.

ID: 649: Inspiring Climate Change Action Through Community Dialogue - Novel Format - Maria Loffredo Roca, US

The UN Sustainable Development Goals serve as inspiration for communities working on positive responses to climate change. These goals were the foundation for the fall 2016 Terry Tempest Williams Student Dialogue at Florida Gulf Coast University. Students, professors, and community members came together to discuss the Sustainable Development Goals and how to use them to respond to climate change. The Dialogue examined current actions taking place on the FGCU campus and in the surrounding community. It also explored what the joint community of university, local, and state leaders can do to respond to the impacts of climate change. The event was conducted in World Caf[®] format, and the tables were organized by various topic areas: science & climate change, agro- ecology/FGCU Food Forest, elections and political participation, community partner/community mobilization, and the FGCU legacy. The result of the dialogue was the creation of a Joint Plan of Action Against Climate Change, which aims to provide a roadmap for achieving climate justice on campus and within the wider community. This plan, along with the United Nations Sustainable Development Goals and the Earth Charter, are the foundation for an Honors Service Lab based on climate justice that students will take in the fall 2017 semester. The goal of this course is to provide a classroom setting where students can come together to achieve the

goals laid out in the Joint Plan of Action against Climate Change. Modeling the Terry Tempest Williams Student Dialogue, this proposed WEEC session would be conducted in World Caf   format and will invite participants to explore critical questions about the SDGs, climate change, and action plans. This format can be used as a tool to build bridges among diverse points of view, and to promote action in participants' own communities as they address the impacts of climate change.

ID: 406: Pol tica Global y Educaci n Ambiental - Rafael Ramirez Beltran, MX

No hace mucho tiempo, la crisis ambiental provocada por el estilo de desarrollo, dej  de ser inter s de algunos (muy escasos cient ficos) y gente preocupada por aspectos concretos, hasta que en los a os setenta y m s contundentemente despu s de 1992, en Conferencia de R o de Janeiro sobre Medio Ambiente y Desarrollo, es asumido por la inmensa mayor a de los gobiernos de los pa ses del mundo como una agenda global inevitable, de pol tica p blica e indispensable en el siglo XXI. Se evolucion  de un conservacionismo a un replanteamiento hacia una nueva racionalidad ambiental. En este proceso se fueron incubando y yuxtaponiendo los conceptos de ecodesarrollo, desarrollo sustentable, sustentabilidad y los m s recientemente de *buen vivir* y la construcci n de una modernidad alternativa-social. La sustentabilidad, se ha introducido como un ingrediente indispensable en las m s diversas pr cticas y acciones sociales en el segundo lustro de la segunda d cada del siglo XXI: de ideas notables, hasta remedio, posicionamiento, valor de mercado, elemento  tico o est tico, pol ticas p blicas, planes de gobierno, partida presupuestal, ingrediente arquitect nico o educativo, forma de optimizaci n, balance social perfecto, hasta formas de gobierno. En este contexto:

 Se est  teniendo en los distintos niveles de los gobiernos, precisi n conceptual de la sustentabilidad del desarrollo que definen las pol ticas p blicas ambientales y la educaci n ambiental que de ella se puede derivar? Lo que se analiza en este trabajo es como el t rmino sustentabilidad a nivel planetario, en los  ltimos a os est  siendo asociado a m ltiples connotaciones, de diversos or genes epist micos, te rico y metodol gicos, lo que impacta en forma definitiva en la pr ctica en dos procesos de cultura ambiental: la pol tica p blica y la educaci n ambiental.

Hasta ahora, en este abanico de posibilidades, encontramos 23 ejemplos diferenciados de entender y practicar la sustentabilidad: desde filos ficos hasta pr cticos. Se recomienda mayor formaci n en t rminos cient ficos ambientales a los tomadores de decisiones.

ID: 592: Enhancing achievement of SDGs through environmental sustainability practices in the public sector in Kenya - Ayub Ndaruga, KE

Kenya is committed to demonstrate practically that the public sector can lead in practicing environmental sustainability. The government has made it mandatory for all Chief Executive Officers (CEOs) in the public sector to sign annual performance contract (PC) targets. The PC targets are expected to be cascaded to every member of staff within the public sector. Since 2012, Environmental Sustainability is one of the key PC targets each CEO is expected to be appraised on annually. The National Environment Management Authority (NEMA) is the institution tasked with elaborating this PC target, monitoring its implementation which includes appraisal for each public sector institution. NEMA has elaborated environmental sustainability within six areas, namely environmental sustainability planning, pollution control, climate change, ecological enhancement, environmental awareness, and strengthening partnerships. For the last 5 years, institutions have been customizing these elaborate sustainability targets based on their contextual challenges. Implementation of this target has been challenging to most institutions since they argue that environment is not their key mandate. Some institutions have hired consultants to undertake this assignment for them and this denies the institution the opportunity to build innovative locally-owned and simple approaches of promoting sustainability. NEMA has engaged in a capacity-building program to demonstrate how locally-owned sustainability initiatives could be nurtured at a cheaper cost. Some institutions have demonstrated environmental economic and social transformation and have domesticated unique innovations. This paper explores the experiences Kenya has gone through in championing sustainability and green economy within the public sector using the mandatory formal performance contracting process and explains how this initiative is helping Kenya to attain Sustainable Development Goals (SDGs).

ID: 685: La pol tica nacional de Educaci n Ambiental en Colombia: resultado de un proceso formativo - investigativo, para su apropiaci n e institucionalizaci n en el  mbito local - Maritza Torres Carrasco, CO

Esta ponencia presenta los desarrollos de la educaci n ambiental en Colombia, a trav s de un proceso participativo instalado

en el territorio, por el Programa de Educación Ambiental del Ministerio de Educación; el que ha posibilitado la construcción de una Política de Educación Ambiental, vinculante de los actores sociales y sectores del desarrollo, asociados a las dinámicas ambientales y educativas (contextos naturales y socioculturales), para la institucionalización efectiva del tema en el ámbito local del país.

El Programa instala esta política, gracias a una estrategia formativa - investigativa, que favorece su relación dialógica con las experiencias locales a partir de una lectura crítica del contexto, orientada al reconocimiento de: a) las realidades educativo ambientales y sus posibilidades de transformación, b) las capacidades de movilización del tema en la acción local, y c) las necesidades de cambio en la educación, en lo ambiental, y su contribución en a transformación social: cultura ambiental sostenible para Colombia.

Conceptos "clave" para el marco teórico-conceptual de la estrategia: a) **educación ambiental:** carácter emancipador (transformación social); b) política pública: enfoque emergente (acción colectiva); c) **participación** (inclusión) - **apropiación** (empoderamiento); d) **formación integral** (complejidad ambiental) - **investigación** (lectura de realidades complejas); e) **investigación en la acción:** originada en la acción de una estrategia formativa; f) gestión (sistémica); y g) **institucionalización:** incorporación en el desarrollo local.

Discusiones emergentes, desde la implementación de la estrategia, para la interpretación de la Política de E.A. como política pública: 1) su realidad nacional ("ideal") vs. la singularidad de las realidades concretas ("topos" locales); 2) el rol de los actores de la E.A. en su institucionalización vs. la institucionalidad; 3) la investigación propia del proceso formativo, posibilitadora de miradas que relacionan: internalidad - externalidad; 4) el carácter performance de la estrategia formativa y las implicaciones en su propia resignificación, y, la de las experiencias locales que acompaña.

ID: 815: Environmental Assessment Program of a provincial government with national projection - Claudia Terenghi, AT

Today's new environmental problems put us face to face with the urgency of an systemic approach to Environmental Education (EE), necessarily critical in values, holistic and from an environmental conception of human rights as the focus. At a national level, the Argentine Constitution guarantees EE as a right, which shows the urgency and the importance of a strategic policy, promoted by the State as a central actor. At an international level, the new Objectives for Sustainable Development, the conclusions of COP21 and COP22 and the *Laudato Si* Papal Encyclical, focus on the relevance of three interdependent factors--economic, social and environmental-- to take care of the "Common Home ". Over these pillars, the Ministry of Planning and Environment and Technological Innovation of the Province of the Chaco (Argentina), is developing a new strategy of EE, which includes all the communities that must necessarily know the existing problematics of their home town, to become aware and consequently act. This strategy is materialized in the training and articulated work with: 1) Formal education: training teachers for the development of community environmental projects with their students. 2) Non-formal education: training of environmental volunteers in several cities of the province. 3) Informal education: campaigns in social networks and graphic media as vehicles of sensitization and awareness of the community. 4) Build and coordinate the environmental management teams in communities. The territorial approach is based on the division into four provincial regions, covering different municipalities that face similar environmental problems that are more urgent to solve. This strategic work in EE is being considered as a model to be replicated all over Argentine Republic.

ID: 917: EE, ESD, and SDGs in Japan - Kumi Tashiro, JP

In Japan, "The Law for Enhancing Motivation on Environmental Conservation and Promoting of Environmental Education", which aimed at building a sustainable society, was promulgated in July and enacted in October 2003. The Law played a role in developing human resources on environmental protection and promotion by promoting the acceptability of environmental conservation and environmental education. It was revised as "Act on the Promotion of Environmental Conservation Activities through Environmental Education" in June 2011, as the necessity to expand the importance of environmental conservation activities and collaboration amongst government, private sectors, and NGOs/NPOs. Under the revised law, enhancements and promotion of "cooperation on promoting environmental protection and its activities" has been added as the old law was a system centered on the instructional provision. Specifically, the new Law made is possible for local governments to formulate "action plans for promoting environmental education by cooperative efforts" as a concrete form of promotion, enriching environmental education both at school and home, further enhancing human resource development and certification systems for facilitating collaboration on EE, developing, educational materials, introducing accreditation systems by the government, and expanding the opportunity for nature experience. In addition, introduction of an agreement system and support for business-led NGOs/NPOs were also added to promote collaboration and encourage

private sector and NGOs/NPOs to participate in the environmental administration. This study reported the latest movements on EE, ESD, and SDGs in Japan.

ID: 1042: The environmental education center systems in Taiwan and Korea and perceived roles of national - regional - local centers - Chankook KIM, KR

This presentation compares the environmental education center systems in Taiwan and Korea at the national, regional and local levels. We will present how EE centers are established at national-regional-local levels and how the roles are perceived differently among the levels. For that, we explain how the EE Acts describe the roles of EE centers and what EE comprehensive plans say about EE centers. And we also share the results of interviews with individuals who work in EE centers to identify their perceived roles of EE centers at each level. Based upon the Environmental Education Promotion Act of Korea, a national EE center and several regional EE centers are designated to promote environmental education. The discussions on articulated roles of national, regional, and local EE centers are ongoing. In Taiwan, four regional EE Centers are designated as integration platforms for resources to help promote the comprehensive development of EE among academia, schools, industry and society at large. They are set to carry out five missions; EE professional leadership, capability building, partnership & networking, technological support, and research & evaluation. In addition to comparison of functions, roles, funds and other institutional components, we will see how the roles of the regional centers are perceived different from the roles of national or local EE centers with focus on two regional EE centers: Southern Regional EE Center in Taiwan and GyeongGi Regional EE Center in Korea.

ID: 410: Review of the Unit-Based Sustainability Assessment Tool for alignment with GAP priorities and Sustainable Development Goals - Geraldine Kumalo, SA

The Decade of Education for Sustainable Development (DESD) ended in 2014 and in 2015 the Global Action Programme (GAP) on Education for Sustainable Development (ESD) has identified five priority action areas to advance the ESD agenda. This paper is based on a review of the Unit-Based Sustainability Assessment Tool (USAT), a tool developed during the DESD for use in Africa and Asia of UNEP's *Mainstreaming Environment and Sustainability in African (MESA) Universities Partnership*, to establish completeness and usefulness in aiding institution to contribute towards GAP priorities. While the GAP programme identifies priority areas, it does not specify the sustainability issues that institutions have to integrate in their policies, teaching and other functions. Hence the review of the tool, though guided by GAP priority areas, was based on the 17 Sustainable Development Goals (SDGs) of the new global development agenda endorsed in 2015, the 2030 Agenda for Sustainable Development. The research was informed by a qualitative design. The methods employed include documentary review of GAP priorities and SDGs to establish key areas and sustainable development issues for universities to focus on in taking forward ESD implementation. This was followed by an appraisal of USAT indicators, first to establish alignment with identified key areas and secondly, to identify sustainability issues (from the documentary review). The tool has elements of all the 5 GAP priority areas but the attention given to different priorities is not uniform. Priority areas 1: Advancing policy and 2: Transforming learning and training environments are to an extent, aligned to current USAT indicators; 3: Building capacities of educators and trainers is more implied than stated. In terms of SDGs, many USAT indicators were found to be vague as they do not specify sustainability issues most probably because of the purpose it was designed for. In its original form, the tool may only be partly useful in the implementation of GAP priorities but cannot be used to aid universities in contributing towards the achievement of SDGs. There is need to re-orient the tool to make it applicable to the post 2015 sustainable development agenda

ID: 844: Youth Engagement in Environmental Education - Brian Waswala, KE

I am a passionate environmental education specialist, formally with the United Nations Environment (UNEP), currently championing for Environmental Education (EE) mainstreaming in formal education through policy development. As a youth EE Specialist, I have been privileged to be actively involved in EE policy formulation and mainstreaming in various institutional, national, regional and international EE initiatives. These include the Eco-School Program in Kenya, [Green Universities Networks for Kenya](#), the development and implementation of the [African Environmental Education and Training Action Plan 2015-2024](#) and the [Kenya Climate Change Action Plan](#) among others. This is because it is essential that global citizens be aware of their environment and the effects of their consumption and production patterns. In so doing, I have been able to promote positive behaviour and attitude change towards environment sustainability; essential life-long skills on natural resource management; promote participatory citizen science in environmental monitoring (river quality

monitoring), an initiative that helps the national government monitor ecosystem health; develop capacity for communities in environmental resilience; and advocate for community participation in environmental conservation through indigenous knowledge. All these initiatives contribute to the achievement of [Kenya's Vision 2030](#), the [African Union Vision 2063](#), [UNESCO Global Action Plan on Education for Sustainable Development](#) priority action areas 1-5, [United Nations Environment Assembly Resolution 2/3](#) - Investing in human capacity for sustainable development through environmental education and training, [UNFCCC Youth for Climate Action](#) and a host of the Sustainable Development Goals. At present, climate change, poor waste management, poor urban development, and insufficient energy hinder development in many global south nations. I urge policy makers to actively invest in youth participation especially when developing EE policies, as this would be a sustainable low hanging fruit in the achievement of national and regional agenda and the SDGs.

ID: 1010: The Promise of Benchmarks and the SDGs for a Sustainable Future - Kim Smith, US

The creation of Agenda 2030 and the Sustainable Development Goals have received mixed response and face variations in implementation across countries. This is particularly evident in the United States, where no consistent standards exist for sustainability education. However, multiple models are being used or have been proposed that advance collective impact for policy and practice. This paper and session will explore how the Education for a Sustainable Future Benchmarks", Regional Centres of Expertise (RCE) on Education for Sustainable Development (ESD), and learning outcomes frameworks can offer powerful tools to support engagement and implementation for communities, non-profit organizations, schools and universities. The presenters will guide session attendees in reflecting on the various models and how they can be implemented within a broad range of contexts in order to guide education for sustainability. Both speakers are leaders of RCE Greater Portland and facilitate collaboration across sectors to advance sustainability in the Portland region and beyond.

ID: 645: A comparative analysis of EE Acts: Lessons learned and policy implications for the future - Judy Braus, US

How does having a national policy to support EE affect practice in a country? How can more countries develop national policies that help strengthen environmental education? In this presentation, members of the Global Environmental Education Partnership, a global network designed to strengthen capacity for environmental education, will highlight lessons learned from comparing national environmental education acts and looking at how these national mandates are helping to strengthen EE within countries around the world. We'll present a comparative analysis of EE Acts from countries including Brazil, Japan, the Philippines, South Korea, Taiwan, and the United States. In addition to looking at the strategies that have had the most impact, we'll explore the barriers countries faced in enacting their national laws and what trends exist among all the countries. In addition, we'll discuss how we can use these Acts to think about future policy making.

Social Responsibility and Agency / Activism

ID: 942: Inward Bound: How the Fields of Peacemaking, Social and Emotional Learning and Educating for Social Responsibility Can Impact EE Pedagogy in Outdoor Expeditionary Settings - Laura Parker Roerden, US

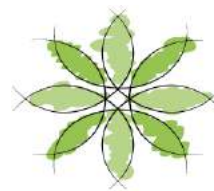
The field of educating for social responsibility in the U.S. over the past thirty years has morphed into various prevention programs such as conflict resolution, peacemaking, and more recently the field of social and emotional learning (SEL). What these fields have in common pedagogically are elements that research has shown to nurture pro-social skills and social responsibility in young people, a key desired outcome of EE and youth programming. This presentation looks at the integration of these practices in the demonstration marine science project Ocean Matters, an expeditionary EE project for U.S. teens working in Oahu, Hawaii; Utila, Honduras; and Grand Cayman, BVI. The goals of this presentation are multifold, including: how to deepen outdoor and EE programming by combining these Educating for Social Responsibility pedagogies in meaningful ways; multiple ways that youth benefit from this programming; how nature itself supports and broadens these outcomes; and how indigenous knowledge through storytelling and service or youth activism can be supporting elements. Based on anecdotal evidence provided by student follow-up up to ten years after their Ocean Matters experience and student journal writings, surprising youth outcomes can be gleaned. Deepening adolescents' relationship with nature by employing these pedagogies can: help inform youth identity, help young people find places they can belong, shore up families and communities by civic engagement and activism, and widen the concept of who belongs to our tribe.

ID: 782: Developing Awareness: Exploring the Use of Interiority Work to Increase Propensity for Environmental Stewardship - Cheryl Re, Canada

This study explores whether PhotoVoice can create an emergent ground for a shift in worldviews towards a propensity for environmental stewardship. Research was conducted in an impoverished neighborhood in the Dominican Republic where youth answered questions about the environment using photography. With discussion about the photos they took, using a methodology called PhotoVoice, participants explored their views and relationship to the environment and the effects of environmental degradation on themselves and others. Analyses of initial and end of study interviews revealed that these youth became significantly more knowledgeable and aware of the environment and how and why it is degraded in their community; this, in turn, increased desire among these youth to engage in environmental stewardship. This study provided an opportunity to explore a gap in literature in environmental stewardship and interiority work, and raised questions and possibilities for future research.

ID: 556: People and pest animals: Role of identity and feelings - Sally Birdsall, NZ

New Zealand (NZ) has a unique biogeography because of its 85,000,000-year isolation. Consequently, it has high rates of endemism: 80% of terrestrial, 51% of marine and 76% of its freshwater species are endemic. NZ was also the last landmass, excepting Antarctica, to be settled by people. When arriving, people brought with them a range of animals that have had a detrimental, sometimes fatal, effect on NZ's unique biodiversity. Recently, NZ's government has formulated policy to become 'pest-free' by 2050. Achieving this goal will require NZ society to mobilise and take responsibility for pest eradication. A group that will play a key role in realising this aspiration are today's teenagers, not only capable of exercising their agency now, but as future citizens. In order to help them take informed actions, education programmes are required. The starting point of such programmes can be finding out what students feel about these pests, particularly since pest eradication is emotionally fraught. With this aim, individuals and groups of students from four secondary schools (two in NZ, one each in England and France) took part in online asynchronous collaborative exchanges about New Zealand's premier pest, the brush-tailed possum. Students' feelings about possums were analysed using Kellert and Berry's typology. Unexpected results were found in that NZ students' feelings were not eco-centric in nature, but instead dominionistic and negativistic, revealing hatred of possums and belief in necessity for control. In contrast, the French students expressed moralistic feelings, wanting possums to be killed 'nicely', and naturalistic feelings as possums were 'part of nature'. English students seemed more measured with small numbers expressing dominionistic and negativistic feelings but also utilitarian ones, suggesting that possums be hunted for their pelts. These results will be discussed in terms of identities, how NZ students view their endemic species and selves as 'native' as opposed to pest animals that have been introduced. Influences on identity construction will also be discussed.



ID: 76: Environmental child soldiers of Surabaya, Indonesia - Kelsie Prabawa-Sear, AU

Surabaya is one of Indonesia's largest cities and has been struggling to become 'clean and green'. The Mayor of Surabaya, Bu Risma, has been leading the charge and achieving wonderful environmental results. The approaches taken however, raise some important questions about social responsibility of adults in addressing environmental issues and in particular, the middle and upper class sections of Surabayan society. The current approach sees the burden of change falling on children through compulsory EE in schools and on the urban poor, which also raises issues of agency for these two groups. This presentation is based on 12 months of fieldwork and presents the Surabayan case study as a context to explore issue of responsibility and agency. Ultimately the presentation will consider whether environmental outcomes should take priority in places like Surabaya where environmental problems are so severe that they are impacting on health and well-being of all citizens. This paper will address the congress themes of social responsibility and activism, global policy and EE and ethics in EE.

ID: 365: Environmental Education as an Intervention for Systems Change - Maureen Jack-LaCroix, CA

Systems Change is an intentional process designed to alter the status quo by shifting the function or structure of an identified system with purposeful interventions. This round table will focus discussion on the journey required for environmental education (EE) to scale up (influencing policy changes that affect all teachers), to scale out (with innovative EE programs reaching more and more students) and, perhaps most importantly for a paradigm shift within the education system, to scale deep (transforming the Cartesian illusion of separation with a profound sense of belonging and connection to the human and natural community). Participants will discuss their personal experiences, observations and insights for each of these contexts. How will the successful 'scaling up' as seen in the inclusion of EE in BC's new Ministry of Education guidelines influence teachers and their students? What kind of EE will be forthcoming? Can these EE learning experiences embody and apply the Indigenous Principles of Learning also recommended by the ministry and welcome the deep wisdom of connection? These and other questions will probe the possibilities of 'scaling deep'. Discussion will also explore how teachers can share best practices to assist the 'scaling out' of quality EE programs. How can EE connect across subject silos, extending beyond science into socials, leadership, planning, wellness and other life skills? Does EE herald integrated learning approaches? The presenter will bring quotes from BC teacher interviews to stimulate the participants purposeful envisioning of the approach, conditions and resources that would facilitate personal and systemic social change within the field of education.

ID: 331: Social Responsibility and Activism: A School-Based Approach For A Sustainable Society Through 'Human Revolution' - Yoshiyuki Iio, JP

At Hamamatsu Johoku Technical High School, I have based our environmental education, with an emphasis on creating a sustainable society, on the teachings of three famed Japanese educators - Tsunesaburo Makiguchi who hypothesized that military, political, and economic competition as it is, is unsustainable and would transform into a new form of competition based on the relationship of nature and society he termed 'Humanitarian Competition'; Josei Toda who believed that humankind is one, sharing a common destiny and upon the realization of this, people can take responsibility as members of a single community creating the 'Global Citizen'; and Daisaku Ikeda who believes that changing individuals is the key to achieving real change on a global scale through what he calls the 'Human Revolution'. Each in their own way teaches the importance of 'Global Citizenship Education' and one's inner transformation. We have taken this principle and developed a ground-up approach by developing our own environmental education program aimed at nurturing "Earth Friendly Engineers" who take into account nature and the environment in their manufacturing endeavors. We were the first technical high school in Japan to offer training for the ISO 14001 Internal Auditor program. So far 481 students have received certification. Our Environmental Club was set up in such a way that the students are empowered to take the lead in promoting and undertaking environmental volunteer activities both within the school itself and in the local communities; planting forests using trees and vegetation native to our area and preserving our natural surroundings. Our school helped with the environmental education of local elementary and junior high schools. This led to the creation of our Junior Eco School geared toward the younger children in the surrounding communities. Like a droplet creating ripples in the water, we aim to create individuals to make waves of changes for the creation of a sustainable society.

ID: 253: Transformative Learning, Systems Thinking and Behavior Change: NWEI's Pedagogy for Sustainability - Lacy Cagle, US

Education has historically functioned to reproduce society and societal systems, but sustainability education aims to follow a new path: to re-create society and shape human systems and approaches to the rest of nature that are just, equitable and regenerative. Instead of continuing to educate for the current environmentally and socially degrading global marketplace, education can transform and renew society by helping citizens discover new ways of thinking and being and by modeling collaboration and critical thinking. In so doing, educational institutions can shift our current destructive and unsustainable societal paradigm to one that is creative and life-sustaining. In essence, sustainability education aims to transform students into leaders who are critical thinkers and active doers. This paper connects transformative learning, systems thinking and behavior change concepts and research, demonstrating how each component is integral in implementing effective environmental and sustainability education. The paper also highlights Northwest Earth Institute's pedagogy for sustainability, rooted in nearly 25 years of experience offering environmental education and engagement programs. At Northwest Earth Institute, we believe the solution to the planet's biggest challenges lies in the power of collective action. Northwest Earth Institute's mission now requires helping people who already care about the environment figure out ways to take meaningful action in their lives, educational institutions, businesses, communities, and in the world at large. We connect transformative learning with behavior change, leading people from awareness to new knowledge to transformation to action. Our aim is to offer resources that advance the shift from ecological knowledge to social action. We believe in making change more possible, more social, and more rewarding by helping people connect with their communities and take action, together. While many people claim that they care about specific or general environmental issues, their behaviors do not often align with their expressed environmental values. People often have strong desires to live more sustainably, but find changing their behaviors to be much more difficult than their desire would suggest. In this paper, we explain why behavior change research is important in the context of transformative learning and environmental education, what behavior change theory offers, and how NWEI uses behavior change theory as well as transformative learning concepts and systems thinking tools in our environmental education and engagement programs. The environmental challenges faced today are highly complex. There is a high degree of uncertainty in how humans will respond to the challenges and opportunities present. Individual transformation, as well as broader culture change, are necessary in reinventing our relationship to the natural systems that support us. We believe that an effective pedagogy for social responsibility and agency must integrate transformative learning practices, participatory and peer-to-peer models of engagement, a systems thinking approach, as well as behavior change research. The ultimate goal is to increase awareness that leads to fully engaged social action.

ID: 423: Societal responsibility of universities: A structuring and global vision of the Cadi Ayyad University for promoting sustainable educational practices - Fatima Arib, MA

Education for sustainable development is not limited to the simple transmission of knowledge; it must reconstruct our modes of thought and action. To achieve this, it is necessary to favor the interfaces between knowledge and practices, to instill transversality throughout the education system, to invent new forms of learning capable of meeting the expectations of new generations who have less need to learn than to understand. What role should universities play in promoting sustainable educational practices in order to contribute to development in Morocco? How to break the disciplinary barriers to make future managers aware of the challenges of global responsibility? What new forms of learning are likely to meet the expectations of students who want to reconcile the economy with society? Moroccan universities are therefore doubly challenged, first by the economic world, which needs lucid and responsible decision-makers, and secondly by younger generations who aspire to a way of life that is consistent with their values. The objective is to present the overall and structuring vision of the Cadi Ayyad university as part of its socially responsible strategy to promote education for sustainable development.

ID: 922: Engaging Environment and Culture in Building teachers as agents of change in South Africa - Esther Kibuka-Sebitosi, SA

Teachers are central to transformation not only for the Education system in South Africa, but to learning sustainable practices within and outside the schools. The paper highlights the importance of local environments and culture in teaching and learning, particularly in poor-resource settings in rural communities in Africa. Utilizing transformative learning and social learning, teachers and subject advisers were offered a programme that engaged their culture and environment to develop sustainability competencies and practices that would be transferable to learners. The programme was conceptualized along three pillars: content, pedagogy and assessment and was underpinned by critical systems thinking. It was delivered by face-to-face workshops. Resources on difficult topics and new concepts were developed and delivered in

a teacher-centered approach. Building teacher skills started with analyzing the curriculum to see where environment sustainable principles could be infused without necessarily putting new demands on teaching load. Three possible routes were identified, namely projects, out-reach and using local examples from the environment. Themes such as Biodiversity and Taxonomy, local languages and stories embedded in cultural change were used. Results showed that using local examples within the environment and engaging cultural practices were fundamental in transformative learning. Recognizing the prior knowledge, especially the indigenous knowledge, and local cultural contexts were key to attracting and keeping teachers' interests. It was found that Transformative learning had to be situated within the local environment and recognizing cultural practices were vital to changing practice. The paper discusses situating learning opportunities in local settings and engaging culture within local environments to transform learning with examples from rural communities.

ID: 816: Teaching ethics in science education: beyond anthropocentrism in theory and practice - Ana Paula Guimares, BR

Science Education may focus on socioenvironmental problems of extreme relevance for humanity and nature. In particular, since socioenvironmental problems have an ethical dimension, it is important to analyze how science education can contribute to develop more consciousness as well as to prepare students to act towards a more sustainable world, taking into account ethics. However, despite the fact that science education often deals with the environment, it still marginalizes the ethical dimension of socioenvironmental problems. Attempts to include ethical discussions in science education often face obstacles, such as disciplinary teaching and excess of conceptual content, as well as misconceptions about ethics and its importance to understand and solve socioenvironmental problems. In general, the approach of ethics in science education prioritizes only the anthropocentric point of view (that is, the exclusive moral considerability of human beings), without considering the possibilities of a non-anthropocentric perspective. In this sense, initiatives for an approach of ethics in science education are still insufficient to foster critical thinking and sociopolitical actions toward greater socioenvironmental justice. In this theoretical work, we explore how a discussion of moral ontology contributes to approach ethics in science teaching. This approach can foster greater understanding of the relationships between science, technology, society and environment; sociopolitical awareness and reflection on values, interests, and power relations; and mobilization of scientific and technological knowledge for sociopolitical actions aimed at solving current socioenvironmental problems. In this context, based on interdisciplinary collaborations and communities of practice, this approach could prepare students to understand how modern societies relate to nature and the importance of reflecting on how we should transform our lifestyles. As an illustration of our approach, we elaborate on the ethical dimension of global climate change.

ID: 812: Developing Social Responsibility and Citizenship Through Place-based and Experiential Education - Kevin O'Connor, CA

In response to the release of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Synthesis Report, Dr. John P. Holdren, Director of the U.S. White House Office of Science & Technology Policy stated "The IPCC's new Synthesis Report is yet another wake-up call to the global community that we must act together swiftly and aggressively in order to stem climate change and avoid its worst impacts". Realizing this call to action will require the active participation of governments, industries and global populations. Unfortunately governments and industries often let short-term economic considerations govern their behaviors contrary to the efforts required to address long-term environmental and social issues associated with climate change. Communities, NGOs, families and schools often lead the way in the development of informed populations whose citizens are supported in their personal responsibility for social actions towards climate change. Schools that follow place-based educational principles actively involve students in a range of community concerns with goals of informing and encouraging action in a wide variety of environmental and social issues. Research identifying long-term development of responsible citizenship is linked to place-based education. This paper describes long-term analysis of a program utilizing place-based science education and how these practices have effected the students' perceptions of their social and environmental responsibilities as citizens. It then explores how these approaches have led to responsible citizenship in northern Canada.

ID: 577: Towards transdisciplinarity, originating from the subject: How do social subject teachers implement environmental education? - Essi Aarnio-Linnanvuori, Finland

Environmental issues are complex and cross-curricular subject-matter. In this presentation, I examine environmental issues as subject-matter in school subjects discussing society, worldviews and ethics. The topic is discussed with concepts of

transdisciplinarity, critical thinking and environmental citizenship. My aim is to describe the process of integrating a transdisciplinary topic in a discipline-based school subject, and to understand the challenges subject teachers meet, based on a dataset consisting of teacher interviews, accomplished in Finland. The interviewees considered interdisciplinary education to be arduous, but some of them had found such perspectives to environmental issues that draw on the specific content of their discipline, and were able to use it for promoting critical thinking. However, individualization of environmental responsibility may limit possibilities for environmental citizenship education at school. Even though the interviewees are well aware of significant environmental behaviors, they view their pupils' range of action possibilities as narrow.

ID: 895: Sustainable schools: limits, possibilities and challenges of appropriation of a public politics by Brazilian schools - Rosilia Almeida, BR

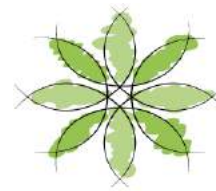
The federal program *Let's take care of Brazil with Sustainable Schools* is translated in the state of Bahia in the Youth in Action program that supports the formation of young social-environmental activists to act in Environment and Quality of Life Commissions in their schools. Those commissions elaborate and develop action plans based on the principles of social-environmental sustainability, which must be articulated to local and global environmental challenges and incorporate a crosscutting perspective into the school curricula, as a strategy to stimulate the youth social-environmental engagement and leadership. To assess the effectiveness of this public policy and contribute to its improvement, a participatory research project was carried at the university Daycare and at ten public schools. The data collection was between August/2015 and November/2016 and involved participant observation, semi-structured interviews and annotations in a field notebook. The data interpretation considered four dimensions that must be addressed so that a school can be considered sustainable, which were taken as categories of analysis: administration model, curriculum, physical space and community relations. The results evidenced factors that favoured and factors that hindered the full constitution of the schools as sustainable educational spaces. We noticed the commissions' efforts to incorporate and translate the sustainability principles into their action plans, which was encouraged at schools with more democratic administrations and that had tried to align themselves to the main organization of environmental education, NGOs, communities and universities. However, we verified that several projects were developed as complement activities and that don't relate to the principle of curricular transversality, preventing a greater in-depth understanding of the relationship between the local actions and the environmental problem by the students. These results can contribute to support decision-making by public managers for the continuity and invigoration of this priority public policy in the construction of sustainable societies.

ID: 821: Measurement Matters: Development of a sustainability locus of control scale for use with adolescents - Misol Kim, AU

Building environmental and social responsibility and agency is advocated as one of the main goals of environmental and sustainability education. Locus of control (LOC) has been identified as a relevant indicator for one's agency and social responsibility. LOC is a psychological construct measuring the degree to which people perceive the social and individual phenomena or outcomes as to be a result of their own behaviours versus a function of chance, luck, or fate, the control of powerful others, or it is simply unpredictable. This presentation will discuss the early development of a scale to measure sustainability locus of control amongst Australian adolescents. Based on conceptual analysis of relevant international literature as well as interviews with Australian secondary school students and teachers, this paper will offer new theoretical understandings of sustainability locus of control as a measure for sustainability education. Its findings will be useful for researchers, evaluators and practitioners looking to measure the impacts of education programs on students' capacity to take action for sustainability.

ID: 191: Indigenous Environmental Issues, Activism, and Education: Implications for Practice - Gregory Lowan-Trudeau, CA

Building on a previous inquiry into the pedagogical experiences of leading Indigenous and allied environmental activists and educators, this presentation will report on a recent SSHRC-funded study that explored the experiences of Indigenous and non-Indigenous educators with attempting to incorporate critical content and discussion related to Indigenous environmental issues in Canada into their teaching practice. This study was guided by a conceptual framework that incorporated Eisner's Three Curricula (explicit, implicit, and null), Marcuse's notion of repressive tolerance, and



decolonizing theory. It was also influenced by Indigenous methodologies as described by leading scholars such as Margaret Kovach, Linda Tuhiwai Smith and Sean Wilson, and Lassiter's collaborative ethnography. Questions such as 'What educational policies, practices, initiatives, and resources are required to provide greater support for and understanding of educators attempting to introduce discussion of Indigenous environmental activism in their practice?' also informed this inquiry along with further considerations related to the tensions, challenges, and barriers encountered by educators attempting to work in this area. The focus of this session will be on the strategies identified by both leading and emerging educators and activists for overcoming the challenges and barriers that they have faced and continue to anticipate in this important work. As a Metis scholar of mixed Indigenous and European ancestry, I will also share insights from my own theoretically informed practice. As such, this session will be of interest both to researchers and practicing educators.

ID: 543: The incidence of transformative learning for sustainability in higher education: influences of specialist sustainability units in an Australian context - Elizabeth Sidiropoulos, AU

The goal of the United Nations Decade of Education for Sustainable Development (DESD, 2005-2014) was to integrate the principles, values and practices of sustainable development into all aspects of education and learning (UNESCO, 2004), intended to encourage personal and social change towards a more sustainable and equitable society. The Higher Education Sector is expected to produce graduates with skills and competencies capable of addressing sustainability challenges and are embedding sustainability into key functional areas, including the curriculum. However, the evidence on student learning is mixed with variable outcomes in student knowledge, attitudes and behaviour. This study investigated the influence of specialist ESE units on student learning for sustainability (LfS) and particularly the development of their skills for advocacy (agency) and change. This study represents the third phase of the author's PhD project, which investigates the contribution of tertiary education to student learning for sustainability. The purpose of this study was to determine the incidence of transformative learning for sustainability resulting from a dedicated SE unit. Specific aims were to: investigate the nature of tertiary students' dispositions prior to the intervention; identify factors that mediate or moderate the incidence of student transformative LfS; and identify the development of advocacy and agency skills. Pre-post surveys were used with matched individual responses from tertiary students in SE units offered as either compulsory or elective units of study. This provided a greater understanding of the influence of dedicated SE units on students transformative LfS and agency. The presentation will outline key influences affecting transformative LfS and the development of SD competencies for student cohorts across a range of disciplines.

ID: 422: Social Practices at Cadi Ayyad University: an innovative approach based on education for sustainable development of students - Fatima Arib, MA

Cadi Ayyad University CAU is fully conscious of the role and the responsibilities that it exercises in front of major societal developments and challenges. It made a commitment in an ambitious sustainable development strategy in order to develop all its components: students, professors and administrative staff, towards socially responsible behavior. We cannot achieve this strategic goal without the mobilization of all the skills. The approach of the university is innovative; it is mainly focused on the education of students to sustainable development. The objective of this paper is to contribute to the reflection on education for sustainable development in higher education and the social responsibility of universities. It will be an opportunity to present the CAU Corporate Social Responsibility strategy and to explain the approach followed to educate young students in sustainable development. In addition to integrating sustainable principles into training programs, the approach is also based on digitization, personal development and experimental learning. The presentation will allow us to discuss the pedagogical issues, the practices, the advances and the brakes of the approach adopted by the university. The experience of the CAU could be inspiring at several levels.

ID: 29: 360 degrees of change: 360 tonnes of greenhouse gas emissions reduction in a school setting - Elaine Lewis, AU

ID: 135: Promoting climate action - what works - Robert Gifford, CA

Environmental psychologists create action strategies based on several theories about why people adopt (or don't adopt) climate actions such as conserving power, energy-retrofitting homes, and choosing clean transport and less-impactful diets. These theories, broadly described as rational choice (weighing the personal pros and cons), altruism (how oneself or the environment can benefit), multiple motivations, and overcoming seven types of psychological barriers (such as perceived

risks or social factors), have been used to boost the adoption of pro-climate actions. This talk will describe real campaigns run by North American utility companies and others, to learn which elements of these campaigns are most effective. The traditional approach taken by utilities to promote energy conservation has been to package information with incentives, such as rebates, pricing strategies and penalties. But evidence shows campaigns that target personal motivations or values, as well as wallets, have a better chance at changing behaviour.

ID: 797: Empowerment and agency for a transformative climate education - *Emilie Morin, CA*

In today's school context, more emphasis should be placed on empowerment of students to respond to climate change, mainly because social and political actions are necessary. The development of this power to act involves many challenges. In order to better understand how schools can address these challenges in a transformative way, we need to better understand the concept of empowerment, and yet few empirical studies have focused on defining and documenting it in the case of climate education, especially for the dimension of the feeling of being able to act on which, we think, the school should invest. In the poster, we first present the challenges of climate education for empowerment in the actual school context. Next, we propose a first conceptualization of the "feeling of being able to act" in the face of climate change with reference to the concepts of empowerment and agency.

ID: 680: Teaching about Climate Change: Tools for Inspiring Action - *Tim Grant, CA*

Educating young people about climate change is challenging, not least because there are so many intangibles involved, from invisible greenhouse gases to ecological changes that may take years to occur. Further, the science is complex and the solutions are not simple. In this session, we will examine how most of the latest science can be understood within a framework entitled 'the 4 dimensions of climate change'. We'll then explore the practical approaches to teaching about climate change inside and outside of schools developed by Green Learning Canada or published in Green Teacher magazine. Hands-on activities will explore the importance of a stable climate, clean air, the greenhouse effect, the real cost of cars, and car-trip reduction programs in high schools. The workshop will also introduce simple science activities that demonstrate some of the intangibles of climate change, and a variety of projects through which students can become aware of their own contribution to climate change and take local action, such as by organizing walking school buses, public transit investigations, and energy and waste reduction programs. Participants will learn about GreenLearning's comprehensive programs and resources that provide educators with everything they need to empower students to take positive actions for a more sustainable future. Through this interactive workshop, participants will deepen their understanding of inquiry and dialogue-based approaches to climate change education and broaden their teaching tool kits, including access to GreenLearning's suite of transformative educational materials that promote critical thinking and inspire student leadership.

ID: 446: Education in Social Action within the Climate Justice Movement: A Framework for Understanding Learning within North American Fossil Fuel Protests - *Jenalee Kluttz, US*

There is no better place to observe the convergence of culture, community, and environmental education than the emerging climate justice movement. The climate justice movement was born of the idea that global warming concerns should be fused with social justice issues to better understand the climate crisis and work toward more effective solutions. In its counterhegemonic nature, the climate justice movement has been building bridges between movements and actors who are all affected by the environmental crisis differently. In doing so, it is providing a fuller conception of the social, economic, and political contexts in which the climate crisis is unfolding. This new approach within the climate change movement is changing the way the climate crisis is understood by offering the opportunity for more radical learning on climate change. Building on previous work within social movement learning and environmental adult education, this paper will outline a framework to understand radical environmental adult education within the climate justice movement. Specifically, it will provide a better understanding of the types of public participation within the movement, as well as the kinds of learning that are taking place. Using North American fossil fuel protests, and specifically the North Dakota Access Pipeline protests at Standing Rock as a case study, the paper will discuss what is being learned through social action and how lessons of power, place, diversity, and eco-centrism are creating the knowledge necessary to work toward more effective solutions to climate change.

ID: 750: How the class actively helped to protect a biodiversity hotspot with TiME - *Uri Shanas, IL*

We offer a novel experience where educators can harness curiosity and engagement to the learning process of conservation issues. Established in 2016, [This is My Earth](#) (TiME) is a voluntary NGO with a strong educational emphasis that enables children and youth to become members of an international environmental organization. TiME provides a hands-on tool for people to become acquainted with critical biodiversity hotspots that require international attention. The organization relies on crowdfunding to engage and outreach to as many of the world's citizens as possible. At the same time it generates funds for partnering with local organizations to purchase privately own lands in biodiversity hotspots, turning them into protected lands. Educators use TiME to explain basic conservation concepts. Using the TiME platform, educators can involve classes of all ages in discussions about environmental decision-making, prioritization of conservation efforts and practical ways to protect nature. Through TiME, conservation education turns into a compelling, real-life experience and a catalyst for individual activism. TiME educational programs make students more aware about global environmental conditions and the ethical imperative of protecting nature. Pedagogical outcomes of TiME educated students are reflected in conservation-oriented actions. Individual involvement is not only facilitated by donating funds (membership as low as one dollar a year), but by voting and campaigning for a favorite biodiversity site. By relying on democracy among members (every member has a single vote per year regardless of donation level), TiME can potentially become a tool for promoting democracy concepts. We will demonstrate how to use TiME's technology and educational approach to engage school children in conservation and how it can be applied worldwide for diverse, multi-age populations. We will further demonstrate how kids participated in the past year in purchasing an important land in Peru saving the critically endangered yellow tailed wooly monkey.

ID: 849: Catch: A Face-to-Face Dynamic Simulation Game for Teaching About Renewable Natural Resource Management and Sustainability - Harold Glasser, US

Catch© is free, fun, and engaging face-to-face dynamic simulation game that responds to the need for new, core-competency based pedagogical resources for teaching about the challenges of transformative change and the forms of learning that are necessary to meet the UN Sustainable Development Goals. Catch© was created as a response to Fishbanks, a game originally created by Dennis Meadows in 2001. Fishbanks, which has the goal of maximizing the net worth of individual teams, has been heralded as a superb tool for teaching about the Tragedy of the Commons. Alternatively, Catch© uses two ostensibly conflicting goals to explore the possibility of eliciting a much broader and richer range of common pool resource management and decision-making. The game has two systems goals: (1) Catch as many fish as you can and (2) Leave the fishery in the state you found it and utilizes a common pool resource setting, with realistic resource dynamics, that produces a systematic effect on the socio-ecological simulated environment. Various face-to-face groups from around the world have played the game with great effect. In this session, we propose to introduce Catch©, play a full game, debrief, and discuss game management so that attendees are fully prepared to use Catch© on their own campuses or in their own organizations. NOTE: I could also present the entire game and run through a session for interested participants. To present the game rules, run the game, and debrief effectively (discuss the learning process and outcomes), I generally recommend 2 1/2 hours.

ID: 478: Raising awareness of sustainability competences through playing a simulation game, Fishbanks Ltd. - Jen-shiuan (Susan) Shiau, TW

Sustainability could be considered as a life style and some scholars proposed it as learning in a changing process. Therefore, people should not only be aware of environmental changes but also what to prepare for one's self to face the challenges of wicked problems. The purpose of this study is to raise people's awareness of sustainable competences through the simulation game, Fishbanks Ltd. in which players role play as fishing companies to compete for marine resources. It is assumed that, through experiential learning, the participants would become more aware of the five key competences of systems thinking--anticipatory, normative, strategic and interpersonal competence-- which Wiek addressed based on sustainability research and a problem-solving framework. To win the game, either of the two conditions were applied in different groups: working for the most assets (economic-oriented goal) or, to also satisfy the goals of keeping the fish population as well as keeping all the teams away from debt (three goals in one). The comparison of pre- and post-test questionnaires showed that, except for interpersonal competence, the players recognized the other four competences better after the game, especially to the question of 'I clearly understand what sustainable fishery is.' More participants t agree with the importance of strategic, anticipatory and normative competence to an individual in sustainability. On the other hand, while the players with the economic-oriented goal gained deeper understanding about values and attitude after experiencing

'the tragedy of the commons', the players with the three goals in one emphasized more on their needs of improving abilities or skills of practicing, such as ways of thinking or communication. It is suggested that the simulation game context provides a suitable environment for learning sustainability. Engaging in the game induces the awareness of which competences are necessary for pursuing a more sustainable future.

ID: 609: conservation education as environmental education: a case study of a community-based non-governmental organisation in trinidad and tobago - *Shahiba Ali, TT*

Research on the outcomes of environmental awareness in Trinidad and Tobago in 2008 revealed that young people in the formal school system do not appear to reflect the change in attitude, behaviour and action competence required in dealing with complex environmental issues in the country. This finding prompted this study on whether the approaches and outcomes of training and education programmes used by a grass-roots community-based non-governmental organisation in a co-management arrangement for conserving a vulnerable marine species of global importance in its locale for over 25 years could be considered as providing non-formal and informal environmental education. Using pragmatism as a research lens for a qualitative multimethod case study methodology to describe the work of the organisation, data were collected on its programmes for sea turtle activity, reforestation, eco-tourism and craft making through interviews, documents, artefacts, direct observations and information from its website. Findings revealed mixed views of the extent to which members saw their work as educational. Didactic teaching, field work and hands-on learning, organisational, workplace, and incidental learning, along with environmental communication strategies were used to train and educate members of the organisation, community members, school children in the area, and visitors. Facilitators came from governmental and other non-governmental agencies, who took on the role of conservation practitioners-as-educators, except for a short-term hire of an education officer for a project. From an analysis of the outputs, outcomes and impacts of their programmes, the work of the organisation could be seen to contribute to the broader realm of environmental education.

ID: 787: Children's Voices about Energy Conservation and Production - *Eileen Merritt, US*

Energy literacy provides the means to solve new problems regarding the role of energy in our daily lives. The role of renewable energy in sustainable development is clear: we need to be more informed and proactive in our future energy uses. Eventually, we will be able to replace nonrenewable resources with renewable, sustainable energy sources. Many students in the United States lack the basic energy literacy that would allow them to solve everyday energy problems. Schools play a pivotal role in fostering a sustainability worldview. Connect Science, a grant-funded program, aims to foster energy literacy in fourth grade classrooms through service-learning. Our program provides professional development and curricular materials to teachers regarding energy resources and conservation, as well as collaborative skills. We piloted Connect Science in nine classrooms. Fourth grade students weighed pros and cons of different energy sources and learned about where their electricity comes from. In this session, we describe service-learning projects that were enacted by fourth grade teachers and students, and students' thinking about energy production and use. We summarize what we learned from teacher surveys, videotaped lessons and students' written work. Students conducted energy fairs and gave presentations about energy conservation at their schools. They communicated a range of views about which energy sources are best, and advocated for a variety of energy conservation practices. As we reflect on our work, we consider the role of student agency in educating others about energy use and conservation. Some research suggests that students are limited in their capacity to serve as agents of social change due to structural and/or relational constraints. During our discussion, we hope to hear from participants about their energy literacy efforts for school-aged children in other countries.

ID: 983: Study Abroad Education as mechanism for achieving the Sustainable Development Goals: Investigating the transformative potential of short-term study abroad experiences - *Siobhan Ashe, CA*

It has been widely claimed that the hallmark of study abroad programs is the transformational quality of the experiences they provide to students and much anecdotal evidence supports this, even though research evidence remains inconsistent. Since 2007 Douglas College has provided students with opportunities to participate in various short-term international 'field schools' to destinations in China, Belize, Scotland, Switzerland and Wales. In 2012 a faculty team began investigating various aspects of our students' 'field school' experiences in order to document the extent to which students perceive this experience to be transformational in its impact. This presentation will review the main findings, focusing in particular on evidence of the impact of several specific dimensions of this study abroad experience: experiential learning, participating in a learning community, total immersion in intensive learning and exposure to different cultures. This research on the

transformative potential of field school learning environments provides the framework for the current exploration of the potential of study abroad education contexts as a mechanism for advancing the United Nations Sustainable Development Goals. Linking the study abroad research findings with innovative research that focuses on designing study abroad learning environments specifically intended to align with the SDGs will be complemented with examples of experimental field school assignments and assessment practices that reflect the values associated with the SDGs. This presentation will include opportunities for audience members to engage in discussing the design of future study abroad programs that advance the SDGs.

ID: 489: Catalyzing a Research Cluster for Social Mobilization on Climate Change using Digital Tools - Stephen Sheppard, CA

Given the increasing global awareness and media coverage on the impacts of climate change, the timing is critical for mobilizing communities and youth cultures to action on sustainability issues. The UNFCCC Paris agreement and the Vancouver Declaration on Clean Growth & Climate Change, initiated by Prime Minister Trudeau, emphasizes the urgency of strengthening citizens' climate change literacy and awareness. Post-Paris, federal, provincial and local governments are developing Climate Action Plans to meet challenging GHG reduction targets, but none of these plans have established a robust, evidence-based strategy for mobilizing citizen or youth action. Research clearly shows that online and digital tools, which feature interactive visualizations, presenting credible data, can be powerful catalysts for 21st century learning, responsible citizenship, and youth engagement on climate action. 'Social Mobilization on Climate Change using Digital Tools' is a UBC-initiated research cluster to bring together researchers and practitioners involved in developing innovative tools for climate literacy and action, and understanding their needs and implications in the community. The cluster (visit www.cooltoolswarmworld.ubc.ca) includes world-leading scholars in climate change communications, education, psychology, interactive arts, visualization and digital media as well as NGO's and companies interested in cutting-edge research on environmental education and social mobilization. Some of the research activities include the design and testing of videogames, future realities, public art installations, interactive mapping, citizen science and online competitions that have enhanced eco-centric learning and behavior. Key issues driving the research cluster and their knowledge mobilization activities are (1) design and use of digital tools to build climate literacy and their measurable outcomes & successes locally and globally; (2) current gaps and barriers in design and wide-spread use of digital tools on climate change; (3) new technologies for climate action developed with communities and educators; and (4) evidence-based best practices, training, and support resources needed for effective delivery and uptake of digital learning tools. Through a panel discussion, we will communicate recent research findings from the cluster. We want to expand the cluster by exploring partnership and collaboration opportunities, hence we invite scholars interested in developing effective digital tools and engagement processes, or have similar research, products and resources that can scale-up and accelerate action to help communities and countries meet their climate change targets.

ID: 909: Youth Action for Environmental Protection - Elaine Nevin, IE

ECO-UNESCO Clubs is Irelands Environmental Education and Youth Organisation; it is a non-governmental, non-profit organisation and is a Key Partner of UNESCO's Global Action Programme on Education for Sustainable Development under its Priority Network 4 Engaging and Empowering Young People. It works with over 10,000 young people annually exploring a range of issues including the importance of biodiversity, energy conservation, consumption and waste, water and climate change. Through its programmes, it raises awareness, understanding and knowledge of our environment in young people and encourages environmental protection through practical environmental initiatives by engaging and empowering young people; it also promotes youth development through these environmental actions. Action-based learning is used, which engages young people in planning and taking action on environmental and sustainability issues. Young people explore values, develop new skills and are empowered to take action through Young Environmentalist Awards- a programme which recognises and rewards young people for their environmental action projects; Youth for Sustainable Development - a youth leadership and peer education programme that develops greater awareness of links between environment, society and economy including power relations, political consciousness and provides opportunities for social action and ECO-Choices - a health and well-being programme with a focus on place-based learning encouraging young people to engage with the natural environment. ECO-UNESCO proposes to run a session (round table or workshop) to highlight ECO-UNESCO's practical examples of applied practice, place-based solutions and action oriented leadership and provide an insight into learnings from these specific programmes: *Young Environmentalist Awards* (<http://www.ecounesco.ie/programmes/young-environmentalist-award>) *Youth for Sustainable Development*(

<http://www.ecounesco.ie/youth-peer-education-programme>) and *ECO-Choices* (<http://www.ecounesco.ie/eco-youth-choices>) and will highlight the importance of building social and civic responsibility and show how action project work can empower young people and provide them with an opportunity to act locally on local and global issues.

ID: 290: Benchmarking the Desirable Attributes of Change Agents for Urban Green Lifestyles - Tassanee Ounvichit, TH

Over-consumption in urban areas has serious impacts on the world environment, both in the rural areas where resources are extracted and in the urban areas where consumption pollutes. To reduce the impacts, there is a need to make urban lifestyles friendly to the environment. However, despite increased volunteerism for environmental activism in the urban areas, there are still concerns about concrete impacts that the volunteers are producing. Qualified change agents for urban green lifestyles are needed and knowledge as to how to assist the volunteers to develop into effective change agents is desirable. This action research started with searching for desirable attributes that environmental volunteers can refer to. Twenty-five leaders, regular volunteers and members of the public who involved in environmental activities of five non-government environmental organizations in Bangkok, Thailand were interviewed. These environmental veterans informed us that qualified change agents should possess a strong cognitive specialty in environmental issues as well as skills in communication, networking and role-model building. Their expectations of the agents' affective domain were higher than conventionally believed. The agents need to be inspired, have clear environmental awareness, serious attention to take action, strong commitment to their activities, and high flexibility and self-sacrifice in their action. These desirable attributes reflected that volunteers need to undergo a holistic transformation process before they turn into qualified change agents. In the next stage of the study, these attributes will serve as benchmarks for 15 young volunteers who agreed to participate in the action research by setting up their projects for urban green lifestyles. Throughout their andragogic course of action, the researchers would listen to their critical self-reflections and discourses with others in order to identify their turning points. The turning points would elucidate how to assist the development of effective change agents in the future.

ID: 862: Greening Making @ UBC Girls' Makeathon - Paula MacDowell, CA

The purpose of this study was to analyze the effectiveness of an equity-oriented Makeathon designed to foster maker mindsets and maker identities in high school girls by engaging them with diverse tools, materials, mentorship, and hands-on design experiences. The central focus of the UBC Girls Makeathon emphasized greening making and coding for social change. Teams were challenged to make a mobile app related to an issue that teen girls face in local or global communities throughout the world. Participants learned how to identify a problem, create new solutions, and change the world for the better by communicating their ideas (via apps and a pitch to a panel of experts). Fun and meaningful maker activities throughout the day included creating inventions or artwork out of e-junk and making reusable tote bags from unwanted t-shirts. Greening making or assembling what assembles a world with a focus on sustainability and shared knowledge was further explored during small group discussions around the growing global problem of e-waste. Grounded in the realities of girls' artifacts and stories, which are significant carriers of meaning and knowledge, this study specifically focuses on two important, yet under-developed, aspects of research: 1) evaluating girls' engagement in maker activities as a way to cultivate mindsets as makers (not merely consumers) of things, ideas, and identities; and 2) understanding how girls analyze and value their maker education experiences (e.g., building, crafting, coding, inventing, and tinkering) in-interaction-with ecological sustainability. The lessons learned in empowering girls as green makers (#greenmakers, #UBCchangemakers) will be useful for teachers and researchers who are interested in working with youth to design apps and innovative maker activities for environmental and sustainable education, research, and/or outreach.

ID: 769: Teaching Corporate Social Responsibility (CSR): special features and proposals for management education - Cedrine Joly, FR

This communication investigates a key topic at the very heart of management researchers', professors' and practitioners' concerns: the education for Corporate Social Responsibility (CSR). Indeed, CSR education is regarded as particularly challenging because of the abstractness, ambiguity and complexity of the subject. At the frontier between ethical and managerial issues, CSR education continues to stimulate the creativity of academics and of professional trainers in this field. This education field challenges current teaching practices in different ways: (i) the definition ascribed to CSR that critically influences the teaching contents and methods; (ii) the characteristics of CSR education that make it unique and confronting and; (iii) the methods used to stimulate students' engagement and learning. In this regards, this communication ambitions to



conduct intensive bibliometric research to identify within management articles the topics and methods described by researchers when talking about CSR education in management. From this bibliometric analysis, our communication isolates the special features of CSR education and the key capabilities it needs to be activated for students - namely awareness, critical reflexivity, engagement and capacity for action. Around these four capabilities, we develop some proposals for CSR management education based on the most innovative propositions made by researchers. More especially, we defend the relevancy of teaching choices putting the emphasis on an integrative view of CSR recognizing the necessity to address social, environmental and economic issues simultaneously and without order of priority and to embrace tensions that are likely to occur between these objectives. We defend the power of such an approach to train citizens and practitioners in various institutional contexts and to let innovative strategies addressing CSR tensions and paradoxes within a wide range of organizations to emerge.

ID: 105: Carbon, Climate and Coffee: Building Alliances between Fair Trade, Small-Scale Farmers and Regenerative Organic Agriculture - Monika Firl, Michael King, Kahlil Baker, CA

When we discovered in 2013 that some of our longest-standing and trusted coffee-farming partners were suddenly losing their harvests to coffee leaf-rust and other climate-related diseases, we knew we were facing a crisis of enormous proportions. Leveraging our connections in both Fair Trade and Organic coffee networks with allied research and development organizations provided a unique opportunity to support environmental, social and economic regeneration from the grassroots up. Through the Carbon, Climate and Coffee Initiative, we discuss the development and functionality of our 'voluntary carbon-tax' imposed on CoopCoffees roasters. We will highlight roaster motivation to invest in research, learning and exchange opportunities with their producer partners. We will demonstrate the impacts on sustainable production and locally-developed solutions, while strengthening our relationships with coffee producers, reducing supply-chain risk, and revitalizing consumer education. Our ultimate objectives include: creating greater understanding around the causes and impact of climate change, highlighting the role of indigenous knowledge and farmer innovation in creating truly sustainable solutions, and embracing the power of consumer activists. Combining the expertise of Taking Root, a carbon monitoring and offsets organization based in Vancouver, the financial investments of CoopCoffee roasters, such as Bean North based in Whitehorse, YK, through the purchase of our direct, coffee-imports and the technical knowledge of agro-ecological groups such as Soil and More International, Soil4Climate, etc., we have been able to facilitate timely support to our producer partners for community-based projects and sustainable solutions to their climate-related challenges.

ID: 469: Sustainability-driven entrepreneurship: round table on a new joint master curriculum - Marco Rieckmann, DE

A new joint Master's programme on sustainability-driven entrepreneurship has been developed in a 3-years transdisciplinary collaboration setting where ten universities and business partners from five European countries have formed an intercultural knowledge alliance, financed by the European Union's Erasmus+ programme. The Master's programme has been created in qualitative research loops, using interviews, focus groups and questionnaires as well as learning pilots in which different parts of the Master's programme were tested in a variety of collaboration formats (workshops, seminars, excursions etc.). Using transformative pedagogy (including service-learning, project-based learning, research-based learning), the aim of the Master's programme is to develop sustainability competencies that enable learners to become sustainable entrepreneurs and to contribute to sustainable socioeconomic transformation. A draft of the Master's curriculum will be presented in this roundtable, followed by an interactive dialogue on the basis of some guiding questions: What is needed for implementing such a Master's programme at different universities and how can it be adapted to specific contexts? How can students be attracted to the programme? How can regional partners, especially enterprises, benefit from the programme and what are the cooperation possibilities? How can such a programme contribute to socioeconomic transformation? Participation in the roundtable can be inspiring by discussions around - How to organise partnerships at the science-society interface reaching out for meaningful cooperation between universities and practice partners; - How to initiate and apply transformative learning spaces necessary to foster competencies for sustainability-driven entrepreneurship and socioeconomic transformation; - How to facilitate transformative and action-oriented learning processes at the individual and collective level empowering people to shape and implement transformation practices.

ID: 839: Reaprovevement of Radiographies for the Environment, Health And Citizens 'Training - Marília De Oliveira, BR

The practice of disposing of radiographs in domestic waste is increasingly common and the insertion in the educational sphere of initiatives that offer sustainable alternatives to the environment, with reuse of these materials, are necessary to guarantee the life of the living being related to the potential of heavy metals and time needed to decompose). These materials in physical contact present risks because they are radioactive materials. The present work aimed to develop sustainable alternatives in the reuse of radiographs, guiding the communities regarding their commitment to the environmental/health/ social sector and the most diverse uses in the craft/professional sectors that may involve this material. The city of Uberlândia-MG is devoid of actions aimed at recycling this material. Therefore, IFTM - Campus Uberlândia together with its external partners in the project "RADIOGRAPHY OF RADIOGRAPHIES IN THE ENVIRONMENT, HEALTH AND CITIZENS 'TRAINING", have presented a vehicle for educational strengthening together with the training of its students and external communities in the reutilization of radiographs. The project was developed by students of the IFTM Technical Courses - Campus Uberlândia in their municipal agribusiness events and fairs, with demonstrations by the students of the applied techniques of radiography recycling: cleaning, environmental education, agribusiness involving the radiographic material, collections, health/radiography, decomposition of radiographs discarded in the environment, confections and sale of handicraft products from clean radiographs and distribution of seedlings, informing the need for tree plantations in function of the climatic balance. The funds were administered by the external partners of the project and donated to the Hospital do Câncer de Uberlândia.

ID: 803: Contents of local hydrology in the courses of environmental and watershed training 2013-2014 of the National Network of Environmental Education (RENEA), Uruguay - Carlos Anido, UY

In Uruguay, water issues are important now. This is one of the reasons why in years 2013 and 2014, courses were organized in all nineteen departments of the country, for primary and secondary teachers, civil social activists and members of NGOs and members of non-binding advising river basin commissions (which appeared after the water plebiscite happened in the year 2004), reaching dozens of people acting on water basins subjects. These non-formal environmental training courses, supported by the Ministry of Education, were organized by the National Environmental Education Network (RENEA in Spanish, <http://www.reduambiental.edu.uy>) to improve coping with climate change's new events and other challenges to the access and quality of water with social participation. It was a national campaign that covered educating about the hydrological cycle, watersheds, volume and quality. The content of the courses exposed the fundamental concepts of water basins molded by rainfall and erosion, covering the water yielded by local surfaces and the calculation models used for average and extreme flows with the local characteristics expressed into the local curves relating intensity, duration and frequency of extreme storms, and the best designs of urban and road drainage. Notice was given on the national increase in rainfall annual quantity (it has grown 20% in 30 years), more rain occurrence and intensity in Rio de la Plata Basin, including unusual extreme events like extra-tropical cyclones and tornadoes on land and seas, although it is observed that total rain and runoff quantities varies slightly yearly but is highly variable monthly. Positive correlations were observed with the phenomena El Niño (increase of rains) and La Niña (decrease of rains). Local conflicts connected to the availability of volume and qualities were considered, as a local consequence of the climate change effect. Causes of the contemporary loss of water quality were discussed and were related to the increase of nitrogen and phosphorus nutrients produced by growing cash-crop monocultures, urban sewage and waste and industries emissions. The loss of quality was connected to growing urbanization and associated waste, to rural areas that affect water quality within a watershed because the use of transgenic cash crops and forest monocultures, including also the differences in law within a watershed because of internal frontiers with different Administrations. The ways to improve quality and mitigate water quality degradation and the consequences of frequent extreme events of excess or lack of water occurring throughout the territory were also discussed.

ID: 464: Eco Champions: an integrated approach to the whole community leadership for sustainability - Patricia Armstrong, AU

Empowering teachers and students in leadership for sustainability and helping them to build partnerships with community groups is essential in raising awareness and changing behaviour towards sustainability in the broader community. The Eco Champions project, conducted by Tomorrow's Leaders for Sustainability Inc., is an integrated set of programs and events to build capacity in school teachers, students and community leaders to lead sustainability projects. It can also build the

capacity of waste/sustainability education officers in local government, so that they in turn can build capacity of teachers and students, and community leaders. It does this by delivering an integrated set of elements: training to teachers and educators in facilitating student leadership; training for teachers to enhance their own leadership capabilities; professional development for local government educators; a Forum that will give students the knowledge and skills to develop effective sustainability projects; and a Challenge that recognises teacher and student sustainability projects, and school/community partnerships, with optional training for members of the community to help build their skills in leading community projects. The author will discuss the evolution of the project that culminated in a 2015 pilot program in the Shire of Mornington Peninsula (Victoria, Australia). Based on data collected from a number of sources, it was concluded that the pilot was highly successful, with excellent ratings by participants. Tomorrow's Leaders for Sustainability is now in the planning stages of expanding this project to other municipalities across Australia. It has potential of being applicable to other schools systems in other countries. This project has implications for educators responsible for promoting sustainable behaviour and social responsibility in their regions by providing an integrated approach across a number of different sectors of the community.

ID: 306: Sustainability in Higher Education Subjects: University-Community Co-Creation Process in the City of Girona - *Leslie Mahe Collazo Exposito, ES*

Following the Royal Decree 1393/2007 that establishes the organization of official university education in Spain, the Universitat de Girona (UdG) incorporated in 2008 the transversal competence in sustainability for all studies. Between 2013 and 2016 the UdG participated in the European University Educators for Sustainable Development (UE4SD) project which prompted us to identify what are the strengths, weaknesses, opportunities and threats of the UdG to move towards curricular sustainability. The aim of this work was to show how we designed and applied a set of actions to achieve the incorporation of the principles of sustainability in all the subjects of the studies of the UdG taking into account the results provided by the UE4SD project. We analyzed the documents produced during the work sessions, a survey applied to teachers and a video. The cooperative training actions addressed to the lecturers and the co-creation processes of the bases of the subjects with the participation of representatives of the whole local community allowed us to know what competences are currently held by teachers in this field and what they should have. We also found out what are the values, skills and knowledge that the local community believes should be part of the curriculum of subjects to move towards sustainability. In addition, we assessed the lecturer's opinion about the suggestions received during the training action. Finally we explain through what mechanisms and spaces we will continue working with the community.

ID: 535: Content Analysis of Descriptions of Exhibits in Nuclear Disaster Memorial Museums - *Shinobu Goto, JP*

Six years have passed after the Fukushima nuclear power plant accident, and the weathering of the memory of the accident has been a concern. In order to disseminate information about the facts and lessons of the Fukushima nuclear disaster and knowledge on radiation, the Japanese government and local municipalities issued new educational materials and constructed exhibition facility on the Fukushima nuclear disaster and radiation. They provide information focusing situations after the accident, scientific knowledge on radiation and history of reconstruction of Fukushima prefecture. On the other hand, they do not include adequate information such as the Japanese government's and local municipalities' responsibilities for the accident and standards of radiation dosage levels prescribed by law. To objectively and quantitatively clarify characteristics of exhibits, content analysis was applied to descriptions of exhibits in the 'Komyutan Fukushima' in the Fukushima Prefectural Center for Environmental Creation built in July 2016. I also analyzed descriptions of recorded audio in the Ukrainian National Chernobyl Museum and compared with the results in the case of Fukushima.

ID: 1000: On the technological accident with the Samarco dams collapse in Brazil: Is there future in the mud? - *Dulce Pereira, BR*

On November the 5th, 2015 there was the rupture of an iron mine dam (Fundao dam) in the municipality of Mariana, State of Minas Gerais (MG) resulting in the worst ecological disaster in Brazil, the largest dam collapse of this nature in modern history. It was aggravated by more liquid waste of the climbing of a second dam (Santarem) that increased the volume and strength of the released metal-rich waste, adding substances in concentrations that polluted rivers, devastated livelihoods and the ecosystem health. 19 people were reported dead, Bento Rodrigues was swamped as was almost the whole Paracatu de Baixo, districts of Mariana. The houses and historical heritage were left as scared shells as the flood devastated other territories along the 663 Km impacted by the volume of tailings released. The mining company Samarco (co-owned by the

Brazilian Vale and the Australian BHP Billiton), responsible for both dams, caused from 55-62 million m³ of iron ore to run directly into the Doce River watershed, along the state of Minas Gerais and Espírito Santo, devastating communities from middle class towns and touristic surfing areas to traditional fishing, indigenous, AfroBrazilian quilombos). The Brazilian coast and underground aquifers have been impacted. There are there are almost 600 people in vulnerability, hundreds were homeless, while rivers still run red mud. Regardless, the engagement of the population as victims of the disaster, supported by the judiciary, universities and NGOs, the negotiation between the impacted population and the responsible companies has been slow and painful, with some undermining of the environmental regulations. This work presents the results of scientific research with priority to soil and water - and the interaction developed in the context of Environmental Education, through the project Sustainable Schools, working with the 41 municipalities more directly damaged in partnership with The Brazilian Movement of People Affected by Dams (MAB). The objective has been to empower the communities concerning their institutional rights by defining the investigations according to their needs and sharing scientific data. There is identification of lack of planning, mistakes in the environmental licensing as well as failures of planning, control and risk management, which are recurrent in post-disaster interventions by the company and by the government. This work will also explore how this process impacts on the university students and researchers concerning the perception of the need to promote ruptures with the concepts of development at any cost, and building demand for transversal Environmental Education, approaching basic references such as precaution and prevention, interdisciplinary practices in engineering and focus scientific reference associated to the exercise of ethical responsibility.

ID: 564: Smart garbage collection system - Ruchi kumari, IN

Solid waste management is one of the major challenges faced by many countries around the globe. Inadequate collection, recycling or treatment and uncontrolled disposal of waste in dumps can lead to severe hazards, such as health risks and environmental pollution. Effective Solid Waste Management is one of the major challenges faced by the local authorities. In India, it is estimated that 62 million tonnes of waste is generated annually in the country at present; it is projected that by the year 2031 the MSW generation shall increase to 165 million tonnes and to 436 million tons by 2050. Due to an increase in population and subsequently increase in waste generation, landfills could become a major source of atmospheric pollution. Lot of research work has been done on various techniques and methods of management but there is still no properly managed system to encourage people to come forward and lead them to segregate waste from the point of its generation itself. Hence there is a need for a system that not only encourages people to adopt initial segregation process but to get something back in return. This new system of smart card will encourage them to segregate waste from its origin. Proper segregation of waste encourages people and ensures that different type of waste is sorted differently for recycle, reuse and different processes of disposal, and well-managed waste means clear streets and unclogged drains.

ID: 833: Study of the efficiency of *Moringa oleifera* in the quality of the water to the irrigation in the rural district Sobradinho - City of Uberlândia - MG. - Marília De Oliveira, BR

No Brasil, a má qualidade ea escassez de água são fatores preocupantes para as comunidades rurais. Na Fazenda Sobradinho - Uberlândia - MG, a qualidade da água para irrigação é prejudicada pelo alto nível de turbidez na água, o que aumenta a quantidade de manutenção que deve ser feita nos reservatórios de água. O objetivo deste trabalho foi estudar a eficiência das sementes maceradas de *Moringa oleifera* na coagulação dos sólidos em suspensão na água do reservatório nas fazendas visando reduzir a necessidade de manutenção no sistema de irrigação. *Distribuiu-se uma quantidade de sementes processadas de Moringa oleifera* a três produtores rurais que responderam a um questionário sobre a avaliação visual da água após o uso das sementes de *Moringa oleifera* e sobre a redução da quantidade de manutenção no sistema de bombeamento da água. Os resultados mostraram que, embora promova a redução dos números na manutenção no sistema de bombeamento da água, o mesmo não é proporcional à avaliação visual feita pelos produtores. Concluiu - se que fatores como a topografia do meio ambiente, a ocorrência dos ventos eo cuidado das propriedades com o sistema influenciam na eficiência de sementes de *Moringa oleifera* em tratamento de água.

ID: 496: Una Panorámica de la Actual Situación de Emergencia Y Articulación del Movimiento Agroecológico en Galicia - Kylyan Bisquert i Pérez, ES

Con esta comunicación se pretende ofrecer una aproximación a la situación actual del movimiento agroecológico en Galicia, compuesto por una amplia heterogeneidad de iniciativas caracterizadas por un marcado carácter social y crítico con el paradigma socioeconómico y agroalimentario actual, así como por una vocación transformadora que trasciende, e incluso transgrede, el marco institucional de la agricultura ecológica certificada. Este movimiento relativamente incipiente en este territorio, aunque con antecedentes ya consolidados, se halla inmerso en un proceso de articulación y búsqueda de una identidad común propia, reconocible en las distintas plataformas y herramientas de las que el mismo se ha ido dotando durante los últimos años: foros de reflexión y debate, sistemas participativos de garantía y otras estructuras organizativas locales, redes de coordinación, medios de comunicación, etc. Algunas características destacables de estas propuestas son su funcionamiento horizontal y asambleario, su orientación comunitaria y de base, su apuesta por la revitalización de los contextos rurales, la relocalización, la autogestión y la autonomía, y el fomento de las relaciones basadas en el apoyo mutuo y la confianza. La aproximación analítica que se presenta forma parte de un proyecto de investigación conducente a una tesis doctoral, en la cual se exploran las implicaciones socioeducativas -actuales y potenciales- que ofrece el movimiento agroecológico en Galicia mediante sus prácticas y discursos alrededor de la alimentación, es decir, de su modelo de construcción de la dieta. La finalidad es reforzar dichos elementos y aprovechar los más interesantes para el campo de la Educación Ambiental, tanto a nivel teórico como práctico, a la hora de promover culturas alimentarias social y ambientalmente responsables, que su vez actúen a modo de eje de transformaciones más profundas y complejas de la sociedad en pos de una nueva Cultura de la Sustentabilidad.

ID: 402: Un Estudio Comparado de Tres Universidades en Transición: Posibilidades Educativas del Modelo de las “Transition Towns” en El Marco Universitario - Kylyan Bisquert i Pérez, ES

Las iniciativas del movimiento de las “transition towns” tienen los elementos necesarios para poder considerarse una metodología para enfrentar los problemas del Cambio Climático y el Pico del Petróleo a través de una dinámica comunitaria. Las universidades, como instituciones y como comunidades no son ajenas a los problemas ambientales y constituyen una referencia en la búsqueda de soluciones. Sin embargo, a pesar de las experiencias de ambientalización impulsadas en los últimos años, se puede afirmar que actualmente las universidades distan mucho de ser entidades de bajo impacto ambiental y existen dudas sobre su capacidad para formar ciudadanos y profesionales comprometidos con los retos ambientales. Esta comunicación da cuenta de una investigación que evalúa desde una perspectiva educativo-ambiental la experiencia de tres “universidades en transición”: la Universidad de Santiago de Compostela (España), la University of Edinburgh (Reino Unido) e la Universidade do Minho (Portugal). Un objetivo es evaluar el potencial de la metodología de la transición para superar un hipotético “techo de cristal” que impide avanzar a la ambientalización de las instituciones universitarias. Se optó por un estudio de casos múltiple, de comparación analítica, que triangula la aproximación al objeto de análisis con distintas técnicas de recogida de información (grupos de discusión, entrevistas, observación, análisis documental) para componer las trayectorias “en transición” de estas tres iniciativas. La perspectiva comparada muestra tres escenarios distintos, tanto en la disponibilidad de recursos como en la adaptación estructural y socio-cultural del modelo de transición a cada contexto social e institucional.

ID: 430: In Case of Emergency Break Glass: Age-old Stories as Guideposts to a Sustainable Future - Roger Petry, CA

What does the Greek mythological story of Pandora's box, the Cheyenne account of how people got their first chiefs, the Biblical story of Adam and Eve, and the trump cards of the 15th century Italian playing card deck have in common? Each of these stories, whether shared verbally, textually or symbolically is central to a specific cultural tradition. Each can also be read as a transition account: a story where people when confronted by conditions of resource scarcity, ecological degradation and social injustice found new ways of understanding their environments and new ways of making a living. Using a grounded case studies methodology, this presentation will sketch out shared elements of these stories that provide key insights into how we might transition from our current ecological and market crisis to a global system of sustainable livelihoods. The talk will highlight the role of specific organizations, both old and new, and the formation of new knowledges found in these stories that are characterized by distress, urgency, and unexpected heroism.

Special Sessions

ID: 733: The Most Important Curriculum: Learning to Grow Food in a Changing Climate - Julie Johnston, CA

The climate change crisis, largely ignored by education systems in North America, is changing everything, but especially our food security (an issue largely ignored by North Americans). Climate disruption is leading to droughts, floods, heat waves, extreme weather events, negative impacts on yields in all major food-producing regions, crop failures, food shortages, volatile food prices, food riots, famines, conflicts, revolts, and starvation. For the last 10,000 years, human beings have evolved into a species dependent on agriculture, and agriculture depends on a stable climate, but that's now going. Developing resilience by learning how to grow food, build soil, collect rainwater and generate energy seems to be quickly becoming more important than learning to read, write and do math. This workshop is an opportunity to discuss this new reality with like-minded and like-hearted teaching colleagues, to share how you're teaching about climate change, and to show off your proudest moments, your most transformative activities, and the biggest failures you've experienced in your school garden program (or just come along to learn from others). You are invited to send 1-3 photos or slides ahead of time to the facilitator at greenheartedATshaw.ca.

ID: 1054: Enhancing Healthy Foods in Schools through Multidimensional Hands-On Learning - Patrick Gale, CA

The purpose of this project was to enhance school health outcomes through a multidimensional participatory approach towards foods education. Our project brought together a multitude of the WEEC Congress themes, including; Place-based Education and Local Outdoor Learning, Agriculture and Garden-based Learning, and Indigenous Knowledge and Environmental Education.

As in many communities, the Beaufort Delta Region of Canada's Arctic faces several food related challenges. Market price of healthy foods is prohibitive for many families. Diet related diseases, such as obesity and type 2 diabetes, are at extremely high rates and increasing. Understanding of a modern healthy diet and basic food preparation skills are lacking in much of the community. Traditional harvesting is costly and playing a reduced role in contemporary lifestyles. Between January 2011 and June 2015, my foods program developed to include growing produce year-round (in a community greenhouse and outdoors in Summer, in classrooms and common areas in the school during Winter), serving thousands of student-prepared healthy meals, integrating traditional Aboriginal harvesting and foods in to our regular program (plants, berries, moose, caribou, reindeer, fish, and others), and service learning in a variety of capacities. Several key community relationships were established to support these programs. In addition, we worked with researchers from a variety of Universities to increase understanding of community food issues and traditional food practices. As a result of these efforts, students contributed hundreds of volunteer hours to community services, including the local soup kitchen and community garden. Children began to shift their diets to include a higher amount of healthy foods and developed the basic kitchen skills required to prepare nutritious meals. Students also learned about food production and harvesting. These interests also lead to higher rates of post-secondary participation.

ID: 1069: Philosophy of naturalistic intelligence. In search of the lost link - Consuelo Giraldo, CO

For at least the last hundred years we have wondered why we do not take care of our planet? We have campaigned for others to become aware of the importance of caring for our planet. In educational institutions, for example, we work on the care of the environment, however, the results have not been as expected. If the planet is our home, if the enormous efforts made to co-engineer people have not had the expected effect, if time is running out, we must make efforts to understand which is the missing link that does not allow us to see clearly the abyss to which we are carrying our environment. Consequently, this proposal aims to make known some advances from different fronts (neuroscience, philosophy, sociology, psychology) that account for the way our brain works giving key guidelines to education in general and those who care about the environment, in particular, to increase the conscience of others, so that they protect the environment not because of fear of other or the laws but because they understand and feel the need to do so.

ID: 534: Valuing Nature in Childhood: the first environmental conservation education intervention for preschool children living around Cuc Phuong National Park, Ninh Binh, Vietnam. - Lan Ho, VN

Most of the kids living around Cuc Phuong National Park (CPNP), whose grandparents had lived and grown up inside the park, have never had a chance to go out beyond the four walls to explore Cuc Phuong forest and learn about their local wildlife; this is a tragedy! In an increasingly urbanised world, local children and families (Kinh and Mung ethnic group) have limited opportunities to connect with nature. Besides, environmental education is not part of the school curriculum, yet Vietnam is losing its wildlife at an alarming rate and is a major contributor to both wildlife trafficking and consumption. Therefore, Save Vietnam's Wildlife (SVW) aims to proactively intervene in Vietnamese education by undertaking Valuing Nature in Childhood Program (VNCP) which plays an important role in reconnecting children with nature, building appreciation of nature and local wildlife through direct experiences in Cuc Phuong forest and the Vietnam's first Carnivore and Pangolin Education Centre of SVW. The VNCP has been undertaken a pilot demonstration for 1,154 kids aged 5 from 14 kindergartens in Nho Quan, which is the closest district to the buffer zone of CPNP. The program has been strategically designed using storytelling approach, engaging activities and multisensory instruction (hearing, touch, smell, eyes) to let kids enjoy experiencing the wildlife and forest. The kids also met our un-releasable carnivores and pangolins (the most trafficked mammal in the world), listened to their individual stories and observed how animals were cared for and fed. Consistent with theories of pedagogy in young children, the purpose of this program is not so much to teach children facts, but to inculcate at a young age a love of wildlife and nature. This project will also help demonstrate the benefits of conservation education, generating support from the education authorities for SVW to embed conservation into the Vietnamese curriculum on a larger scale.

ID: 780: Analyzing the Efficacy of Environmental Topics Used in English Language Textbooks in Japanese Higher Education - Joshua Jodoin, JP

UNESCO defines Education for Sustainable Development (ESD) as a means of addressing present and future global challenges by creating sustainable and resilient societies. One of the major objectives of UNESCO's Sustainable Development Goals (SDG) is to address deficiencies in educational programs that do not integrate the concepts of ESD. Language teaching and English as a Foreign Language (EFL) textbooks are one major educational area that could better integrate ESD best practices, especially since environmental themes and topics, such as global warming, are commonly used. Although these topics are useful for raising student awareness of critical issues, lessons dedicated to these topics often fail to engage students beyond the purposes of English language teaching. This research examines the role that environmental topics play in EFL textbook through an analysis of a corpus built of over 35,000 words from EFL textbooks published after 2005. Furthermore, the research aims to codify these environmental-themed texts by skill, topic, purpose, layout, and outcome as a way of appraising how best practices in ESD could be further incorporated. This initial research is part of a broader project where best practices in Education for Sustainable Development (ESD) will also be researched in the EFL classroom in Japanese Higher Education (HE) with the final aim of answering, "to what extent can ESD be integrated and add value to EFL in Japanese HE?"

ID: 455: Creative Arts and Sustainability for Econnection in Early Childhood - Kumara Ward, AU

Curriculum Frameworks in Australia require the inclusion of early childhood education for sustainability (ECEfS) or EE in early childhood education settings. Despite this, research highlights considerable barriers to effective ECEfS. The complexity of this subject matter and the belief by many educators that the requirement for ECEfS oriented content is yet another demand for an already overcrowded curriculum, are often cited reasons. In Australia, the 2014 Review of National Quality Standards showed that 24% of services did not meet required accreditation ratings for standards relevant to sustainability education. In the USA, United Kingdom and Canada, the proliferation of early childhood services implementing outdoor learning programs and seeking support to integrate ECEfS also points to the need to develop new ways of addressing this issue. This paper reports on a study conducted in 2016 called International Arts-based Pedagogies and Experiential Nature Education (IAPENE). This study investigates working with integrated curriculum in early childhood where the arts ' a common and expected practice ' form the basis for integrating education for sustainability. This natural combination promotes econnection: a state in which cognitive awareness, physical intra-actions, affective engagement with the natural world and arts oriented sensibilities collectively form the basis of our relationships with each other and the natural environment. Using interviews and photo elicitation, thirty educators in arts/sustainability learning from education and community sectors across five counties, shared perspectives on arts and sustainability education. This precipitated the development of a pedagogical tool for educators where key principles, pedagogies and practices are articulated. This IAPENE tool was trialed in early childhood settings in Australian and in the USA in 2016, during which data about the educators' and the children's relationships with nature were gathered, further refining and confirming the

value of this tool as a pedagogy for sustainability.

ID: 665: Wilding the Rubrics: Pondering Wild Pedagogies within Educator Training Programs - Polly Knowlton Cockett, CA

“Before we ask questions, we must have questions to ask, and before we have questions to ask we must feel an awakened interest or curiosity” (Burroughs, 1918, p. 187). What are Wild Pedagogies and what might they look like in educator training programs? Indeed, how might the Wild manifest in urban educational settings, where many students and their teachers never meet wilderness per se? The way educators feel about wilderness (nature) has an impact on the people they work with. Is this important? Does it matter? Why? If so, what kinds of experiences can provide opportunities to rethink perspectives? How can professional educator training programs that are inherently very structured, rigid and beset by measurable learning outcomes and assessments by pre-determined rubrics, integrate wild pedagogy? If you wish to integrate existential experiences with wilderness, do you sneak them in or include them in the learning outcomes? What happens if everything in your course outcomes ‘needs’ to be measured? If you later slip in that which cannot be directly measured, does it devalue its importance? Who is attracted to educator training programs for teachers and early childhood educators? Are they people who themselves need or strive for control? What happens when control is loosened? If you integrate a little less control into your program what do you when students resist? What are some barriers to integrating a little wild pedagogy, and can these be overcome? In this interactive session, the co-presenters, who met while canoeing down the Yukon River with other Wild Pedagogues, will explore such questions as they have encountered them in their own work as post-secondary instructors in pre-service educator training programs. Participants will then be invited to share their own experiential questions, and together we’ll ponder the wildings. Burroughs, J. (1918). Nature lore. The Century Magazine, 187’196.

ID: 578: Green Impact: developing the agency of staff and students to transform campus culture - Quinn Runkle, GB

Green Impact is the flagship sustainability engagement programme of the UK National Union of Students. It is an environmental accreditation scheme with an awards element that has been developed over the last decade, having been founded in partnership with student activist. From simple origins, the scheme has grown to become a successful, national programme across UK tertiary education, and increasingly off-campus too. The scheme is centred on student mentors and auditors (over 1,000 trained annually) who support staff to implement sustainability actions within their workplaces through the guidance of bespoke workbooks. Actions might include environmental, social, or economic sustainability activities. Green Impact provides a framework and legitimacy for environmental champions to do more, helps break down departmental barriers, and empowers students to shape how their departments are run. It effectively engages staff and students to work collaboratively and take ownership to shape the culture of their institution. This year Green Impact is being run in 270 organisations, with 1,889 Green Impact teams or departments, reaching 29,191 staff. NUS has trained 352 students as mentors, and the scheme has amounted 85,851 greening actions, 52,352 of which were done as a result of the scheme. In 2014/15 Green Impact saved participating organisations £1.2m and 6,923 tCO₂e.

ID: 246: Power and Expertise in the Garden - Megan McGinty, US

School gardens provide an opportunity to teach about complex socio-ecological systems, but this is not always reflected in the research or curricula. Further, very few studies focus on teaching practices in the garden. This study uses video and audio data to show a representative garden educator portraying two dramatically different garden ecosystems; a flat, simplified version in their pedagogical discourse and a complex, interrelated version in personal interviews. Member-checking and further analysis of the data revealed a number of powered structures and influences that constrained the educator’s ability to use their socio-ecological expertise when teaching. This research raises questions about the effects of power within and across social and ecological systems, even in ‘bounded’ spaces, and challenges the notion that expertise produces expert teaching..

ID: 919: Collaborative online learning for environmental education in the US and China - Yue LI, US

Online learning provides an opportunity for environmental educators to exchange ideas and practices globally. By offering environmental education online courses, we provide a platform to bridge environmental education communities between the US and China. In this presentation, we share three projects that Cornell University collaborated with the Chinese



government, universities and NGOs to provide professional development training for environmental educators. The first project is an Urban Environmental Education online course. With funding from Alibaba Foundation, we collaborated with an environmental education organization *Youth Lead* to translate the course lectures into Chinese and coordinate study groups in China. The second project is an Environmental Education Overview online course. Collaborating with Center for Environmental Education and Communications, Ministry of Environmental Protection, we develop the course and incorporate examples of environmental education from China. The third project is Cornell University is offering a Civic Ecology MOOC on edX and xuetangX, and uses social media including Facebook and WeChat as an informal discussion platform for students to share ideas and practice. We will also plan to pair Cornell undergraduate students and Chinese environmental professionals to conduct collaborative projects and share through online tools. Further, we conduct collaborative research to examine the impact of online learning on environmental education programs and environmental behaviors across culture and language. These projects will not only foster the exchange of environmental education idea and practice internationally, but also help us understand how environmental education principles work in different cultural and language contexts.

ID: 39: The effect of environmental education on improving the mental health of children - Seyed Mohammad Shobeiri, IR

Health science is the branch of psychology preventing mental disorders and investigating ways to maintain optimum health and emotional resilience. This study examines the effect of education on environmental issues on improving the mental health of students based on gender differences. A quasi-experimental approach was conducted using pre-test and post-test. 142 boys and girls between five and six years old were selected from the city of Mashhad kindergartens. A two-part questionnaire which included questions about demographic information and mental health (SCL-90-R) was used. The results of the research show that the average post-test mean responses had grown considerably from pre-test responses. Concepts presented in training and exercises were reflected in responses as well as improvements in mental health. Keywords: education, environmental issues, mental health, children

ID: 69: An Evaluation for Interpretive signage at World Heritage Site in China - Xue Dong, US

The most important goal of interpretation at World Heritage Sites should be environmental education. Through an effective interpretive program, visitors would know more about the environment and shape their own environmental perspectives gradually. This presentation looked at evaluating the effectiveness of the interpretive signs at the Dujiangyan Irrigation System World Heritage Site in advancing environmental education. Basic theories of environmental education and interpretation, field trip investigations, and focus groups were incorporated into the analysis of environmental learning experiences with emphasis on the interaction between people and place. This study is building on interviews with experts engaged in natural heritage conservation and environmental education; meetings with practitioners and engineers of planning; surveys with tourists who were randomly sampled in the site. The four core recommendations of my evaluation are as follows: (1) improve Interpretive signs; (2) increase opportunities for outdoor learning; (3) provide interactive exhibits; (4) add contents about environmental education.

ID: 87: Integrating teaching and learning around the 7 Sustainable Development Goals of the Well-being of Future Generations (Wales) Act within Higher Education - Carolyn Hayles, GB

The Well-being of Future Generations (Wales) Act of 2015 is the first of its kind in the World, where the 'well-being of future generations' is considered at the heart of Welsh Government decision making. In the Act, Sustainable Development means the process of improving the economic, social, environmental and cultural well-being of Wales by taking actions, aimed at achieving seven well-being goals. The goals are a: Prosperous Wales; Resilient Wales; Healthier Wales; more Equal Wales; Wales of Cohesive Communities; Wales of vibrant Culture and thriving Welsh Language; and Globally Responsible Wales. It is still early days for the Act, however it is important that Welsh universities respond to the Act and put in place activities that support staff and student engagement through learning, teaching and research activities. University of Wales Trinity Saint David (UWTSD) has a clear National profile, with many of its staff and students speaking the Welsh language. UWTSD has an important role to play in the region. Many students are locals, living and working in the region. They also intend to live and work in the region on completion of their studies. Therefore it is important that students have an understanding of the Act and are well-versed in its intentions and delivery.

In this paper the development of a University-wide stand-alone certificate set up by UWTSD's Institute of Sustainable Practice, Innovation and Resource Effectiveness (INSPIRE) is presented. The primary aim of the certificate is to support student engagement with the Act. The online certificate takes students on a journey through the seven Sustainable Development or Well-being Goals, giving them an insight into the aspirations of the goals, supported by research and case studies, which cut across a range of sectors. Students are also expected to take part in University-based activities that reflect the ambitions of the Act.

ID: 90: Hospitales Verdes, una retribución social y ambiental con nuestra ciudad. - Claudia Paz, CO

Aunque la Secretaria de Salud de Cali es la autoridad sanitaria que ejecuta acciones de inspección, vigilancia y control referente al cumplimiento normativo en la atención en salud, gracias a una necesidad de querer enseñar mediante la práctica, a los caleños, entidades públicas o privadas, ya sean instituciones educativas, de salud, comerciales, etc, nació el programa de Hospitales Verdes, el cual es una apuesta de ciudad verde que pretende demostrar que curar sin hacer daño al ambiente es posible.

Este programa consiste en la vinculación y creación de un grupo de hospitales y clínicas dispuestos a la aplicación de estrategias de reducción del impacto ambiental procedente de su actividad. Desde esta perspectiva, se realizó una experiencia piloto de un hospital público, que dentro de sus estrategias ambientales cuenta con paneles solares, postes solares, calentadores solares, reconversiones tecnológicas como sustitución de aires acondicionados, de termómetros mercuriales, reciclaje de aguas, y aceite vegetal usado, sistemas ahorradores de agua, programas posconsumo, jornadas de sensibilización y educación ambiental con niños, jóvenes y adultos en la cuenca del río Meléndez, río que es de vital importancia para la ciudad, entre otras que aportan a la mitigación del cambio climático. Hoy por hoy, tanto la Secretaria de Salud como las cinco (5) Redes de Salud aliadas (Instituciones públicas que tienen entre 10 y 38 Instituciones prestadoras de salud) han desarrollado diversos proyectos ambientales similares, y son todos miembros de la Red Global de Hospitales Verdes y Saludables con sede en Argentina, y son muestras reales de empresas que brindan a los usuarios de sectores vulnerables de la ciudad una atención que educa para la sana convivencia con el ambiente.

Además de aportar al mejoramiento de un entorno saludable, el principal Hospital vinculado, es reconocido como la empresa grande con mejores prácticas de Responsabilidad Social del departamento del Valle del Cauca, Colombia. Este programa demuestra como con voluntad y esfuerzo puede haber un nuevo rol de las entidades de salud promover armonía entre lo económico y la sostenibilidad.

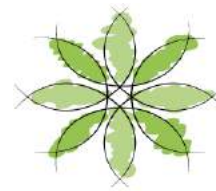
ID: 163: University-wide response to the Well-being of Future Generations (Wales) Act - Carolyn Hayles, GB

The Well-being of Future Generations (Wales) Act of 2015 is the first of its kind in the World, where the well-being of future generations is considered at the heart of Welsh Government decision-making. In the Act, Sustainable Development means the process of improving the economic, social, environmental and cultural well-being of Wales by taking actions, aimed at achieving seven well-being goals. The goals are a: Prosperous Wales; Resilient Wales; Healthier Wales; more Equal Wales; Wales of Cohesive Communities; Wales of vibrant Culture and thriving Welsh Language; and Globally Responsible Wales. It is still early days for the Act, however it is important that Welsh universities respond to the Act and put in place activities that support staff and student engagement through learning, teaching and research activities.

In this paper, student and staff focussed activities lead by the University of Wales: Trinity Saint David (UWTSD) and its Institute of Sustainable Practice, Innovation and Resource Effectiveness (INSPIRE), in support of the seven Sustainable Development Goals of the Act, are presented. Four principle activities are discussed in detail, namely: changes to degree validation, learning and teaching support, an internal research grant scheme in support of innovative research around the Act and best practice reporting.

ID: 174: Nature connection practices promoting self-knowledge and caring for nature - Riitta Wahlström, FI

The alienation of nature is one of the main reasons for the alienation from our emotions, our compassion, and from knowing oneself. As an ecopsychologist and EE teacher I have created numerous nature connection practices to re-establish connection between nature and oneself. Nature connection practices include "go in silence and freely find your powerplace", "find the symbols for your hoped future", "throw away your fears using symbols from nature", and many



other similar practices. I have described 56 different practices in my book: *Wellness by Loving Nature*. These kinds of practices are opening the emotions, promoting the self-knowledge, and enhancing environmental responsibility. Nature connection practices create wellbeing and caring, loving attitudes towards nature - something which has been found to be crucial for environmentally responsible actions. This presentation will show research findings and include discussion for future ideas.

ID: 176: Botanical Garden: COME IN! VSTUPTE! KOM IN! WEJD! GYERE BE! - Kennert Danielsson, SE

The project, '*Botanical Garden: COME IN! VSTUPTE! KOM IN! WEJD! GYERE BE!*, 2017-2019', focuses on visitors with special needs. The project intends to make botanic gardens (and also arboreta) more accessible to all visitors, regardless of their potential handicap, since botanic gardens, as open scientific and educational institutions, should not exclude any group of visitors. The project emphasizes the perception of nature through all senses which significantly enriches learning activities for general public. . During the course of the project educators will also improve and acquire new competencies, such as developing quality skills for work with people with special needs. Participants will have the opportunity to learn about innovative education methods. An integral part of the project is to raise awareness of other countries in the context of European citizenship and identity and also to improve language skills of educators. Last but not least, the project's priority is to engage innovative methods of education and open education in botanic gardens and arboreta. We will create a methodology on how to make botanic gardens accessible to the general public, regardless of any potential handicap and create a demonstration exhibition for all senses. The exhibition, to be shown from spring 2019, will enable attendees to learn about nature and the environment through all senses. Results of the project will be disseminated through virtual means of communication, media and European organizations (The European Botanic Gardens Consortium) and other organizations worldwide (BGCI).

ID: 178: Pro-environmental Behavior Models of University Student for Mitigating Climate Change on Purchase of Green Products - Tai-Yi Yu, TW

In recent years, the reports of the mass media and increased visibility of international environmental protection groups have created social distance between individuals and climate change in terms of one's ability to act. From the perspective of environmental sustainability, this study investigated purchase behavior intentionality and consumer loyalty of undergraduate students to green products. This study integrated several latent variables, such as environmental ethics, social responsibility, and self-responsibility into a behavior model. A survey was conducted over eight universities who had received 8 hours of environmental education about climate change; a total of 1586 valid respondents were collected. Analytical results of our structural equation model showed that an individual must have environmental ethics before they can become aware of their social- and self-responsibility to the environment, which then increases their purchase intention and consumer loyalty for green products. Adaptation strategies cannot reduce psychological distance to climate change instantly, and this study showed that the effectiveness of adaptation strategies requires consideration of both temporal and spatial distances. To clarify the role of mediator variables in the environmental responsibility chain, we compared the research model with competing research models, and discovered that environmental ethics act as the mediator for adaptation strategies, social responsibility, and self-responsibility. This study identified the relationships between the environmental responsibility chain (environmental ethics, social responsibility, and self-responsibility), beliefs in climate change, and purchasing behavior intentionality and consumer loyalty of green products. Results indicated self-responsibility fully mediated the relationships between environmental ethics, and behavior intentionality and consumer loyalty. We assert that an individual purchasing and using green products is a highly self-responsible behavior toward promoting environmental sustainability.

ID: 211: Fighting Fracking Downunder an Older Women's Agenda: óNannagogy - the Knitting Nannas Against Gas (Australia) - Lorraine Larri, AU

In Australia, 'Nanna' means grandmother. The Knitting Nannas Against Gas (KNAG) are synonymous with successful non-violent, anti-fracking protest. They present a different Australian eco-activist approach by engaging older women, a group not usually visible or vocal due to both age and gender stereotyping. There are now over forty groups since their beginning in 2012. My research involves situated learning of environmental adult education through activism. I investigate what I call 'Nannagogy' i.e. how older Australian women are being motivated and engaged in learning as a community of practice, to become environmental champions protesting coal seam gas extraction ('fracking'). This 'novel format' session recreates a typical 'knit-in' showing how informal learning occurs amongst the women through sitting, knitting, and plotting. A broader

educative role occurs for passers-by when Nannas collaborate in blockades of fracking sites. This presentation will be a rich informal learning environment: encouragement of audience participation with sets of knitting needles and wool; video loop of Nannas videos; examples of craft and art (knitted banners, barriers, posters, postcards, buttons); the 'Nannafesto' (<http://www.knitting-nannas.com/philosophy.php>). An introductory presentation will set the context and take the PechaKucha format (20 slides each 20 seconds long). Preliminary findings from an online survey will be highlighted.

ID: 214: Post-Sustainability and Environmental Education: Remaking Education for the Future - Bob Jickling, CA

This symposium marks the culmination of a multi-year project to examine a crisis in education's ability to effectively engage in the most pressing and social and environmental issues of the present era. It also marks the launch of a new book of the same title. To begin, this symposium briefly acknowledges serious critiques of education as a whole and environmental and sustainability education in particular. However, participants take to heart the idea that deconstruction is a prelude to reconstruction. Thus, this critique quickly leads to discussion about how education can be remade in ways that are conceptually strong and respond to the educational imperatives of our time, particularly as they relate to ecological crises and human/nature relationships. Central to the task at hand is not to add new bits to the curriculum, or new signifiers, but rather to frame a 'new vision for education.' All presenters are, in their own ways, seeking to fundamentally disrupt a dominant vision of education and to propose grounds for necessary change appropriate to the global challenges we now face. As the Earth is rapidly shifting from the Holocene to something being called the Anthropocene, there is a collective urgency to 'educate a generation of students who grow dangerous to the status quo.' What is clear is that there needs to be a shift in educational thinking and purpose that can enable practices that are life-affirming, relational, and truly transformational. This can be realised at any level of engagement through the role of 'rebel teacher' and through 'being differently' in the world. Discussion topics will include: Repurposing Education in a Volatile Age; Creating Educational Experiences that are Held, Felt, and Disruptive; The Search for the Rebel Teacher; Education and the Common Good; Education as Life.

ID: 218: Sacred Land: Potential Connections to Environmental Awareness and Engagement - Janet Groen, CA

'It has some old bones, and some scents, and beautiful trees. You have a sense of the energy of the place and the energy of the people who have walked there before.' This is how one retreatant described her impressions of a religiously based retreat centre she had just visited. Across Canada there are multiple retreat centres, situated in places of tremendous beauty, affording people a chance to rest and to reconnect with themselves and with nature. Many retreatants will return to a particular centre again and again, citing the sacredness of that land as an important part of their spiritual journey. As more voices are added to the chorus (McFague, 2013; Walters, 2009; Hitzhusen, 2006, 2012) that our environmental crisis is a spiritual problem, I am led to wonder what happens when these spiritual seekers visit these sacred places of natural beauty. Why do people come to these centres; what do they do during their stay; and what, if any, kind of change do they undergo while on retreat? Does their time on this land cause them to tread a little more lightly on the earth and/or become more actively engaged in environmental citizenship? Over these past three years, I have been engaged in a research study, entitled *How Then Shall We Live: The Potential Role of Religion, Manifested Through Their Spiritual Retreat Centres in Cultivating Environmental Citizenship*. A life history approach (Cole & Knowles, 2001, West, Alheit, Anderson & Merrill, 2007) was used to explore the experiences of retreatants; a particularly helpful approach as it situates retreatant experiences at a retreat centre within a holistic understanding of their broader life history. In this presentation and paper, I offer my analysis of retreatant experiences (n=6 for this particular paper); exploring the links between their spiritual story and environmental awareness and citizenship prior to their retreat experiences; their reflections on their land based experiences at the retreat centre and finally, the impact of these experiences on their understanding of their place in the natural world and examples (if any) of environmental citizenship in their daily life.

ID: 241: Guardians of the Great Barrier Reef - Stewardship in Action - Megan Connell, AU

The Great Barrier Reef Marine Park Authority's Reef Guardian program creates engaged and informed active citizens who are socially responsible stewards of the Great Barrier Reef. Since its inception in 2003, the program has evolved from knowledge sharing in the classroom, to students taking on-ground action." This cultural change has shifted how communities connect with, and in turn protect, their local environment. Reef Guardians instigate self-directed change in their homes, schools, local governments and community for the benefit of their urban catchments and coastal ecosystems and, ultimately, the Great Barrier Reef. Their projects are diverse and collaborative. They include wetland rehabilitation,

beach clean-ups, community events, and citizen science monitoring for the Reef. Indigenous Rangers and Traditional Owners actively partner in local projects and share Indigenous knowledge with students and communities at annual educational events across the state of Queensland. This paper session presents an overview of the Reef Guardians model, including its core principles of care, learn, act and share, and demonstrates how we inspire and support local projects for Reef stewardship. Dynamic communication and engagement occurs through traditional education methods such as curriculum-linked environmental education resources, as well as innovative community education tools such as future leader eco-challenge events and social media channels. Through the Reef Guardian Program, we have developed strong partnerships to encourage and support environmental stewardship in communities adjacent to the iconic Great Barrier Reef. We work with these partners using our education tools, networking and capacity building activities to engage people in place-based environmental learning. This empowers those involved to influence others in their community to reflect on how their actions may contribute to the health of the Reef. We will share with you our experience of how this creates focussed, collaborative stewardship to address challenges facing the Great Barrier Reef.

ID: 259: Development of educational programs emphasizing the nature experiences in biotope - Akihiro Iijima, JP

In environmental education, nature experiences are believed to form a useful basis for learning the relations between nature and humans. In these days, however, the opportunities to engage in outdoor activities tend to decrease with the rapid growth of the electronic media. Moreover, accessibility to nature is getting worse owing to the changes in the environment. Furthermore, few experience-oriented learning programs in nature have been developed in Japan so far. To solve the conflict between the real and the ideal, this study is intended to offer some new learning programs based on nature experiences by using biotope. In this study, we focus on the biotope managed by private company CHINO CORPORATION as a field for nature experiences. To date, the biotope plays an important role for conserving rare species in SATOYAMA ecosystem in Japan. We organized four small groups (A to D) by 11 college students and launched a development project for experience-oriented learning programs in nature. Here, the target learners were first or second-year students in elementary school. The A group established a program in which children experience nature with one's five senses. The title is 'Let's have fun, the forest expedition'. In this program, children try some quick quizzes by using five senses while exploring in the biotope. The B group established a program which focuses on the pleasure of creation and discovery. The title is 'Let's create the field guide'. In this program, children walk around with the format of field guide and try to find signboards illustrating animals and plants we can see in the biotope. The C group established the field quiz program by using IoT (Internet of Things) devices. The title is 'The detective in nature'. In this program, a facilitator with a tablet guides children through the biotope. Children answer questions from the facilitator at the check points in the field. The D group established a program named 'Leaf collector'. Children walk around in the biotope with a handout illustrating the characteristics of several plants, and collect the leaf samples. They take a picture on site and the collected leaf samples are compiled into the original booklet. In the presentation, we will discuss the educational effects of introducing these learning programs.

ID: 266: Aplicación Interdisciplinar de Técnicas Educativas a La Problemática Ambiental de Los Humedales Tipo Cauce Aislado de Río Valle Del Cauca Colombia (2012-2016) - Luis Gonzalez Escobar, CO

El estudio de este trabajo valora la importancia de la aplicación de técnica educativas interdisciplinarias (TEI) en la identificación de los factores que favorecen la comprensión de la situación ambiental de los humedales tipo cauce aislado de río (CARs) y la responsabilidad de los educadores ambientales, para el manejo de la observación organizada, que fortalezca las acciones de pensamiento, la profundización en el conocimiento y la percepción que se va adquiriendo de la problemática. Un aporte teórico y metodológico a la construcción del campo de la Educación ambiental universitaria. La práctica de carácter descriptivo e interpretativo plantea niveles de estudio relacionados con los humedales tipo CAR; la aplicación de TEI a los problemas ambientales y la incidencia que pueda tener este tipo de práctica en el aprendizaje, que desde el carácter interdisciplinar de las ciencias ambientales y la transdisciplinariedad de la educación ambiental, podamos comprender la complejidad de las dinámicas sociales y las prácticas culturales en las repercusiones que estas puedan tener en la integridad territorial de nuestros humedales.

ID: 278: No Easy Way Out: How fast does in-situ conservation education wear off: the case study of the critically endangered Philippine Cockatoo Conservation Program in Palawan, Philippines - Indira Dayang Widmann, PH

The Philippine Cockatoo Conservation Program (PCCP) aims to downlist the Philippine Cockatoo *Cacatua haematurus* from critical to endangered in the IUCN Red List. Katala Foundation Inc. implements the PCCP in Palawan, Philippines where the last stronghold of the species could be found. Its approach is ecosystemic, and integral is conservation education (CE) that is targeted to specific audiences. In Dumarán, the first PRIDE campaign in the Philippines was implemented in 2003 through social marketing methods to engage community members to take part in the conservation of the species. Strategies varied from puppet and mascot shows, conduct of Katala festivals, face painting, posters, school visits, to mention a few. The PRIDE campaign measures changes in levels of knowledge, attitude and interpersonal communication and behaviors (KAP) through pre- and post-test surveys after a year of CE intervention. Results of the post survey in 2005 directly attribute the positive impacts of the campaign with the knowledge and attitude variables increased by an average 17 and 23 percentage points respectively. Likewise, the campaign helped persuade the local municipality of Dumarán to secure two forest patches as protected area under municipal legislations and thereby demarcated for conservation. After five years from post-test, this novel PRIDE campaign was subjected to the longitudinal study assessing the KAP regression. Knowledge variables regressed by an average of 8 percentage points while attitude variables regressed by average 12 percentage points. This proves that public awareness campaigns must be sustained progressively along with other barrier removal interventions towards conservation. KFI established the Katala Institute for Ecology and Biodiversity Conservation to pursue these objectives on a long-time basis by serving as a venue for practical and experiential learning on biodiversity conservation. Keywords: PRIDE campaign, Dumarán, social marketing, community education and public awareness (CEPA), parrot conservation, KAP

ID: 287: Las prácticas de Egresados de programas de maestría en educación ambiental: caso de una profesora de biología de educación secundaria - Oswaldo Escobar Uribe, MX

A partir de una investigación cualitativa sobre las significaciones imaginarias construidas por egresados de dos programas de maestría de la Ciudad de México en torno a su formación y prácticas en Educación Ambiental, se desprende esta ponencia donde se destacan las características de las prácticas observadas de una egresada que vincula su asignatura de Ciencias I (Biología) para primer grado de nivel secundaria con Educación Ambiental. En este estudio se observa que las formas discursivas de la profesora están nutridas de una intertextualidad (Batjín, 1982) en el orden de lo político, pedagógico, curricular, cultural y experiencial, apoyado además con materiales de elaboración propia, dispuestos para exponer y orientar una racionalidad ambiental imbricada dentro de un espacio institucional. En esta práctica se encontró una lógica de engranaje entre el orden de ideas, orientación discursiva y realización (dispositivo), que además emplea la pregunta para interconectar los temas e inculcar una ética sobre lo ambiental que tiene que ver con entender al otro y no sólo a la naturaleza. Las “formas de lenguaje” tienen intenciones de complejización, ejemplificación, conceptualización y personalización. En breve, se destaca un interés por mostrar la EA a través de estrategias de acercamiento a los temas desde los lugares comunes de los estudiantes, avanzando paulatinamente hacia una complejidad mayor.

ID: 308: The Status of Nonformal EE in Taiwan: The spectrum of promoting environmental education facilities through EE Act - Yi-Hsuan Hsu, TW

In the early 1990s, environmental education (EE) was initially launched at all levels of the school settings (K-12) in Taiwan. Since then, EE has become a theme recognized as an influential instrument for increasing environmental concerns by Taiwanese educators. However, according to the EPA assessment findings (1998, 2014), school students (including college, high, secondary, and elementary schools) have showed a moderately low participation rate in action for the environment while their general knowledge and attitudes towards the environment are being increased substantially. In addition, the assessment also found that the extent of the behavioral performance among those student groups is gradually weaker as the students are elder. Also, college students and adults have received relatively less influence from the instruction of EE. So, encouraging a paradigm shift on approaches of EE, and enhancing the elements in nonformal education techniques are constantly needed in Taiwan during the time. In 2011, nonformal EE settings have been increasingly developed since Taiwan launched the Environmental Education Act. The Act accompanies national EE funds to pay for education and training, and it requires three kinds of certification: for personnel who conduct environmental teaching and learning, for facilities & venues that are regularly carrying out EE activities and programs to the public, and for institutions that train environmental educators. Up to the end of 2016, there were a total number of 9575 personnel, 140 facilities & venues, and 28 training institutions acquiring the badge certified by the EPA in Taiwan. The EE Act promotes nonformal environmental education settings to develop rapidly in Taiwan, that is, it can provide people more opportunities to learn in/for/about the

environment. This study aims at addressing a dynamic expansion of environmental education facilities, and their spatial distributions, characteristics, and programs at this stage were analyzed.

ID: 316: Tool-kit for teaching Climate Change - Delivering climate science education and increasing scientific literacy through simulation, games and inquiry - Savannah Poirier Hollander, CA

This interactive workshop explores why some teachers avoid teaching controversial topics, such as climate change. I will address the gap that exists between students and teachers when discussing divisive scientific topics. Delving into the mismatch between student understanding of climate change and the reality, I will address the missing links in student scientific literacy skills and other factors that might contribute to the confusion. Misunderstandings in climate science seem to stem from confusion about whether it is a scientific controversy or a social/political controversy. I will move around this idea and outline the importance of presenting the materials from both viewpoints. Climate change and other mainstream scientific theories are often large, nebulous, webby ideas; breaking them down into small, digestible chunks that students can relate to personally can provide the context for reaching a deeper understanding of the larger issue. The importance of nature as a classroom, a significant factor in students' ability to relate to ecological issues on a personal and scientific level, will be a theme throughout. Using examples from current research, I will explore important aspects of the nature of science that secondary students need to comprehend before they can build on their understanding of contentious topics in science. Interspersed throughout, I will have classroom activities and interactive approaches to teaching aspects of climate change and increasing scientific literacy; from simulations and debates to case studies and games.

ID: 341: Investigation into the Core Competencies Required for "Environmental Educators" to Work in an Environmental Education Learning Center - Traishar Kao, TW

The Environmental Education Act of Taiwan came into force in 2011 and there have been 145 environmental education learning centers being certified as of March 2017. In every center, at least one environmental educator has to be certified according to the 'Environmental Educator Certification and Management Regulations.' These environmental educators can apply for becoming certified "environmental educators" to the issuing authority via various channels to prove if they are academically qualified, with experience, with expertise, being recommended, taking examination, or taking training. Despite these methods of certification having been listed in the regulations, the essence and specifications required for environmental educators in these learning centers remains ambiguous. The aim of this research is to delve deeper into these required competencies. The field data of this research had been collected from October 2014 to April 2015 in Taiwan. In total, 29 interviewees from 11 Environmental Education Learning Centers of 10 different types participated in the survey, including environmental protection facilities, community and cultural preservation centres, national parks, farms, scenic spots/recreation areas, water resource and wetlands centres, soil and water conservation centres, museums/zoos, and natural centers. Among the 29 interviewees, there were 8 managers, 11 teaching staff and 10 administrators. A questionnaire on the 'Competency Indicators of an Environmental Educator' was then developed in order to explore the "core competencies". The target audience of the questionnaire included officials from the authority, certified staff in environmental education, and learning center staff and volunteers. In total, 65 questionnaires had been returned. In order to systematically present the collected data in an organized manner, data collection and analysis had been carried out alternately. The first draft of the competency indicators was generated from the qualitative field data, which were properly recorded, processed and analyzed by triangulation. The data obtained from the questionnaire were then analyzed by using SPSS 12.0, and the statistical results were presented as the source of the research conclusions. The results of this study are the core competencies of "environmental educators," which encompass three dimensions: Environmental Literacy, Environmental Education Teaching, and Environmental Education Administration. In total, seven facets with twenty-one indicators have been identified within the three dimensions. Keywords: Environmental educator, Core competency indicators, Environmental education learning center

ID: 344: Reuse centre as a place to learn about sustainability - Elena Saarikallio, FI

The real-world relevance motivates children and young people to learn about sustainable ways of consumption. At best it can lead to new understanding about sustainable lifestyles. The Helsinki Metropolitan Area Reuse Centre in Finland addresses this by offering multidisciplinary learning adventures for children and youngsters. The Material Agents adventure is designed for 12 to 18 year-olds. The main objective here is to learn about common materials and sustainability issues

related to them. Gamification, tablets, and role-play are used to motivate youngsters to study the given materials, share information and think about new solutions for ecological problems related to them. The Little Agents adventure is designed for children aged 5 to 8. They will learn through games and stories about the life cycle of commodities surrounding them. They have an opportunity to build life cycle models using building blocks and use their imagination to furnish a miniature house with reused materials. Schools have warmly welcomed both adventures, especially since the Finnish curriculum for basic education aims for building a sustainable future and emphasizes learning outside the classroom. In addition, the Reuse Centre offers day camps for children and garden based learning program for kindergartens where they have a chance to learn about the nutrient cycle by taking care of vegetable gardens and building their own vermicomposts. The Helsinki Metropolitan Area Reuse Centre is a social enterprise with a mission to improve the state of the environment by reducing the amount of waste and natural resource consumption. Operating second hand stores and providing environmental education are the main ways to achieve this. The Reuse Centre teaches over 40,000 children, youngsters, adults and educators each year. We visit schools, kindergartens and institutes, and increasingly use our six second hand stores as learning environments, as well.

ID: 348: Learning community development and increasing personal agency in a 15-week, residential, place-based sustainable education: successes and suggestions. - David Ostergren, US

The Sustainability Leadership Semester (SLS) at Goshen College in northern Indiana provides an interdisciplinary, place-based, and problem-based undergraduate learning experience engaging the multiple facets of regional environmental issues. This is a 15 credit, three month, 24/7 immersion into sustainability during which the students live in LEAD Certified Platinum buildings on a 1,200 acre nature preserve and sustainable farm. The program is built around field work, including weekly experiences with people, businesses, non-profit organizations, government agencies, churches, schools, and farms who all share water and energy resources. An eight-day canoe trip from the headwaters of the Elkhart River to Lake Michigan highlights connectivity and incorporates multiple stops to meet with stakeholders every day. Four courses (i.e. limnology, sustainability, policy, eco-justice) are paired into month long blocks to maximize field time and flexibility in class discussion. Team teaching with two to four professors is the norm in classes, the field, and/or during seminars. For a final project, the class partners with an organization in the watershed to address a current challenge or need. Students come from multiple disciplines; environmental science, communication, art, peace & conflict resolution, religion, psychology, and sociology. Our research investigated how students develop skills in community assessment and development, with sustainability as the core, guiding principle. To measure change we use a pre-post essay case study scenario with content analysis, student self-reporting, and professor evaluations. Our findings indicate that the most significant shifts include; 1) a stronger commitment to making a connection with place, 2) from the student focusing on their own sustainable behavior, to focusing on more on community/system change, and 3) an increased feeling of personal agency to facilitate community change.

ID: 427: Making field trips in nature effective: The interplay between novelty and learning - Peter Van Petegem, BE

Educational field trips are common practice in EE and ESD, well recognised by researchers for their potential to achieve cognitive and affective educational outcomes. One of the factors that influences learning during field trips is their novelty. This paper focuses on the interplay between novelty, preparation, and environmental learning outcomes of 5th and 6th grade students during a typical field trip in Flanders. Our dependent variables are Inclusion of Nature in the Self, two ecological values (Preservation, Utilisation), and ecosystem knowledge. The sample includes 484 students (10 to 12 years old) and their 24 teachers. Key questions addressed are: (1) What is learned during the field trip? (2) What is the level of novelty for students during a field trip? (3) How does the novelty effect relate to learning? Results show that participation in the field trip leads to a substantial increase in ecosystem knowledge, but fails in reaching the affective goals set out by the field trip organizers. Our results furthermore provide support for the hypothesized non-linear relationship between novelty and knowledge gain, showing that while a little novelty is positive, too much novelty can stand in the way of learning.

ID: 466: Floods, fires, and fear, oh my!: Exploring Visual Rhetoric in Environmental Documentaries - Nawal Al Hosany, AE

The Global High Schools category of the Zayed Future Energy Prize, the world's pre-eminent award for renewable energy and sustainability, is a program designed to empower youth through education, open to all high schools that teach students 11-19 years old. The Global High Schools Prize provides a unique approach to environmental education, allowing students

to research, plan, and execute their own vision of a sustainable future for their school. The Prize's planning, implementation, and education phases give students hands-on experience in sustainability and energy, motivating them to take action, pursue careers in science, and drive positive changes in their communities. A case study of Munro Academy on Cape Breton Island, Nova Scotia, will be presented, documenting the research, application, implementation, and community engagement aspects of the Prize. This example will demonstrate how building environmental awareness initiatives into the curriculum teaches the knowledge and skills necessary to face critical global climate and energy issues in future.

ID: 472: Medicina Tradicional Mexicana y la Educación Ambiental - Alma Cuevas-Nunez, MX

Hablar de la medicina tradicional mexicana es reconocer tan solo una de las aportaciones que nuestros ancestros han heredado a nuestra cultura. Esta aportación se relaciona no solo con los conocimientos que los grupos indígenas tenían acerca de los beneficios que las plantas medicinales brindan a la salud física del hombre, sino también a todas aquellas prácticas y rituales que animan y protegen su espíritu y alma. Esta reciente visión de la medicina tradicional ha superado la limitada idea del uso de la herbolaria como la única forma de alcanzar la salud, se han ido reconociendo e incluyendo además otras prácticas terapéuticas que los grupos indígenas realizaban como parte de la sanación. Entre dichas prácticas se destacan las curaciones, masajes indígenas, temazcales, limpiezas energéticas, uso de rituales con plantas, etc. Este conjunto de prácticas se caracterizaron por la estrecha relación del hombre con las fuerzas vivas de su medio ambiente. Esto es, en las prácticas medicinales ancestrales existió la certeza de que el ser humano tenía el compromiso de restablecer, cultivar y fortalecer sus relaciones con las fuerzas, elementos o espíritus que regían y sostenían la vida (montes, manantiales, cuevas, santos cuidaderos de un poblado o región, animales, el fuego, la tierra, la lluvia). La salud, bienestar y preservación de la vida dependen del culto a estas relaciones, es por eso que el ritual y el rezo cobran tanta importancia en este tipo de medicina. El trabajo que hemos realizado en Azcapotzalco, Ciudad de México consiste en: Favorecer el conocimiento y prácticas ancestrales como una forma para que los individuos de la zona restablezcan su salud física, emocional y espiritual además de obtener ingresos económicos. Aunado a lo anterior, destacamos el vínculo del saber indígena con el cuidado y preservación del medio ambiente.

ID: 490: Educación ambiental en un Área Natural Protegida con la incorporación de estudiantes universitarios. - Elena Arano Leal, MX

Asumir la perspectiva de sustentabilidad en los diferentes niveles educativos, representa un reto. Muestra de ello, es la experiencia vivida al procurar incorporar la sustentabilidad en las experiencias educativas, a fin de impregnarla en la estructura curricular. Reconociendo que, sumar otra experiencia educativa que aborde dicha perspectiva, no implica que se permee al resto del diseño curricular. Es deseable que la sustentabilidad sea asequible no solo conceptualmente, sino a través de los hábitos de coexistencia y convivencia dentro y fuera del aula. Es por ello, que la intervención en un Área Natural Protegida (ANP), brinda la oportunidad a estudiantes de la licenciatura en Pedagogía, para reconocer la confluencia entre su formación académica y la asunción de hábitos de vida sustentable.

Por lo cual se creó un Proyecto de Vinculación en la Facultad de Pedagogía con la Secretaría de Medio Ambiente (SEDEMA), con el Objetivo General de: *Favorecer la coexistencia sustentable en el Área Natural Protegida "El Tejar-Garnica" en la Fracción III denominado Parque Natura, como espacio de formación educativa, convivencia social, cultural y natural para la sensibilización en la población estudiantil y comunitaria*.

A través de este proyecto los estudiantes y docentes de las experiencias educativas "Práctica" y "Desarrollo humano", con la asesoría de expertos, efectúan acciones de educación ambiental en el ANP, promoviendo que su aprendizaje sea inherente al diseño pedagógico y realización de las estrategias de educación ambiental.

ID: 492: Nuevos Paradigmas en la Relación Hombre Naturaleza en Los Andes - German Callejas, ES

La comunicación se centra en el estudio de la realidad contemporánea de los indígenas quechuas de los Andes y su integración en el modelo presente de desarrollo global. Los datos que fundamentan esta reflexión provienen de una investigación de carácter cualitativo – etnográfico y de la revisión documental de la información referida a la situación presente de los indígenas en los Andes. Las conclusiones destacan el alto nivel de penetración de la cultura occidental en el imaginario de los indígenas; la elaboración de estrategias de integración y convivencia de los modelos de desarrollo indígena y occidental; el esfuerzo por la conservación y el fomento de elementos que constituyen el eje vital de la cultura, y la persistencia, a pesar del alto nivel de urbanización, en los fundamentos culturales de la tradición indígena. Aspectos que en su conjunto dan lugar a la elaboración de nuevos paradigmas sociales, ambientales y de desarrollo, que reconfiguran la

relación entre el ser humano y la naturaleza en el mundo andino actual.

ID: 495: Environmental Education Certificate Program of Distinction - Molina Walters, US

The main focus of environmental education programs has been to change environmental behaviors and attitudes through increasing environmental knowledge, literacy, and leadership. A number of environmental education programs that aim to increase and nurture environmental knowledge, attitudes, and behaviors have been developed worldwide. The purpose of this project is to examine the effects of place-based, environmental education coursework required for the certificate on university student's pro-environmental behavior, attitudes, and knowledge. Through one-on-one interviews and surveys of students who have completed between ten and fifteen credits of the certificate requirements, the project has gained an understanding of the impact of this coursework to building environmental stewards and leaders.

ID: 509: Field-based study in tertiary biological sciences: an endangered species? - Frances Quinn, AU

This qualitative, interview-based study explores the learning associated with an intensive field experience in a field-based tertiary level botany unit of study, the attitudes and perceived costs/benefits to the staff and students involved in the field experience, and the kinds of learning that students report having achieved. The context and rationale for this research is the decline in field-based tertiary education in biological sciences, and calls for a renewal of science courses that enable students to experience nature first-hand and learn the fundamentals of the natural sciences. Though effective conservation of our rapidly declining biodiversity depends on people with this expertise, there is very little research on the learning and attitudes of students in tertiary field-based biological science contexts.

ID: 529: Saving Nemo through Aquaculture Conservation and Citizen Scientists - Karen Burke da Silva, AU

The Saving Nemo Clownfish Club is an immersive conservation program in Australian high schools and universities. Using data collected by citizen scientists and aquaculture of marine ornamental species creates authentic learning opportunities, improved laboratory skills, and provides an opportunity to make a difference to a global conservation issue. Most marine ornamental species sold in pet shops are still being taken from the wild, whereas most freshwater species are being bred in captivity. Coral reef environments are negatively impacted by over-collecting, adding to their current vulnerability caused by climate change. We have designed a program to help alleviate this pressure and embed strong conservation education at the same time. School based aquaculture conservation engages students and teachers alike and can have additional positive impacts such as overall understanding and attitudes toward conservation issues, increased conservation action, and a greater probability of staying engaged in science. Citizen scientists are able to contribute data thereby helping develop a scientific understanding of the issue and a contribution to education more broadly.

ID: 542: Place-based Education in the Anthropocene - Bob Coulter, US

This session offers a critical look at the potential of place-based education in the anthropocene. Building on foundational work by Sobel (1996) and others, and integrating previous critical looks (Gruenewald, 2008), an argument will be made that place-based education offers ways to foster improved learning opportunities, as well as a risk of reinforcing implicit notions of human dominance. In short, there is a lot of good to be realized, but only if we do so wisely. To support this argument, two strands will be brought together: One describes how place-based education offers great potential to leverage a number of emerging understandings from cognitive science. For example, research on neuroplasticity (Eagleman, 2005) shows how experiences 'in this case, being outdoors in the local community' permanently shape our cognitive pathways. Along with that, place-based education is particularly well-suited to foster extended and embodied cognition through authentic group efforts where we learn more as we learn with each other (Clark, 2008; Sloman, 2017). Still, these potential learning benefits must be sought out with care. Without anchoring in a suitable ethical base, there is a risk of place-based engagement fostering an ideal of dominance and control emerging from greater understanding of how things work. To address this, we need to give equal attention to fostering the growth of an ecological imagination (Fesmire, 2005) that lets us see ourselves as one of many interdependent parts of a grander system. In sum, we need to nurture in young learners a deep engagement with the natural world, and equip them to see the many connections and causes playing out before them. But, we need to do so in the context of a broader concern for nurturing an organic, non-hierarchical resonance with the world at large.

ID: 562: On-site Solar Energy Generation: The Opportunity for Experiential Learning - Sarah Finder, DE

Founded in 2015 and currently with offices in the UK and Germany, Solar Options for Schools Ltd. set out to enable all schools to install solar panels at no cost and integrate the solar panels into the curriculum. Practically, this means bringing schools and investors together on an online platform to enable schools to have access to low- or no-cost solar solutions and where schools can utilize actual energy production and consumption data from live, on-site solar panel systems. Working closely with our Education Advisory Board of experts in sustainability education and solar energy based learning materials, we are developing three experiential learning programs: The Solar Ambassadors program enables groups of students to assess a given school's solar potential by analyzing its roof space, determine the school's current electricity consumption, calculating solar yield, and comparing different system sizes to determine the most suitable option for that school. Once a system is installed, the Energy Detectives program enables students to compare real-time generation and consumption data for their school to see how they can reduce consumption or shift consumption to times when the system is generating more electricity. And lastly, the Global Citizens program facilitates international projects and exchanges about solar energy expansion to developing countries. The idea behind these efforts is that having tangible experiences and direct interaction with the topic of energy allows for higher quality learning opportunities for students and expands teaching options for educators. Furthermore, there is growing evidence that, in general, sustainability education is motivational and can increase student achievement in STEM subjects. The ultimate goals of these current educational efforts are to successfully create the three student programs so that they can be adopted into physics, mechanics, mathematics, natural sciences, or social sciences curriculums and to analyze their effects on students' achievement.

ID: 603: Confronting Health-related Challenges of Climate Change through Higher education program - Pei-Chih Wu, TW

Climate change is the biggest global health threat of the 21st century. It is important to identify those populations most at risk, adaptation strategies in different levels, and take actions to cope with the changes. This study, which is in line with the policies of Taiwan's Ministry of Education, aims to develop and promote the education programs in the field of health on climate change adaptations. We summarize the evidence of health impacts, vulnerability, and adaptations in Taiwan and worldwide. After communicating with industries, government, and universities, we develop materials for health associated departments such as nursing, public health, and medicine. We created multiple teaching alliance organizations, communication platforms, and mechanisms to promote the integration into current lectures and curricula. In the first year, thirteen schools, nineteen lecturers, and 951 students have been successfully recruited to participate in this program, with 25 courses having fully integrated our teaching materials in to the curriculum. Most students are quite satisfied with the program and believe education on health adaptations to climate change is essential for their imminent professions. Therefore, this model of imparting knowledge regarding climate change health adaptations seems beneficial for the development of professionals in higher education. This program will continuously strive to increase the capacity of adaptation in health professionals.

ID: 620: Ecole verte Fatick/Catalogne - Mamadou Toure, SN

L'école bien que jouant un rôle très important dans le relèvement du niveau de sensibilisation et d'instruction de la population, tarde encore à être véritablement la courroie de transmission permettant de faire le lien entre le savoir, le savoir-faire et le savoir-être. Conscient de cela, le Conseil Départemental de Gossas, en collaboration avec l'Inspection de l'Education et de la Formation, a entrepris de mettre en œuvre le projet « ECOLE VERTE », en vue de passer par l'éducation comme un créneau efficace de promotion du développement durable, de conservation des écosystèmes et de lutte contre le changement climatique. Ce projet rentre dans le cadre de la participation à l'effort d'atténuation et l'adaptation des changements climatiques. Il est né de la volonté d'impliquer l'école, notamment les élèves, les parents d'élèves et les enseignants dans les activités de connaissance et préservation de l'environnement et d'adaptation au changement climatique. Le thème du projet est l'éducation à l'environnement dans un contexte de changement climatique et de dégradation de l'environnement. Le programme vise à supporter les écoles qui veulent innover, avancer, systématiser et organiser toutes les actions éducatives qui ont pour but d'affronter, par l'éducation, les nouveaux challenges et valeurs du développement durable dont la lutte contre les effets du changement climatique.

ID: 648: Know*ledge Constellations and Re*constellating: Narratives to Inform Indigenous-and-Environmental Education - Brigitte Evering, CA



There is a growing sense of urgency to address environmental issues within both Indigenous and non-Indigenous communities. Some have argued that communities will be most successful in challenging such issues if ways can be found to work with different knowledges. However, the practice of bringing together knowledges is not yet consistently effective. There is also a recognised need for skilled practitioners to work in/with communities. Unfortunately, there is minimal programming advice based on this individual perspective available to guide post-secondary institutions wishing to meet this need. This research answered two important questions: What are the key principles and concepts in a narrative describing how individual practitioners think about using knowledges when finding solutions to place-based environmental issues? and What are the implications of this understanding for post-secondary Indigenous-and-Environmental education? Findings were based on coherent conversations with environmental practitioners who were deliberately using multiple, including Indigenous, knowledges. These practitioners helped co-create a Know*ledge Constellation Story to describe how they think about using knowledges in their work. This narrative identified Knower, Processes-of-Knowing, and Content-Knowledge stars, which individuals actively constellate into their know*ledge constellations. Then in a group coherent conversation with educators familiar with Indigenous-and-Environmental education, we explored the educational implications of this story. Together, we finalised a Teaching-Learning Story of Re*constellating that outlines a number of principles of re*constellating such as clarifying the informative or decisive intent of bringing knowledges together. Another principle identified by educators was to teach students to be aware of the conditions of emergence of re*constellating, for example, articulating similarities while appreciating differences. Findings include recommendations for educators preparing students to meet environmental challenges. Such programming will assist graduates to engage with communities to address environmental concerns, meet legislative and policy requirements, and support research efforts that would benefit from a clearer understanding of the practice of re*constellating.

ID: 654: Environmental education and sustainable tourism in Emberá indigenous communities of the Chagres River.
- Rolando Checa Campos, PA

In Panama, indigenous peoples are grouped into seven ethnic groups and occupy 20% of the national territory, representing 12% of the country's population. The displacement of members of the Embera ethnic group from the Darien region to the Chagres River was part of a "social experiment" of the United States Army in the so-called Canal Zone, in order to train the astronauts of the different NASA space programs in jungle survival, since 1960 through 1975. (RCheca, 2007). Subsequently, more individuals migrated and settled in the Chagres River, applying their traditional practices for the use of natural resources within their reach. However, the territory where they were established was declared a "national park" in 1985, and many of their activities were banned by the new legislation of the protected area. However, they found in environmental education and sustainable tourism a different way of thriving in harmony with nature, achieving an alternative of sustainable local economic development which provides complementary economic benefits to the traditional productive activities permitted by law and keeps them away from poverty conditions. Environmental education is part of their ancestral knowledge, but over time, they have been strengthened by the exchange of knowledge with institutions such as: the Panama Canal Authority, the National Environmental Ministry, the Smithsonian's Tropical Research Institute, and other institutional actors. Now, under a combined environmental education and sustainable tourism scheme, they provide a service to national and foreign tourists and contribute to the protection and sustainable use of the natural and cultural resources of this important region, which provides 42% of the water needed for the system lakes of the Panama Canal. Key words: Sustainable tourism, environmental education, indigenous community, conservation, protected area.

ID: 664: Environmental Education Centers: A European Paradigm - Constantinos Yanniris, GR

In Greece, an extensive network of Environmental Education Centers (EECs) educates students, teachers, and local communities on environmental and sustainability issues. EECs have been commended by international organizations for their holistic, experiential educational approach (CEDEFOP, 2012). In the wake of the Eurozone debt crisis, the Greek government enforced the closure of forty percent of EECs and curtailed the staff of the remainder (Greek Ministry of Education, 2011). Nevertheless, the decision for the shrinkage of environmental education could not be sustained. Within a period of two years, advocacy from teachers' associations, education officers, local communities, and pressure from political parties resulted in the re-opening of 1/3 of the EECs that were abolished in the wake of the crisis (Kouvelis et al. 2010); moreover, new EECs that were held in the pipeline started to appear (Greek Ministry of Education 2015). This outcome has attracted the interest of researchers who explored the institutional, structural, and pedagogical characteristics that contributed to the resilience of environmental education infrastructure in the country (Yanniris & Garis, 2017). A notable point is that the institutional framework of EECs requires the co-operation of three different administrative levels:

local municipalities, the central government, and the European Union. At the local level, the cooperation starts when a municipality offers a building to be converted into an Environmental Education Center. Accordingly, the central government assigns teachers and educational guidelines and finally, the European Union provides funds for the implementation of educational activities. In this manner, each level of administration perceives the partnership as beneficial and renews its commitment to the project. This scheme of mutual benefit could be considered by other systems that may have an interest to usher local educational innovation in state-level regulatory frameworks under the indirect support of a higher political hierarchy such as a federal government.

ID: 702: Ecological sanitation technology and agriculture - SARRA KITANOU, MA

The purpose of this study is based on the introduction of human urine as a nitrogen-rich fertilizer product in agriculture. A true source of nutrients, it can be generalized and applied as fertilizer in some developing countries including Morocco. Indeed, the Moroccan countryside has been experiencing low yields due to soil depletion, lack of sanitation, and excessive costs of chemical fertilizers. The test on growing zucchini made with sanitized urine in five different doses proves the effectiveness of this alternative. The experiments demonstrate the impact of human urine on crop productivity and are used to determine the optimum amounts for better agricultural production. The results show that the sanitized urine contains 5.6 g of N per liter, with a basic pH. In terms of returns, the urine can be used as nitrogen fertilizer competitive with conventional fertilizer when used as a maintenance fertilizer. The recovery rate of N-urine was significantly higher than that of N-fertilizer. We have also shown that the dilution of 100% urine optimizes performance. Rural communities especially should take the Ecological Sanitation (Eco-San) technology to improve their income, and leave a healthy environment.

ID: 721: Special management waste in the ENMS Leon, Universidad de Guanajuato: the collection center - Juana Ortiz Cienega, MX

Worldwide, environmental awareness about waste-management is a topic that has permeated through several normative levels. For Mexico, the SEMARNAT elaborates the rules known as NOM for the environmental sector, with the goal of protecting the environment, as well as the preservation of natural resources. The NOM-161-SEMARNAT-2012 establishes the criteria to classify the special management waste, as well as the elements and procedures to elaborate the management plans. In Guanajuato, the Instituto de Ecología establishes the guidelines to characterize the special management waste. The environmental regulation for environmental management in Leon, establishes that it is important to properly regulate the waste management. Since 2013, a collection center for special waste-management was placed by the local government in the Escuela de Nivel Medio Superior de Leon (ENMS Leon), a high school that belongs to the Universidad de Guanajuato. It has mainly been managed by students, who were responsible for the waste separation and the correct disposal, always supervised by some teachers. The collection center received inner waste as well as external waste from the neighborhoods around the school. The main objective of the present case of study is to determinate the achievement of the state and federal normativity, in terms of special waste-management, as well as to know how the student's collaboration influenced this goal. We reviewed the normativity that the collection center must accomplish, from the federal instances to the local ones, to obtain the right environmental statement.

ID: 734: How Can "Pokemon Go" Apply to Your Environmental Education Program? - Xue Dong, US

Pokemon Go, the augmented reality pocket monster game, lets people locate and catch "Pokemon" in real life. Pokemon Go may inspire you to offer some environmental education programs through the use of augmented reality games. Hopefully, playing the EE related augmented reality games will become a new way to explore local parks. For example, you can develop a game which invites visitors to learn a new plant in the park and guide them in discovering the relationships with native species. The game accomplishes these goals by engaging players in a story centered around figuring out what a new alien species wants with the park's native plants. Then ultimately, the player decides what to do about the invasive species. The game was originally created for State Parks in New York, and the game storyline and everything is basically the same, you can just complete it at a different setting. I hope that there will be more active and creative augmented reality games developed and better promoted in the near future. Augmented reality could not only increase visitors' knowledge, but also encourage them to be involved in stewardship. So if you are looking for some exciting outdoor activities, go with friends to a local park to participate in augmented reality games.

ID: 736: The land value for indigenous peoples of the Amazon region of Acre, Brazil - Rosely Imbernon, BR

‘Action research’ as a methodological approach was applied to the training courses of indigenous teachers in the Training Course of Indigenous Teachers - CFDI, at the Federal University of Acre-UFAC, in the State of Acre. This methodological approach addressed the concept of land value as a basis for a re-reading of the Earth Charter of Indigenous Peoples, documents proposed at the World Conference of Indigenous Peoples on Territory, Environment and Development, during the United Nations Conference, Rio-92. The application of research action allowed us to analyse the central issue, law and value of the land, from the perspective of indigenous students.

ID: 757: Cultural Literacy/Environmental Education - Barry Wood, US

Edward Wilson’s book *Half Earth* (2015) argues that it will require half the Earth set aside as wilderness to guarantee present biodiversity. Such a dramatic calculation suggests an equally dramatic and innovative half-and-half formula for EE: a 50/50 split for K-12 curricula between current state-defined cultural education, and environmental education. Current curricula reveal the need: science units for American K-5 students in the revised Next Generation Science Standards (2013) number 38, EE content is limited to 5; in the Core Knowledge Foundation publication, *What Your Kindergartner Needs to Know* (1996), cultural literacy (literature, history, visual arts, music, mathematics) takes up 242 pages; science occupies 33 pages with taking care of the Earth confined to 3 pages. Creators of these curricula are university professors, deans with PhDs, and CEOs firmly embedded in the Business-Industrial-Corporate-Technological world and the education system which supports it. Few appear to know that we overshot the Earth’s carrying capacity in the 1980s, that our ecological footprint now adds up to 1.6 Planet Earths, or that our Technosphere built environment (houses, buildings, factories, vehicles, roads, energy installations) weighs 30 trillion tonnes, 50 kilograms per square meter, 95 pounds per square yard of Earth’s usable land, a massive transformation of a self-organizing, self-maintaining ecosystem to an artificial urbanized world where we are occupied and employed building, maintaining, renovating, replacing it. To educate a new generation of environmental experts, we need a revolution that begins with childhood education where the foundation for professional EE is laid. Cultural education must continue; EE should be expanded dramatically to half the curriculum. EE content includes our dependence on, impact on, and danger to the aquasphere, atmosphere, biosphere, and geosphere. These are not afternoon-lesson topics, but a profoundly full curriculum on the ecosystem upon which we and our entire civilization are based.

ID: 763: Assessment of competencies for sustainability in secondary education in Mexico - Jorge Rodríguez Aboytes, MX

Given a conceptual model of competencies for sustainability, like the generic competency for sustainability established in the latest secondary education reform in Mexico, an assessment of competencies for sustainability was conducted with the students of the main high school in Matehuala city Mexico. Within the assessment process, an analysis of the institution curriculum was conducted, along with interactions with students and teachers through interviews, focus groups, and workshops. An assessment framework was constructed in order to design an instrument that generates the evidence of learning regarding those sustainability competencies and, thus, to infer their levels of achievement. The instrument consisted of a performance task, and a knowledge and attitudes questionnaire. It was applied to 60 students, divided in 3 groups according to their level of instruction. In spite of the differences between the three groups, the results showed that all students have good attitudes towards sustainability and comprehend basic terms related to it; however, their performance in systemic thinking, prospective thinking, and the ability to propose strategies are not developed well enough to face the challenges that the environmental and civilization crises demand today.

ID: 772: Eco-san Latrine System and Its Acceptability by the Community in Democratic Republic of Congo - Stanis Koko, CD

The vast majority of the population living in rural areas of Democratic Republic of Congo (DRC) is dependent on groundwater sources for their drinking water and agriculture for their food and income. The majority of this population also uses normal pit latrines as their primary method of sanitation with harmful effects on groundwater quality and the general environment. The ecological sanitation (Eco-san) system, a hygienic sanitation option, is not promoted and remains unknown by the vast majority of people, hence the necessity of promoting this technology. The purpose of this study was to determine the acceptance level of Eco-san by the community in the DRC. A number of activities were undertaken and

implemented in Ntondo village, including awareness raising and capacity building on appropriate management of Eco-san latrines, data collection, training of beneficiaries on hygiene principles like the use of Eco-san latrines and reuse of Eco-san fertilizers, and agricultural follow up; rallies; construction of Eco-san latrines; farm plot demonstration; etc.. The general perceptions of people using Eco-san were encouraging. 98% of users expressed positive perceptions, whereas 2% expressed negative perceptions towards this technology. Similarly, the majority of the neighbours of the Eco-san users (96%) expressed a positive perception of Eco-san and 4% of them were not convinced. The positive perceptions of users and their neighbours using Eco-san showed its acceptability by the community in DRC was high. Moreover, absence of odours, and great ecological and economical advantages associated with Eco-san latrines make them acceptable as a sanitation option. Thus, the level of acceptance of Eco-san latrines by the users and willingness to install by non-users indicated possibilities of further scaling up of this technology. Finally, it is recommended that NGOs, Research Institutes, and Governments should create policy and strategies to promote Eco-san in the various corners of the country.

ID: 773: Educational Commons: Strategies, barriers and innovations in teaching Sustainable Development - Cristina Capineri, IT

Drawing from both the activities carried out by the University of Siena in the last decade, namely UNSDSN-Med and the participation at G7 Education (Udine June 2017), and the personal research engagement, this contribution analyses the inclusion of sustainability in HE curricula and classrooms. First, the paper will review the state of the art from recent literature and from a large selection of case studies and best practices developed at the global level. Secondly, it will include the results of a survey titled "The role of Higher Education to foster sustainability" addressed to international Institutions (universities, research institutions, NGOs, etc.). From these sources, the paper will highlight innovative methodologies, tools, and learning processes, but also barriers and weaknesses of the ongoing initiatives taken into consideration. The outcomes of the paper will contribute to suggesting future scenarios for the improvement of sustainability in HE and for the educational transformation that is required to create a sustainable future.

ID: 950: Agriculture and Garden Based Learning: Life Improvement with Agriculture (Productive land management) - Brumel Murutanganji, BI

Our project will be addressing farmers, and how to help them learn to improve their daily job so that they can get an income out of it and improve their way of living. Indeed, the country of Burundi is a territory which is inhabited in majority by farmers (90%). Most farmers work just to feed their family. For the past many years, the population has not responded well to invitations to learn, so to motivate them to learn, we will attract farmers by making a competition.. In one province, we will give the participants an equal amount of seeds, and we will show them how to sow in harmony and to sow more than what the family will eat. After that, we will observe how they follow up on their plants and at the final stage we will compensate the winner, and we will sell the products of the farmers and give them their money. From that money they earn from their harvest, we will remove a small amount for new seeds to continue the learning and to bring them into the habit of sowing more than the strict minimum. In one year, the project will be executed in two to three provinces and if we want to cover the whole country, the whole project will be done in six years.

ID: 360: Honoring our Elders: Learning Science through Place-Based Approaches - Yuen Sze Michelle Tan, CA

The recent science curricula reform in British Columbia, Canada, places emphases on place-based learning and students developing understandings of the processes of science. To this end, we propose place-based approaches to support students' learning about the environment and biology that focus on an easily overlooked aspect of science instruction. As much of the attention is given to learning about the practices of science and using scientific content, the idea of 'community' is often neglected as an important aspect of science place-based education. In our presentation, we highlight theoretical perspectives that underpin the development of our proposed research study, and present two examples by which students could engage with a scientific discourse through the lens of community engagement and the theme of 'honoring our Elders'. The first example is the storied lives of the Southern Resident Killer Whale community who dwell in a cherished and endangered place, the Salish Sea. Elder wisdom held by Orca matriarchs is the lifeblood and the heart knowledge of the pod. With the recent death of matriarch Granny J2, questions arise 'Who will assume the role of knowledge keeper of the pod's lived experiences? What is the future of the Southern Residents Orcas and this place called the Salish Sea as matrilineal diminish and disappear?' We juxtapose the first example with a case of learning science in Vancouver's Chinatown, where students are given opportunities to apply their scientific knowledge and engage in inquiry when considering the historical, political,

social, and cultural context of the place. The conversations culminate in how the 'place' is inhabited by Elders that are currently facing the threat of being displaced from their homes, community, and local spaces.

ID: 1043: TNC China Youth Engagement Program - Xinchun Wei,

There are 373 million youth between the ages of 5 to 24 in China, lacking opportunities to explore nature as well as gain in-depth understanding of the significance of environmental protection, they need comprehensive and advanced environmental education to help them prepare for the future. TNC China Youth Engagement Program is meeting this challenge head-on with a determined focus to help Chinese youth learn about nature and how it works around them; engage them in volunteer service to make positive change in their communities; and build career pathways to strengthen the conservation workforce. This program focuses on three key areas of engagement: Learning, based on China's education situation, the Conservancy collaborates with partners and environmental education experts to establish a Chinese E-STEM system to bridge the gap between traditional and experience-based education; Action, based on practical program and the needs of students, custom design the project-based teaching practice with offline environmental education and field exploration, connect Chinese youth with nature and introduce them practical environmental problems, encourage youth to engage in conservation through volunteer activities; Leadership, the Conservancy provides youth with one-to-one mentorship and internship opportunities in order to cultivate their ability of resolving practical problems. Meanwhile, excellent students will have access to TNC internships and be shaped into future environmental education leaders.

ID: 1055: An Examination of the Research and Innovative Planning Initiatives of North America's Largest Solar Driven Sustainable Green Florida Community - William Hammond, US

This presentation will share a planning model that facilitates reviewing and rating any development or community proposal on the quality of its overall design considering vernacular, biophilic, and efficiency/conservation (LEED Certification type factors). This assessment system helps to provide a metric that addresses quality assurance and comparison of developments and communities on factors of sustainability, green design, aesthetics, and life quality.

The presentation will be focused on the example of the Babcock Ranch Community located fewer than 15 miles from the two largest SW Florida cities Ft. Myers and Cape Coral. Innovative community master planning, developer leadership combined with unique state land-use regulations provided an opportunity to make feasible a unique example of an integrated, Green-designed, solar, environmentally sustainable, and largely self-contained community. Ultimately, the Kitson & Partners LLC designed Babcock Ranch Community is intended to be the largest sustainable solar community in North America, accommodating 45,000+ people in the Town Center, Villages, and Hamlets, and incorporating large natural flow-ways while being surrounded by 160k acres of State Preserve lands. The Master Plan for the Babcock Ranch Community was shaped by the unique ecological, hydrological, native and anthropogenic landscapes. The Master plan was also driven by architectural design goals including walkability, use of autonomous vehicles, native plant conservation and landscaping, research based hydrological, ecological restoration, and workforce housing. The community plan also provides for Green Pre K- 12 schools and University facilities offering a unique context for this large community and its residents. The K-12 Green schools will use an advanced STEM curriculum approach that adds economics, environment, and culture as three driving factors (E2 C) to the conventional STEM formulation and the community as its school grounds.

ID: 416: A Critical Review of ESD in Japan: Beyond the Practice of Pouring New Wine into Old Bottles - Yoshiyuki Nagata, JP

Japan stands as a rare country in which ESD has been incorporated as mainstream policy. However, looking back on the United Nations Decade of Education for Sustainable Development (UNDESD), ESD has not brought about the transformation in Japan that one expects ESD to aim for, despite this support at the policy level. The cause may be that pouring the 'new wine' of ESD into the 'old bottle' of the traditional educational system has diluted the dynamism contained in ESD. Both 'shallow ESD' and 'deep ESD' exist. The former stems mainly from widely shared interpretations of ESD that emphasize the overlap and connections with existing school subjects and types of education. The latter is needed to avoid this loss of dynamism and to gain access to the full potential of ESD. Holistic educational approaches that

replace conventional ones, as well as system-level transformation, are indispensable to realize this 'deep ESD.'

ID: 788: Recurrent drought in Somalia and Genuine factors behind it - Mohamud Ahmed, SO

Somalia is currently experiencing the worst drought ever seen. Famine in the Horn of Africa has swept away people's assets, resulted in crop and production failure, led to declines in food security and widespread malnutrition. This has led to the displacement and loss of hundred of humans and thousands of livestock particularly in the South central parts of the country, Puntland and Somaliland. In February 2017, the President of Somalia declared an emergency situation in a high level meeting attended by major stakeholders and donors. The Somali government has requested assistance from the international community, and so far some international and local aid actors have responded but the response is very delayed. For more than a decade, recurrent droughts have severely impacted the Somali environment, residents, and animals. This is a result of a combination of several factors, especially political and social instability. For more than two decades, the country has been torn by war following the collapse of the central government causing a power vacuum to flood with armed actors across the country. Such conflict has caused the loss of the nation's public institutions and infrastructure; rebuilding efforts are ongoing, but are slow especially in the rural areas most vulnerable to the drought. The ability and capacity of local people and local administration to respond to the drought is limited. The local administrations lack the necessary skills and resources to tackle the recurrent drought, therefore they can't provide support needed by the people such as establishing an early warning system, environmental protection, education and healthcare facilities, or clean water. The demographic and community structure is also a factor as the Somali population is estimated around 12M with almost 50% living in rural areas. This needs special consideration and attention highlights the need for a rural development strategy. Corruption is the worst disease affecting the Somalia community. According to a Transparency International report, Somalia is ranked last in the 2016 Corruption Perceptions Index. Much corruption revolves around foreign aid, and more opportunities for corruption are likely to exist in 2017 as more aid flows into the country (Transparency International 25/01/2017; Marqaati 11/02/2017). Furthermore, Somalia lacks a comprehensive and effective strategic resilience plan. Every time drought hits in Somalia, there is an attempt to respond to it, but with no long term plan put in place. Heavy reliance on foreign aid and reductions in remittance support for Somalia diaspora communities, following the restriction of remittance in some countries, have had a remarkable impact on the recurrent drought in Somalia. A large number of local people depend on remittance support from families and friends as alternative sources of livelihood. Also much reliance on foreign aid has resulted in negligence in farming activities and search for other employment opportunities. In conclusion, to address and deal with this prolonged problem, there must be special consideration given to the above mentioned issues and factors to come up with a durable solution so that a peaceful and prosperous country will be gained.

ID: 807: Considering the Stories of Other Beings in Our Midst - Zuzana Vasko, CA

Val Plumwood proposes a rethinking of our relationship with the natural world toward a less human-centered perspective, one that gives nature an active voice. In a similar vein, Heesoon Bai suggests how welcoming animist perspectives and reconsidering the commonly practiced separation between animate and inanimate entities can build toward a more peaceful and compassionate connection with non-human beings. My purpose in this presentation is to propose that the other-than-human beings in our surroundings and ecologies have histories and lived experiences and thus have rich stories of interest to us, and that attentive observation and listening, together with sensitive and empathetic imagination, can bring us to a closer understanding of these stories. We will explore ways in which narrative writing from the perspective of other beings a practice which calls upon sensory, embodied and poetic epistemologies can engender and build upon meaningful connections with non-human entities while expanding our sense of knowing and curiosity about what life may be like for them. Here, rather than allowing us to escape the realities before us, the imagination brings us closer to them.

ID: 847: Learning the river culture by playing, studying and discussing. (Results and experiences from case studies) - Elena Comino, IT

When consider how to manage the Environment, we know that one of the most important and difficult aspects is how to explain environmental issues to stakeholders. This is due to the fact that the stakeholders have different ages, cultures, and experiences living in the environment. It is not enough to have a deep scientific knowledge, it is also very important to know how, to whom, and what it is you want to communicate. The aim of this paper is to present how we work for 'river culture' dissemination in the frame of the results we achieved in several International European projects. The Research



Group of Applied Ecology of Politecnico di Torino developed these activities between 2009 and the present. According to our experience, in order to have successful Environmental Education it is fundamental to provide concepts using simple language, provide support with examples, and to give a practical motivation for any explained concept. The research study proposed here gives evidence to the experiences conducted in the primary and secondary school, in the University, and with common people using different approaches: from board games to video, to public presentations and rounds table. The authors underline the rules used and the network created between all the actors: adults, teachers, children, keeping in mind that these actors will be the future leaders and administrators.

ID: 859: The Process of equipment: Perceptions of Technology, Skill, and Risk in the Outdoors - Kevin Fraser, CA

This research, which is only at its beginning stages, explores the process by which recreationists become equipped for a back-country trip. I conceptualize and explore the notion of equipment beyond the 'gear' itself, so as to include the skills and abilities, technology, tools, and knowledge that a person assembles before embarking on an outdoor trip. I will examine how the ways in which people are equipped influence their readiness and engagement in a task such as paddling a river or climbing a mountain. Having received little attention, the processes that take place prior to a trip influence experiences during and meanings after trips. Understanding the process of equipment has implications for safety, meanings, and learning accrued during trips, and outcomes that might determine how a recreationist becomes equipped for their next experience. In an education context, understanding the equipment process could help educators reflect and analyze how they prepare themselves or groups for trips by identifying how the process influences the delivery of outdoor experiences. Central to my research is how and whether technology affects the process of becoming equipped by shaping skill development and risk perception. This research project will seek to identify processes by which recreationists become equipped for backcountry canoe trips in the interior of British Columbia, and the role that technology plays in those processes to understand how the equipment process influences the outcomes of trips.

ID: 889: Getting Australian teachers started with sustainability - Mark Caddey, AU

www.sustainabilityinschools.edu.au is an online portal with Australian Curriculum linked learning resources and case studies for teachers on getting started with sustainability in primary and secondary schools. It also provides a range of community activities and advice for schools wanting to take a whole school approach to sustainability. This new curated resource portal houses over 500 resources and has a monthly average visitation of 1500 teachers and growing. The portal is available to all teachers nationally. The Australian Association for Environmental Education (AAEE) is part of a 10-member alliance, the Australian Education for Sustainability Alliance (AESA) comprises education, youth, and environment organisations and education unions all wanting to see a higher prioritisation of sustainability in the school education system www.educationforsustainability.org.au. AESA undertook national research of over 5000 teachers to better understand their needs when teaching Sustainability as a cross-curricular part of the Australian Curriculum. AAEE now manages the portal on behalf of AESA. The research showed that 80% of Australian teachers were unaware that sustainability is a three cross-curriculum priority or they lack understanding of the concept and relevance of teaching sustainability (2013). Analysing this data revealed both an inconsistency with pre-service teacher training across Australia and a lack of professional development opportunities in supporting teachers to be able to teach concepts of sustainability confidently and effectively. The 'Getting started with Sustainability' portal both supports sustainability learning and action, as well as providing professional learning advice for teachers to improve their knowledge and understanding. It can guide schools in adopting more holistic approaches to sustainability. This presentation will discuss the research findings and explore the role of a professional association in understanding the needs of its teachers and the wider environmental education profession and how this can be better met.

ID: 939: Inclusion, equality of opportunity and perception of the environment in the higher education system in Morocco. - Mohammed Youbi Idrissi, MA

The issue of education and the environment is becoming increasingly important in the higher education system in Morocco. In this context, I have led, with many Moroccan and European partners, a project entitled "Network of Moroccan Universities for Inclusive Education" [www.rumi-project.org]. This fabulous experience has made it possible for some marginalized and underrepresented target groups in Moroccan universities to appeal to Moroccan decision-makers to improve the conditions for access to higher education in Morocco. These are: (a) foreign students enrolled in Moroccan universities and more specifically students of sub-Saharan origin; (B) students with disabilities, and (c) students suffering

from socio-economic insecurity. We conducted focus groups and informed questionnaires with these three categories and organized study days in Morocco and training workshops in Europe. The results are worrying about the students' perception of several themes during their university studies, including inclusion, equal opportunities, and more particularly the issue of the environment and the fragile equilibriums of ecosystems in Morocco. Our approach was based on analyses that considered the gender approach and took into account certain recommendations of the COP 22 (Marrakech). I would like to share these results and testimonies with the participants at the ninth World Congress on Environment and Education.

ID: 958: Teaching Global Indigenous cultures to young learners - *Sophia Hunter, CA*

British Columbia's new Social Studies curriculum for grade 3 focuses on Global Indigenous peoples, particularly the relationship humans have with their environment and the cultural and technological innovations these relationships foster. This challenging topic is fascinating to students but finding age-appropriate contemporary resources was difficult. Through Simon Fraser University's President's Dream Colloquium on Returning to the Teachings: Justice, Identity and Belonging, ideas and resources were borrowed and adapted to allow grade 3 students to discuss concepts such as the Whanganui River gaining legal personhood or understand the significance of the Hokule'a's journey around the world. We plan to share and discuss resources that allow urban learners to develop shifts in thinking about their environment, well-being, and ways of living. This interactive presentation will foster sharing and dialogue, allowing teachers to take or suggest resources and big questions as needed.

ID: 974: Educate to walk together : free ludic spaces for children. - *Maria Montalbano, IT*

Our cities appear often as labyrinths that need to be untangled, between colliding time schedules, unavoidable traffic jams, and few islands where to have a break. How can you harmonize all this? And leave a child the right space to grow, letting them achieve not only a cognitive maturity? We should give children instruments to practice the right to play, to learn the art of walking through the city thanks to free spaces where they can measure themselves without referring to pre-established parameters. This way of learning is even more important nowadays. In a world, which creates and offers, today more than ever, spaces which are beautiful and super functional, but at the same time created with the purpose of projecting ourselves in that space within a predefined role. The freedom of creating and becoming your personal vision is suffocated, or bounded, to rigid standards. We can observe unnatural rhythms in children's everyday lives: sometimes they are frenetic and sometimes static. Considering that the citizens of tomorrow, which theoretically have the whole world in front of them, actually have the feeling that the free and shared occasions to experiment themselves are shrinking. If happy islands, casual or designed, still exist, it means that the art of walking and of communicating with the city is still possible. Positive actions which are not meant to fence children's minds and bodies with entertainments and prohibitions, should be enforced. While those rules, far from the relational cartography of the city, traced by the educational community, should be avoided. Only by overcoming these limits, a child can grow and conquer their own place in the world. To make this happen we must give them the opportunity to rest freely in safe areas where to meet, confront, and share not only virtual spaces. I will try to trace some of the possibilities that emerged, during the last 10 years, in the Italian context, and especially the metropolitan area of Bologna.

ID: 1014: Beach Investigators - *Mark Bryant, US*

There is growing concern for Humans and the connection we have with our natural environment. "Beach Investigators" is a week long summer program that aims to help students find motivation for exploring the natural environment around them. The program aims to accomplish this by working to find outdoor activities and skills that resonate with a student's own identity and sense of community. These skills will range from science based observations, to artistic expression.

ID: 1025: Blended Learning in Development - *Jaime Webbe, KE*

If we are to change the way we make choices and manage the limited resources on our planet, we must educate and empower a new generation of stakeholders: Generation Green. The need to educate and empower has been recognized through global processes including the Sustainable Development Goals which promote a holistic and integrated approach to sustainable development while recognizing significant technical and capacity needs and challenges. Of particular note is SDG Target 4.7 calling for education for sustainable development such that all learners acquire the knowledge and skills needed to promote sustainable development. Furthermore, United Nations Environment Assembly (UNEA) Resolution 2/3

on capacity building through environmental education and training, which specifically calls for greater access to environmental education, training and capacity-building opportunities. In order to meet today's challenges, development organizations need to make best use of technology while fully recognizing the needs and priorities of learners. Blended learning is defined as a formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path or pace[1]. If successful, blended learning can be very cost effective in terms of investment per person trained, can broaden participation by increasing accessibility and reducing in person time commitments, and can lead to long-term and sustained capacity development beyond the project end through in-country teaching capacity development. Blended learning also allows for the easy customization of learning content, including for different audiences (journalists, policy makers, scientists, etc). Finally, blended learning can support holistic, cross-sector approaches because of its inclusive, dynamic and flexible nature. UN Environment is promoting the blended learning approach through its new SDG Campus. This SDG Campus combines digital and online learning with face-to-face training. It will be dynamic insofar as new material will be constantly developed and made available and an online multi-stakeholder platform will be built around social-media, SDG-related events, and student / youth and teacher engagement. This session will introduce the SDG Campus from the perspective of countries, learners, and international development organizations. [1] http://www.innosightinstitute.org/innosight/wp-content/uploads/2012/05/Classifying-K-12-blended-learning2.pdf?utm_campaign=elearningindustry.com&utm_source=%2Fwhy-blended-learning-is-better&utm_medium=link

ID: 598: La Naturaleza Como Maestra: Educación Ambiental en el área de influencia de ITAIPU Binacional - Ada Rivas de Escobar, PY

La experiencia de ITAIPU Binacional, la mayor generadora de energía hidroeléctrica limpia y renovable en el mundo, en el campo de la Educación Ambiental dentro del Área de Influencia de su embalse, se inicia en 1990. Desde ese momento, la educación ambiental ha sido uno de los pilares principales en la gestión socioambiental de la empresa, desarrollando diferentes programas destinados a concientizar a la población sobre la importancia del cuidado de la naturaleza para la formación de una sociedad sustentable. El enfoque de las acciones es principalmente vivencial, poniendo al ser humano en contacto directo con la naturaleza y los aspectos culturales que hacen parte de su identidad, con el fin de lograr que el individuo sea sensibilizado y así contribuir a la conservación del patrimonio natural y cultural. Para ello, son utilizadas distintas estructuras educativas establecidas por la empresa; entre ellas se destacan las ocho áreas protegidas con las que cuenta la ITAIPU Binacional, el Museo de ITAIPU - Tierra Guaraní, un museo de historia natural, arqueología y antropología, cuyas colecciones provienen de los primeros trabajos de investigación realizados en el área de influencia en la década de 1970, y el Centro de Investigación de Animales Silvestres, encargado de la conservación, investigación y reproducción de especies nativas de la región, muchas de las cuales se encuentran en peligro de extinción. El Programa de Educación Ambiental crea un lazo y un nexo entre todas estas unidades y temas, acercando así al hombre a tener una visión integral de lo que es el medio ambiente: un espacio vital en donde se conjuga la naturaleza, la cultura y los seres vivos, una fuente inagotable de aprendizaje y conocimiento.

ID: 831: El ámbito rural de México. Espacio posible de la educación ambiental que impulse proyectos productivos sustentables. - Jose Silverio Morales, MX

Nuestro país tiene dos riquezas importantes, una es su diversidad cultural en lo que corresponde a las 63 etnias y sus respectivas lenguas; la otra es su diversidad biológica. Algunas de nuestras etnias habitan dentro de ecosistemas o bien cercanos a ellos en lo que llamamos el ámbito rural o campo mexicano. Su cultura, cosmovisión, prácticas agrícolas, conocimiento de su medio, algunas costumbres y sobre todo su relación armónica o bien de bajo impacto con la naturaleza constituyen un universo invaluable de conocimientos que no solo se debe preservar sino incrementar y proyectar como contraparte a un modelo de desarrollo insustentable. La educación ambiental participativa puede impulsar proyectos productivos sustentables cuya característica sea la de generar actividades de bajo impacto pero con aprovechamiento de recursos naturales al alcance. En México hay ejemplos notables de estos proyectos, pero es necesario ampliarlos para que más comunidades rurales obtengan beneficios que mejoren vida y como ejemplos de sustentabilidad. A la educación ambiental, en su modalidad no formal, le correspondería impulsar algunas prácticas como: elaboración de fertilizantes y plaguicidas orgánicos, regeneración del bosque, actividad forestal reducida, construcción de hondonadas para captar agua de lluvia, incremento de la fertilidad de suelos, producción de biogás a partir de desechos agrícolas, control de plagas agrícolas mediante la asociación de plantas, producción de setas comestibles, criaderos de especies pequeñas con importancia biológica, alimentaria o científica; elaboración de compostas, lombricultura, invernaderos, implementación de hortalizas,

plantaciones de árboles frutales, producción de productos fermentados, viveros de plantas medicinales, plantaciones de cactáceas y amaranto, entre otros. Aparte estará la realización de ferias y exposiciones con la finalidad de ir creando un mercado para los productos del ámbito rural. La anterior propuesta puede ser difundida y participativa por los educadores ambientales, como una forma de preservar la sustentabilidad y de mejorar las condiciones de vida de la población rural en México.

ID: 832: Estudio ambiental integral de la zona lacustre-chinampera de San Pedro Tláhuac CDMX. Hacia una propuesta para apuntalar procesos de conservación biológica y productivos, mediante una estrategia de educación ambiental. - *Jose Silverio Morales, MX*

Ciudad de México con más de 11 millones de habitantes, 4 millones de autos circulando, desabasto de agua en algunas colonias, crecimiento desmedido de construcciones, contaminación extrema en ciertas épocas del año; en ella se sitúa la región lacustre llamada “Lago de los reyes aztecas de San Pedro Tláhuac” que aún con la presión urbana se conserva, no sin sufrir deterioro y con una característica especial; en ella se manifiesta el carácter interactivo de naturaleza y sociedad. La primera, representada por un ecosistema lacustre con especies endémicas, otras no, algunas migratorias, constituyendo un ecosistema de gran diversidad biológica. La segunda, representada por una comunidad de canoeros cuya labor es acompañar turismo en sus “trajineras” por los canales del lago y por personas dedicadas a la agricultura en terrenos llamados “chinampas” donde siembran hortalizas, arboles de ornato, frutales, flores, utilizando los recursos que provee el humedal. Una actividad cercana a la sustentabilidad.

Aunque existen estudios sobre la flora y fauna del lugar es importante mantener un estudio y monitoreo permanente de la zona para conocer su estado y brindar conocimientos tendientes a su conservación. Por ejemplo, es importante que al lugar se le reconozca como sitio RAMSAR; que exista repoblamiento con especies propias y características del humedal como son el axolote *Ambystoma mexicanum* y el ahuejote *Salix bonplandiana* los cuales tienden a disminuir. La actividad productiva de los agricultores de la chinampa podría ampliarse con otras alternativas de producción como criaderos de especies lacustres, elaboración y aplicación de plaguicidas orgánicos para sus campos, producción de hongos comestibles, amaranto u otras especies alimenticias.

Sobre este “terreno ya sembrado” será importante no solo conservar sino ampliar las posibilidades de una mayor diversidad biológica, de actividad productiva y de turismo ecológico además de constituirse en un sitio de conocimiento ecológico “*in situ*” para escolares mediante la educación ambiental.

ID: 701: Performance of External Membrane Bioreactor for wastewater treatment and irrigation reuse - *Sarra Kitanou, MA*

The performance of an external membrane bioreactor (EMBR) in treating domestic wastewater was investigated as a laboratory pilot-scale experiment. The results showed that the rate of the Chemical Oxygen Demand in the permeate could be reduced up to 27mg/l and the Biological Oxygen Demand concentrations of 5 - 8.5mg O₂/l and suspended solid concentration of 5.7mg/l. In the same way, the rate of Total Nitrogen and Total Phosphorus was reduced respectively to 8.7mg/l and 0.4mg/l. Globally, the results of the investigation revealed that the external membrane bioreactors present several advantages in terms of water resource protection because of the great quality of the treated water that can be reused for irrigation.

ID: 110: Microorganisms as new expression systems in technology - *Foroogh Nejatollahi, IR*

Microorganisms have had a number of beneficial applications in agriculture, food production, and waste treatment. Recent advances in technology using microorganisms such as bacteria and fungi as proper hosts for expression of some recombinant antibodies has provided an incredible system for producing a number of necessary products for clinical use. Environmental learning will lead to innovation in research and introduces microorganisms as powerful systems in developing technology, providing new prospective and practices. A number of single chain antibodies against cancer cell markers and infectious agents are selected in our laboratory using *E. coli* bacteria as an expression system. Some valuable experiences in using a prokaryote from our environment to produce an efficient protein have been gained. Some of our experiments were designed using bioinformatics methods. Discussing these experiences and introducing a new insight on microorganisms in our environment will open new ways for useful research and challenges to apply the potential of our environment much better. Bioinformatics is a new discipline that addresses the need to manage and interpret the data. The Bioinformatics approach provides systematic identification of environmental potentials; it is obvious that future analysts

will require powerful new bioinformatics tools to design successful projects. Learning from the environment and proper applications of microorganisms in biotechnology provides necessary expression systems which are needed in science and technology.

ID: 865: Análisis de los artículos científicos de Investigación en Educación Ambiental de países Iberoamericanos -
Antonio Fernandez Crispin,

El objetivo de este proyecto es conocer el estado actual en que se encuentra la investigación en educación ambiental (IEA) en Iberoamérica. Se pone especial atención en identificar quiénes hacen IEA en Iberoamérica, a partir de cuándo se está haciendo y donde lo están haciendo. Para ello se hizo una revisión exhaustiva de las fuentes de información bibliográfica teniendo como marco teórico los conceptos generales sobre la producción científica. Es un trabajo del tipo exploratorio descriptivo. Se hizo un análisis de contenido mediante una rejilla de observación. Se trabajó con tres portales electrónicos especializados para la búsqueda de documentos científicos, registrando únicamente artículos. Dichos portales fueron *Redalyc*, metabuscador de libre acceso, *EbscoHost* metabuscador de acceso restringido a instituciones académicas y *Scopus*, portal editado por Elsevier, página de acceso restringido. En Ebsco se registraron 97 documentos en 29 revistas científicas. En Redalyc se encontraron 141 documentos en 72 revistas diferentes y en Scopus 225 artículos en 168 revistas. Publicadas en inglés. En total se registraron 282 artículos en 79 revistas de los cuales solo 55 se publican en alguna de las cuatro revistas declaradas abiertamente como Revista Especializada en Educación Ambiental, el resto se distribuye en revistas especializadas en ciencias ambientales, ciencias de la educación y otras en 9 temáticas diferentes. Los trabajos de educación ambiental surgen en el año de 1987 y alcanzan un punto muy alto entre 2004 y 2011. En la mayoría de los casos es un pequeño grupo de personas quienes hacen la investigación en sus respectivos países, destacando los brasileños, seguidos de los españoles y mexicanos.

ID: 1057: Unlocking the hidden power of worldviews: a new opportunity for the transformative Education for Sustainable Development - *Emilia de la Sienra, AU*

The field of Education for Sustainable Development (ESD) has evolved from an applied science approach with a positivist orientation dominated by the connection between logical knowledge and behaviour, to a range of more holistic approaches aimed at the deep transformation of the self by questioning the meaning of human experience. This paper explores the potential for the concept of worldview to help achieve ESD's transformative agenda.

A worldview is a complex constellation of meaning from which the wide range of human conduct emerges; it is the uniquely-personal, subjective meaning given to reality, which explains each life experience and prescribes patterns of emotions, thoughts, and actions. Therefore, the concept can help to explore how people apprehend and make sense of their own reality, form their unique structures of meaning and choose their way of being, becoming, and behaving. The deep transformation of the self is inherently dependent on the transformation of the worldview, and yet there has been limited exploration of this concept in the ESD context; consequently, we first developed the Transdisciplinary Framework on Worldviews and Behaviours, and now we build upon it through an in-depth qualitative study of the personal worldview of twenty-five randomly selected adults from Sydney, Australia.

The theoretical TFWB and the empirical evidence presented here represent the foundations for a new learning approach that leverages the hidden power of worldviews; potentially useful in the design of innovative learning experiences that boost introspection and new conceptualizations about how worldviews shape what it means to be human, contributing to the achievement of the ESD's transformative goals.

ID: 1067: “Good, better, best”: how do we label practice in environmental and sustainability education, and should we? - *Richard Kool, CA*

The migration of ‘best practice’ language from engineering and operations to contentious, value-laden and practice-rich domains like environmental and sustainability education has increased in recent decades, to the point now where ‘best practice’ has become a slogan or label used to identify and market a range of ESE products and processes. The use of terms such as “best” have enormous implications. For example, asserting something is “best” is demonstrating a confidence that may not really be warranted. And by claiming one’s product or process is an example of “best practice”, there is also an assertion of power in the sense that if mine is “best practice”, yours can’t possibly be worth utilizing. At the least, a designation of “best practice” should be the result of a consensus process within a field, and we feel it is unlikely that we have a consensus amongst the users of ESE “best practice” language even as to what “best practice” itself means, let alone

what ESE best practice” means in practice. And those approaches that claim to be “best practice” have rarely if ever been evaluated in terms of what they actually achieve in order to see if, in fact, they are the “best” in comparison to all other programs. In this presentation, we will critically examine the concept and wonder about the usefulness of ‘best practice’ language in ESE, and begin a discussion with participants about other kinds of language and theoretical possibilities we might want to consider.

ID: 1068: Fostering positive changes towards community wastes and the environment: Testing an environmental education intervention in a Chinese Loess Plateau village - Aiqin Wang, CN

As China continues to develop at unprecedented speeds, mismanagement of agriculture and community waste have led to wide-spread and significant pollution of water and farming land, and threaten the environment and human health. Mismanagement of rural community waste is largely the result of lack of waste treatment infrastructure on the public service side, but is also attributable to a deficiency in awareness and knowledge of, and an apathy towards, environmental protection at a grassroots level. In the latest efforts to curb haphazard dumping of community waste, the Chinese government has called for grassroots participation in rural waste management. To this end, it is crucial to foster positive changes among villagers in attitude and behavior towards waste, waste management, and the environment. We designed and pilot-tested an intervention program in a Loess Plateau village in Northwestern China, focusing on environmental education of villagers and schoolchildren. A women-led rural-participatory-appraisal informed the design of the education intervention. We adopted community-participatory-learning-action to implement the program. Village women again led the exploration of local options of waste management. There is a universally strong desire and willingness among the villagers and schoolchildren to participate in waste management through sorting, reduce, reuse, and recycling. The direct impact of the environmental education on eliciting positive changes in knowledge and behavior was not evident at the exposure and intensity level of the program. We learned firsthand that conducting rural environmental education in this population of low education and chronic poverty must be locally adaptive in content and format, relying on a trust relationship. With adequate resources from local government and a partnership with village administration, grassroots waste management is plausible. It is urgent to explore and test different grassroots models in education and in waste management.

Urban Ecosystems

ID: 342: how urban land use variation influence diversity and distribution of bird species in Harare, Zimbabwe - Tafadzwa Jakata, ZW

In this study we investigated the influence of urbanizing landscape structure on avian species assemblage diversity using data for Harare, Zimbabwe. Initially we quantified landscape structure elements by way of image classification using Object-Based Image Analysis of a 5m-resolution, 2014 SPOT 5 image of Harare. The image classification yielded five land use/land cover types i.e., low density residential, high density residential, urban grasslands, urban forested and commercial built-up patches. During the summer of 2015, we then obtained bird species data through field-based observation of the birds at 35 random locations distributed equally amongst all the five land use/land cover types. Next we quantified the avian species diversity using Barger-Parker Index, Menhinick Index and Simpson’s Index. Non-metric multidimensional scaling (NMDS) and analysis of similarities (SIMPER) consistently distinguished avian species assemblage composition based on the Barger-Parker Index, the Menhinick Index and the Simpson’s Index in urban grasslands and urban forested areas from those in built-up areas, i.e., low and high density residential, and commercial areas (stress = 0.18, R² = 0.64). Our results provides evidence that urban landscape structure influences avian species assemblage diversity in urbanizing tropical landscapes. Our findings improve our understanding of biodiversity-landscape interactions which helps to the planning and development of biodiversity tolerant cities.

ID: 451: Changing catchment practice on an urban river in Sydney - Sue Burton, AU

The Cooks River runs for 23 kms through the centre of urban Sydney in Australia with a rapidly growing catchment population of over half a million. The river and its creeks are some of the most polluted in Australia. This is a story about the practical efforts of the community and government to turn this around. It is also a story about how the community has valued the river and the consequent impacts on the natural systems. This extends to thousands of years of Aboriginal people living in the area followed by European occupation and the ongoing challenges of increasing urban density. The dominant values of the river to community and government are and have been about the provision of ecosystem services. Advocacy



and community engagement need to be approached within this paradigm. It is perhaps not an unusual story for an urban river, however it is the Cooks River story.

ID: 771: Green Mobilization In Kulturpark - Mehmet Delseiz, TR

The fairground in Izmir Kulturpark had been moved, and as a result, the green field and the plant in the park has become a point at issue for a long time. Statements made by non-governmental organizations, political party representatives and people with environmental awareness cause confusion. They state in any platform that the most important green field in the city will be zoned for construction and will become an unearned income. Within this information pollution, a student group from Saint-Joseph High School called 'Young Reporters for the Environment' have worked on the issue and tried to find out what the situation is, and what is the plan of the municipal authority about this issue. They have voluntarily given support to a joint project called "Preparation of Suggestions for Identification, Protection and Maintainability of the Materials in the field of Kulturpark". It was initiated by the municipal authority and the university, with the aim of protection and enhancement of the green field in the said area.

ID: 931: The Analysis of Key Success Factors of Waste Management for Urban Ecosystem - Lina Astuti, ID

The discussion on sustainability of the City means a discussion of urban ecosystems or urban ecological systems. Life in the ecosystems means an interaction between humans and the surrounding environment, which in general is an artificial environment. The construction of infrastructure, business centers, roads and settlements, can be an attraction to population growth. Population growth that is not accompanied by good city planning, can have an impact on the growth of the city with irregularities that can ultimately lead to degradation of urban environmental quality. One of the components in the City ecosystem is the waste which is generating from the rest of human activities. Handling improper waste can damage the urban ecosystem. This study attempts to examine the relationship between population growth rate, education level, economic growth rate, environmental understanding, technological and law enforcement on the successful implementation of household waste management system. The method of analysis used is regression analysis. The data includes secondary data and literature review for Indonesia, Japan, India and China. The results of this study show that environmental understanding, law enforcement and technological progress have a significant influence in waste management to achieve sustainability of urban ecosystems. Key words: Waste Management System, urban ecosystems, sustainable.

ID: 965: Public space between relational cartography and new forms of citizenship. - Maria Montalbano, IT

A progressive dwindling of free and accessible public spaces, apparently connected quite intimately with changes in the life of Italian cities over the last decade, has beset Italy and the splendid squares that have so frequently served as inspiration and model for innovative co-housing projects in the rest of Europe. Indeed, the cartography of relationships that once guaranteed a quality of life and a daily exchange distinct from the socio-spatial separations of northern European rational functionalism, now appears to have blurred. In the meantime, new spontaneous forms are emerging. From the virtual to the real to the virtuous, they appear to be redesigning the spaces and times of a community that takes shape, joins together, and melts on the wave of events to fully be in the time of things, in a *dasein* that requires no framework or prefiguration and where streets, arcades, and gardens once again perform the role of thread that links lives and activities of their inhabitants as they relax, work, hang out, and reflect. Is it possible today to achieve a harmonious dialogue between citizens' desire to participate and those who govern, between creative energy and the desire to live with a renewed sense of community? In an attempt to follow the traces of new landscapes redesigned by those who, through participatory actions, social streets, and creative practice, spontaneously tend public space, my reflection takes inspiration from Alexander Langer. As early as the 1990s, in response to the constant reduction in opportunities for chance interactions and a decrease in gardens and uncultivated spaces where one could cultivate humanity through exchanges with others, he proposed free opportunities as a sure antidote to the growing danger of widespread anomie. Key Words: proximity; community; sharing; relationship's cartography; free opportunities; *reciproCity*

ID: 407: Post-Secondary Environmental Experiential Education: The KPU Urban Ecosystems Degree - Katherine Dunster, CA

The launch of an experiential learning degree at Kwantlen Polytechnic University (Bachelor of Horticulture Science 'Urban Ecosystems Major') in 2013 provided an opportunity to use the 23-hectare campus as a place for praxis and transformation. I

will discuss our post-secondary experiential learning framework, what has worked, what needs tweaking. Our program welcomes students interested in hands-on environmental learning that is grounded in sustaining the local places where they will live/work. The campus ecosystem is a living lab used to explore, collaborate, assess, plan, design, implement, test, innovate, monitor, adapt, and reflect upon resilience, climate change, and human survival. We take many risks, and learn from both discoveries and mistakes. We are restoring ecosystem function and bio-integrity to the landscape and improving community human health & well-being, while providing working examples for others to learn from and adapt elsewhere. We are addressing the Calls to Action set forth by the Canadian Truth & Reconciliation Commission and the UN Declaration on the Rights of Indigenous Peoples recently ratified by Canada. We acknowledge the campus is located on territory of the Kwantlen First Nation and we are respectfully de-colonizing the landscape from the settler agricultural period (1827 – 2014), while re-indigenizing with native plants, including traditional foods and medicines. The ecosystem approach lets us create site-scale projects that nest functionally within the larger landscape. Seven projects have been initiated from a rooftop farm, to a music garden, healing labyrinth, traditional berry picking patches, off-grid vertical rain garden, stream restoration, and a 70-metre long rain garden with constructed biodiverse riparian and wetland habitats that intercept 290 m³ of annual precipitation. We are collaborating with the Faculty of Health on creation of a next-generation accessible community food garden and seed bank that will connect health and well-being to food, eating, and gardening.

ID: 500: Gigantes invisibles, árboles del centro de Medellín - Alejandra Leoci Eisses, CO

Como muchas ciudades en Latinoamérica, Medellín se enfrenta a la dicotomía entre desarrollo y sostenibilidad. Pese a que la ciudad ha dejado atrás la sombra de los carteles para convertirse en el centro de la innovación en Colombia ahora enfrenta grandes retos ambientales. El más urgente, la contaminación del aire. Lo positivo de esta situación es que parte de la atención ciudadana se dirigió a los árboles. Nuestra propuesta narra la experiencia de una campaña de comunicación ambiental que incorpora el arte como vehículo para transmitir los valores estéticos y culturales asociados a árboles patrimoniales en una calle emblemática del centro de la ciudad. *Gigantes Invisibles* fue una exposición de ilustraciones hechas por artistas locales a partir de sus impresiones sobre la manera en que estos árboles más grandes y con frecuencia desapercibidos en medio del caos de la ciudad. Algunas ilustraciones narran la interacción de las personas con el árbol, en el centro de Medellín es común que vendedores desplieguen sus negocios informales a la sombra de un árbol o que los habitantes de calle usen las raíces como armario para guardar sus pertenencias. Está la exposición cerró con un concierto de música clásica y permitió comenzar nuevos procesos que vincularon otras organizaciones a nivel nacional como el Instituto Alexander von Humboldt para desarrollar programas de educación ambiental en espacios no convencionales.

ID: 608: Environmental education through citizen science: the Imbovane Ant Project - Dorette Du Plessis, ZA

Citizen science is increasing in popularity and used by many scientists for the collection of scientific and environmental data. At the same time, citizen science projects also enable people to engage with the scientific method in collaboration with scientists working on environmental issues in local contexts. Since 2006, the Stellenbosch University, South Africa, has run a highly successful citizen science project involving scholars and teachers in the monitoring of ant species. The Imbovane Outreach Project (pronounced im-bo-vaan-ie), which means ‘ants’ in one of the national languages - isiXhosa, aims to increase environmental literacy and inspire secondary school scholars to take up scientific careers through participating in a field and laboratory programme that is embedded in the national Life Science curriculum. By having participating scholars assist with the formulation of hypotheses, collect environmental and diversity data, and analyse their data together, Imbovane contributes to the development of scholars’ critical thinking and group-work abilities. Imbovane focuses on under-resourced schools, and supplies crucial ICT equipment to these schools, where many scholars have never had the opportunity to use scientific equipment such as microscopes. To date, the project interacts annually with approximately 1250 scholars and biodiversity data already collected has led to four scientific publications. Here we propose to evaluate the effectiveness, the educational value of the project, by scholars completing questionnaires at the beginning, before being involved in the project and after participation in the project’s activities. Questionnaires will evaluate the knowledge of the participating scholars on topics taught during training workshops including basic biodiversity science, ant taxonomy, and their experience of the scientific method. The Imbovane Outreach Project highlights the importance of citizen science projects as tool for adding educational value for scholars in communities where exposure to science and environmental education projects is scarce.

ID: 882: Sistema digital interactivo para la enseñanza de materias socioambientales en la Facultad de Ciencias, de la Universidad Nacional Autónoma de México- *Lucia Almeida- Leñero, MX*

Los problemas socio-ambientales actuales requieren medidas interdisciplinarias para enfrentarlos. Debido a esto, resulta fundamental incorporar esta perspectiva en programas de educación para la formación de nuevos profesionistas. La carrera de biología de la Facultad de Ciencias de la Universidad Nacional Autónoma de México a pesar de ser afin a los temas ambientales, carece de una perspectiva amplia de los problemas sociales alrededor de ellos. La materia de “Recursos Naturales” es la única asignatura obligatoria que integra aspectos sociales junto con los biológicos. Un producto final de la materia es generar un proyecto de investigación el cual tiene por objetivo conocer una problemática socioambiental y plantear soluciones. El objetivo de este trabajo es crear un sistema digital interactivo el cual integre, sistematice y actualice la información generada por los profesores y los alumnos. Se diseñó un plataforma digital interactiva, la cual incluye: 1) Temario y bibliografía básica 2) Planta docente, mostrando los perfiles profesionales de cada profesor, 3) Información sobre las salidas de campo 4) Resúmenes de todos los proyectos realizados entre 2008 y 2017. La plataforma digital será una herramienta fundamental para la docencia y servirá como espacio de referencia en el cual se podrá realizar una búsqueda sobre distintos proyectos socioambientales de México.

ID: 502: The Commons as Classroom - *Domenico D'Alessandro, US*

Much has been said about the LEED criteria and the Living Building Challenge and biomimicry. I suggest we also add transparency of design for the purpose of educating the general public on the reading and understanding of the urban ecosystem. The task of the designer then includes the addition of educational information for the general public that must go beyond the signage and be intuitive and interactive. My work in urban green infrastructure has taken a step beyond the cradle to cradle model and adopted the Earth First model promoted by the United Nations. I base my core design principles on the five kingdoms of nature as described by Lynn Margulis. This means that all of the kingdoms must be present in a healthy state of reciprocity and must be accounted for in every project. Also we cannot solely depend on new construction to carry the burden of balancing the degraded state of the environment. This is especially important if we also wish to keep the historical significance and social context of our built environment. The challenge then becomes how to adapt the built infrastructure into functioning ecosystems through green design and how to impart environmental information, having nature as teacher, in the same way we incorporate advertising for products into our daily routines? Teaching opportunities in and out of the classroom to foster an intelligent cognitive social exchange through transparency of design and celebratory events then become part of the curriculum. Domenico D'Alessandro will illustrate some opportunities through a series of concept designs developed with the City of Chicago as backdrop.

ID: 623: A Groundbreaking Approach to Graduate-level Programming in Urban Environmental Education - *Annalise Ritter, US*

This workshop session will engage participants in considering new possibilities for academic training in urban environmental education by looking at the nature of the city, and how educators can leverage urban complexities to promote environmental leadership and stewardship. IslandWood and Antioch University collaborate on the delivery of an M.A.Ed in Urban Environmental Education that navigates the intersection of social justice and socio-ecological well-being in cities. UEE Graduate students will join one of the co-directors in presenting the essential program elements as a new approach to preparing educators who engage urban residents in place-based and culturally responsive learning that explores the challenges of creating healthy urban ecologies. The UEE program is structured for praxis. Academic studies include urban systems, planning and design, strategies for creative instruction and community engagement, GIS for understanding public health, urban art and expression; and asset-based community development. Courses focus ideas around the many Seattle communities that are experiencing environmental injustice, gentrification, and economic stress. The program supports its academics with a practicum that immerses students in organizations that are engaged in such sectors as environmental health, housing and job access, gardening and food distribution, youth leadership, public education, and civic government. The UEE program values the creative potential of a diverse cohort and faculty and is committed to recruiting at least 65% students of color. Through its graduates, it seeks to cultivate minority leadership in communities - leadership that is well-versed in the processes in which urban landscapes, and thus lives, are shaped. This session will discuss the potential for urban environmental education to use the global diversity of cities to foster leaders who will ensure our cities can achieve equity and ecological harmony.

ID: 162: The importance of embedding sustainable Biophilic Design strategies in interior architecture and design education - Carolyn Hayles, GB

Research has demonstrated that being connected to and affiliated with nature, promotes human health and well-being. However human interaction with nature is often lacking due to societal trends such as increased urbanism; an increase in the amount of time spent indoors; and approaches to building design. Recent studies in neuroscience, endocrinology, environmental psychology and other related fields have revealed how the spaces where we work and live can have an impact on health and well-being. We are getting closer to understanding the positive (and negative) impacts of specific elements of our indoor environments. Indeed, research suggests that humans have an innate need to coexist with nature. Therefore, bringing nature and natural elements back into architecture and interior design can facilitate a sense of well-being and provide healthier indoor environments. Biophilic Design as an attempt to redress the way the built environment has exacerbated human separation from the Natural World, focusses on bringing back nature and natural elements into modern architecture and interior design through the inclusion of: environmental features; natural shapes and forms, patterns and processes; light and space; place-based and evolved human-nature relationships. Biophilic Design works in harmony with environmentally sustainable or 'green' design considerations to create buildings that demonstrate 'Restorative Environmental Design' solutions. It is becoming increasingly clear that Biophilic Design elements have real, measurable benefits relative to human metrics such as emotional well-being, stress reduction, improved learning, healing; as well as increased productivity; and from an environmental standpoint, Biophilic Design features can foster behaviour change towards environmental stewardship. As design educators we need to ensure our students understand the importance of designing spaces that engage with the natural environment to promote health and wellbeing. Working with students to develop design strategies that increase occupant satisfaction are of paramount importance. Examples discussed focus refurbishment projects and the importance of adapting existing spaces for improved health, well-being and liveability.

ID: 437: Écosystèmes urbains : le parc bangr-weogo de Ouagadougou, un outil d'éducation environnementale - Roger Baro, BF

La 9^{ème} conférence internationale du Congrès mondial sur l'éducation environnementale (WEEC) est un moment privilégié de dialogues, de partages, d'apprentissage entre acteurs d'horizons divers. Ces acteurs sont tous mus par la volonté et la certitude que c'est ensemble on peut relever les défis environnementaux. Et ce dont il s'agit paraît abstrait : l'éducation environnementale. Et pourtant elle doit se vivre au quotidien si l'humanité veut parvenir à reconstruire et réinventer sa relation à l'environnement. Dans notre quotidien la culture est aussi présente. Ne dit-on pas la culture est ce qui nous reste quand on a tout perdu ! d'où la justesse du thème de WEEC 2017 : « Culture/Environnement : Tisser de nouveaux liens ». Eh oui il faut tisser de nouveaux liens solides qui reposent sur une dualité complice entre la culture et l'environnement qui semblent consubstantiels. Dans cette dualité la forêt nous semble un point d'attache, surtout quand elle « surgit » au milieu d'une capitale africaine au sud du Sahara. C'est pourquoi nous menons la réflexion sur : « Écosystèmes urbains : le parc bangr-weogo de Ouagadougou, un outil d'EEDD ? »

1. Présentation du parc

Le parc urbain Bangr-weogo est une forêt située au cœur de Ouagadougou, la capitale du Burkina Faso sur une superficie de 263 hectares.

Plusieurs infrastructures composent le parc :

- v Jardin botanique ;
- v Parc zoologique ;
- v Espace de détente et de loisirs éducatifs ;
- v Pépinière-Herbier ;
- v Parc des sports ;
- v Musée- salle d'exposition ;
- v Centre de documentation à l'éducation Environnementale ;
- v Faso Parc (espace enfants) ;
- v Bar restaurant.

2. Parc : un écosystème urbain aux fonctions multiples 2.1 Economique

Le parc bangr-weogo de par sa position apporte une plus value à l'économie nationale :

- v entrée payante pour les visiteurs
- v développement de commerce du fait des visiteurs
- v création de 81 emplois permanents et une centaine d'emplois temporaires

2.2 Services de régulation

Le parc joue un rôle régulateur :

- v régulation de l'érosion ;
- v régulation du climat local (création d'un micro-climat) ;
- v purification des eaux et de l'air ;
- v régulation des flux hydriques ;
- v régulation des parasites et des maladies ;
- v régulation des risques naturels (exemple de l'inondation du 1^{er} septembre 2009) ;
- v régulation des déplacements des populations d'espèces.

2.3 Services écologiques

Le parc demeure unique pour la capitale en terme d'écologie.

Sur le plan floristique, le parc Bangr-Weogo regorge 327 espèces, dont 117 espèces ligneuses et 210 herbacées. On y distingue 6 formations végétales : forêts claires, galeries forestières, savanes boisées, fourrés marécageux, savanes arborées, savanes arbustives.

ID: 440: The city as a system - Streamlining inter-/multi-disciplinarity in urban environmental higher education by subscribing to system theory and thinking - Johannes Hamhaber, DE

Urban areas are responsible for an ever rising share of natural resources demand with implications far beyond the city limits. In developing countries, the fast urbanization, combined with a shift towards western consumptive cultures, is accelerating the resources efficiency of cities as a major lever to enhance the overall sustainability of our societies. Typically, the problem definitions of such challenges and therefore their proposed solutions are of technical nature, and within that often sector based. This regularly leads to translocation of detrimental effects between the environmental compartments, or in space and time. The understanding of cities as complex socio-technical and socio-ecological systems provides for more integrated solutions. Based on this assumption, a group of five universities from Indonesia, Mexico, Kenya, Egypt and Germany, under the lead of the latter two, have evolved a system-theory based master program called 'Interdisciplinary master on Resource Efficient Cities' (IMaREC) in order to promote integrated approaches to urban sustainability in countries of fast urbanization and emerging consumerist lifestyles. In order to build content and didactics on a common base, the curriculum is built on an understanding of the cities as complex socio-ecological systems. Seen as the conceptual base for all modules, system thinking provides an integrative view for problem definitions and potential solutions, both to the students and lecturers, thus potentially bridging the common gaps between disciplines and offering common ground and terminologies for interdisciplinary collaboration that often still lacks in Global South countries learning practice. The presentation (and/or paper) will present the systematic approach of curricular development to evolve a student-centered, competency based curriculum and learning concept, including the role of system theory in the overall conceptualization, the emerging didactical approaches, and the changing roles of lecturers in such an interdisciplinary environment.

ID: 538: Connecting threads between performance art, urban design and environmental education - Susan Wake, NZ

This conference invites us to mobilize the collaborative power of people in considering a new relationship with the environment. This research asks, if progress is 'unavoidable', what kind of progress do we want and who should instigate it? It proposes that performance is one medium that can motivate or inspire people to live differently. Paralleling the call of this conference to weave new connections, e.g. between culture and environment, and the seeming imperative of cultural change if we are to reach a sustainable truce with nature, an artist has conceived an interactive performance that brings intergenerational strangers together for the purpose of viewing their city differently. An Auckland primary school recently worked with the artist to present a performance called 'Lookout' during a fringe festival. At this festival, sixteen 7-9-year-old students shared their differently constructed vision of future Auckland with a new adult stranger every hour and the pair asked each other scripted questions about experiences of the city, real and imagined, and their role within it. The experience was profound for each and when the shows were over, the students were keen to continue their exploration of their urban environment, especially given the widespread media reports about the Auckland housing crisis with its spiraling prices and plummeting availability due to immigration and rural decline. Led by their teacher, they are continuing to explore their vision for improving Auckland. In this presentation, the woven connection is taken a step further to include a student landscape architect who has developed urban designs based on the younger students' visions. This presentation will evaluate the potential for these students' transformative learning from an environmental education, performance art and urban design

perspective as a forerunner to more in-depth research with and by the young students themselves. If culture is to change, starting young is an obvious place to start and both performance and urban design offer an attractive and alternative springboard for environmental learning.

ID: 670: The relations of human beings with other beings in a Brazilian educational urban context. - *Andrea Figueiredo, BR*

The purpose of this work was to capture the sensations, feelings and emotions that connect people to urban green areas and their biodiversity, trying to identify which relationships are grounded on the seeing, coexisting and the aesthetic and ethical values of these with other non-human beings in the Brazilian urban context. Historically, the planning of Brazilian cities does not prioritize green spaces as spaces necessary for well-being, health, coexistence and learning. The reality in the city of São Carlos, in the interior of the state of São Paulo, which is located in the southeast region of the country, is of a few urban green areas that allow human beings to share with other non-human beings. Even so, some of these places have significant flows of people and are used by them. Aiming to fulfill the proposed objective, based on an interpretative perspective, we analyzed documents produced by a group of 14 people, in a period of 8 months within a university extension project of environmental education. We also analyzed reports obtained through interviews of 7 people that live in neighborhoods near the green areas. It was possible to identify as similar elements in the analyzed data: memory, belonging, experience and pride in being involved in these areas as important indicators of the way they developed a perception and care for other non-human beings in the urban environment.

ID: 761: Evaluation of Recyclable Material Disposal - *Rosiangela Borlom, BR*

The management of urban solid waste is a strategic environmental practice used by companies and governments. At the municipal level, the collection of recyclable materials is an effective tool regarding pollution control and the reuse of materials, which helps in the collection of resources for the production of new products. However, the lack of knowledge and absence of correct education about the practices of selective recycling collection by the population has led to an increase in financial charges for the separation of materials. Between January and February 2016, rubbish bins were opened and all the contents were removed for observation, photography and notes. After this, we found an incorrect disposal of recyclable wastes and that the degree of conservation of the dumps is very poor due to vandalism and lack of maintenance. The second part of the work was carried out in March (posters and banners were made) and in April, environmental education lectures were presented to the population in several different strategic locations. The lack of proper raw material education and correct disposal methods in the recycling bins are a problem. Actions to raise awareness are highly recommended so that recyclable materials can be used in the preparation of new products for the population. Furthermore, environmental managers should focus on maintaining recyclable bins at least once a year to increase conservation status and prevent vandalism practices.

ID: 795: Knowledge and attitudes towards bumblebee-friendly gardening: A survey of Fraser Valley residents and university students - *Michelle Riedlinger, CA*

The Fraser Valley's blueberry industry, British Columbia's highest-value field-based crop industry, relies on the pollination services of bees. Managed European honey bee hives are the foundation for blueberry pollination, however, the industry could potentially increase yields by \$10 million to \$20 million each year with the additional pollination activities of local native bees, such as bumblebees. Urbanization is a major factor contributing to the widespread decline of native bee populations, yet urban and suburban gardens also contain a diverse range of pollinator-friendly flowers that have been correlated with increases in native bee numbers and diversity. In this study, we worked with students from Geography, Environmental Studies and Agriculture to survey two population groups: residents living within a two-kilometre range of blueberry farms and students from the University of the Fraser Valley. We asked both groups about their knowledge and attitudes towards urban bee support efforts. We also asked about their willingness to engage in bee-friendly gardening on their own properties or to help monitor bee populations on the university campuses. Our survey revealed that Fraser Valley residents are aware of bee decline in the region. A significantly high number of residents are willing to adjust their gardens to include identified bee-friendly plants to help mitigate bee population decline. Even though the surveyed university students were equally aware of bee population decline, a significantly lower number of them were willing to help with efforts to support bee populations through monitoring. Our findings suggest that there are opportunities to engage growers

and residents in building more resilient native bee communities via planting of floral resources in urban and suburban settings. Increasing student engagement in local sustainability initiatives such as supporting bee populations is critical, but requires a sustained cultural shift within the university, including course work requirements across faculties.

ID: 8: Ecological restoration in cities: The challenges of teaching about novel ecosystems and layers landscapes -
Valentin Schaefer, CA

Novel ecosystems and layered landscapes offer exciting opportunities for students to learn about the complexities of urban environments and to explore complex interactions between people and the environment. Urban landscapes are radically altered environments with large areas of impervious surfaces, invasive species and parallel systems for transporting water, waste and energy. Traditionally in ecological restoration the restoration target was the historic ecosystem on a site, but this has become irrelevant because most urban sites are unable to support these ecosystems under current conditions. Novel ecosystems differ in composition and/or function from present and past systems and are more relevant in light of human action, climate change and invasive species. The novel ecosystem approach focuses on species of conservation interest, may incorporate invasive species in the final outcome and involves a constantly adaptive approach. In cities, the novel ecosystem approach also acknowledges that complex socio-ecological histories of a site have shaped them over time. The layered landscape concept maintains that prior uses, meanings and ecologies shape possibilities for the future. Restoration goals often clearly intertwine with social, political and economic considerations. Restoration planning engages diverse values and visions that can generate competing visions for a site that need to be addressed in setting the restoration target.

ID: 325: Case studies for maintaining and enhancing urban greenery - *Phuong Nguyen, VN*

Rapid industrialization and urbanization has made forests and green spaces fast disappear and that has resulted in many environmental problems such as urban heat island, ecological crisis and microclimate change. To deal with the problem, two proposals were suggested as solution for preserving and improving tree in cities. One proposal is to enhance green space in a Vietnamese university, a developing country, was studied aiming to plant appropriate trees in campus, roadside, community, parking, and rooftop where comfortable open space serve for study, work and research goal. The other study proposes a novel approach based on system analysis to plan the ecological corridor for a developing urban of considering carbon flux, biological diversity and environmental costs. These studies are promising solutions for policy-makers in protecting tree in urban areas, moreover, its useful knowledge of plant is beneficial for numerous students, who will be a crucial part of modern social to help them have right actions with urban trees.

ID: 836: Environmental shifts and cultural influences in the transition of a wetland ecosystem of the Sumas Lake to the urban ecosystem of the Sumas Prairie - *Mariano Mapili, CA*

We report on a two-semester student-led, faculty-supervised investigations into the transformation of the past wetland ecosystem of the Sumas Lake into the current urban ecosystem of the Sumas Prairie, where we explored the possibility of reverse-reclamation in light of probable consequence of predicted natural sea-level changes in British Columbia, Canada. Our investigations led us through the intricate web of interconnections and conflicting world views and cultures that were central agents in the human-induced reclamation of the bottom of Sumas Lake which supported a First Nation's way of life into fertile farmlands for sale at bargain prices to immigrant settlers. We compared the physical, human and cultural geography of the Sumas Lake ecosystem of the past to the urban ecosystem of the present Sumas Prairie by employing field methods, data visualization and analyses through Geographic Information Systems, conversations with key storytellers and guardians of history and traditional and indigenous knowledge in museums, archives and libraries, as well as the use of biological, hydrological and geological techniques for wildlife, vegetation, water, soils, and slope surveys. We report that in the end, the students gained deeply personal and unique understanding of the Sumas while the Sumas in turn gained the commitment of the students to keep the stories alive for the next generation.

ID: 389: La Percepción del Transporte Ecológico Como Alternativa al Cambio Climático en Estudiantes de Brasil, España, México Y Portugal - *German Vargas Callejas, ES*

El propósito de esta comunicación, basada en la realización de grupos de discusión en Brasil, España, México y Portugal, es describir y analizar la percepción de estudiantes universitarios sobre la introducción de modelos ecológicos de transporte

como solución al problema del cambio climático. La mayoría de los estudiantes reconocen el alto nivel de emisiones de Gases de Efecto Invernadero derivadas de los medios motorizados de transporte, pero llama la atención que muchos ignoran el impacto de las emisiones derivadas del transporte aéreo. Ante la posibilidad de introducir tecnologías de transporte con menores emisiones de CO₂, se revelan visiones críticas y contradictorias: unos estudiantes destacan los avances en eficiencia energética y el gran aporte de la tecnología, otros critican el modelo de producción de esta tecnología que, en sus palabras, resulta en si misma altamente contaminante. Desde otra perspectiva, se considera que la introducción de vehículos ecológicos (bajos en emisiones, híbridos, etc.) es un engaño, un producto del marketing que se guía por la intención de maximizar ganancias más que por la voluntad de generar una solución efectiva al problema del cambio climático. Cabe destacar que no se producen grandes diferencias entre los estudiantes de los cuatro países, aunque si ciertos matices del discurso en base a su formación académica de base.

ID: 491: El Modelo de Vida Urbano Y Su Relación con el Cambio Climático en Brasil, España, México Y Portugal -
German Callejas, ES

Las grandes ciudades se han convertido en las principales fuentes de emisión de gases de efecto invernadero en el planeta, una realidad que es reconocida por los estudiantes universitarios de Brasil, España, México y Portugal, cuyas percepciones sobre esta realidad han sido recopiladas a través de la técnica de los grupos de discusión, cuyos resultados se presentan en esta comunicación, cuyo objetivo principal es describir y comprender las múltiples relaciones que, según los estudiantes, se establecen entre el modelo de vida urbano y el cambio climático. Los primeros resultados destacan una visión negativa del entorno urbano, que es criticado como un sistema de organización insostenible, anti-ecológico e injusto, donde la concentración de población incrementa los niveles de consumo y el consecuente incremento de las emisiones de gases de efecto invernadero. Siendo uno de los principales reclamos retornar a modelos de organización más humanizados y menos destructivos.

ID: 544: The Canal Participatory Conservation for Tourism Encouragement of the Waterfront Communities -
Paranee Srisawad, TH

Water as a resource is essential for all lives, including people who live their life meaningfully and very closely to the canal. All their everyday activities seem to rely on it. Accordingly, the rivers or the canals and ecosystem need to be taken care of and protected. Some nautical tourism activities directly affect both the canals and the people around the canals. This study aims to survey the canal conservation, the stakeholders analysis, and to find the solutions for involvement in the canal conservation in order to encourage in the tourism in Suratthani province, Thailand. Mixed methods research were conducted for this study, including a questionnaire which was used to collect data from people and an interview form used by the stakeholders. The results found that the canals are being utilized even more. Moreover, the canals were used for promoting the tourism and the growth of economics. Consequently, it affected directly the people in waterfront communities. The nature of canals has been changing, causing water pollution, and unfair sharing advantages. The people in waterfront communities had less roles to get involved, and were weak networks for the canal conservation. On the other hand, the private sectors were more likely to make use of the canals and to cooperate in conservation which the local governments had been trying hard to do. In addition, the solution for the canal conservation was to motivate the people in waterfront communities to get involved in conservation and cooperate with other stakeholders to promote the sustainable community tourism.

ID: 593: Développement de l'Agro écologie: espace témoin de changements de mode de consommation vers plus de durabilité en milieu urbain. - *Loubna Chaouni, MA*

La Fondation Mohammed VI pour la protection de l'environnement mène depuis 2007, un programme de sauvegarde et développement de la palmeraie de Marrakech, palmeraie urbaine à caractère historique et culturel, en mobilisant et en fédérant l'ensemble des parties prenantes. Ce programme qui vise à limiter sa dégradation principalement par la plantation de jeunes palmiers prend en considération l'inclusion de la population locale dans ce processus de sauvegarde. Le développement de l'Agro-écologie est l'un des leviers qui permet d'articuler au mieux ces relations bénéfiques hommes / territoires. Ainsi ce projet constitue :

- Un moyen de rapprochement entre les consommateurs et les producteurs au niveau local : Création des canaux de

commercialisation courts : Agriculteurs – hôteliers

- Un espace de sensibilisation du public à l'importance de conserver et de valoriser les savoir-faire traditionnel lié à l'agriculture et à l'alimentation en général
- Un espace de sensibilisation des jeunes à l'impact de leurs choix alimentaires sur l'environnement et aux modes de productions associés.

ID: 886: Valoración socio-económica de servicios ecosistémicos de regulación y belleza escénica del pedregal de San Ángel, Ciudad de México - Lucia Almeida- Leñero, MX

La cuenca de México y sus ecosistemas están perdiendo la capacidad de auto-regulación y mantenimiento de sus servicios ecosistémicos, debido al acelerado proceso de urbanización, crecimiento poblacional, a la inherente demanda de bienes y servicios y por la generación de desechos de la Ciudad de México. Por ello, es primordial conocer la importancia de los ecosistemas urbanos, a través del enfoque de sistemas socio-ecológicos y de servicios ecosistémicos y para poder expresar en términos monetarios o no monetarios el valor intrínseco de éstos; integrando las necesidades y las percepciones de los actores. El pedregal de San Ángel es un ecosistema relicto inmerso al sur de la ciudad de México, que brinda entre otros servicios ecosistémicos los de regulación de cantidad de agua y belleza escénica. Con el objetivo de valorar socio-económicamente estos servicios ecosistémicos del pedregal; se realizaron 400 encuestas para conocer la percepción del valor en la provisión de bienestar que genera el pedregal para la comunidad del campus de ciudad universitaria de la Universidad Nacional Autónoma de México. A este valor de percepción se suma el valor económico del agua que brinda el pedregal a ciudad universitaria. Estas valoraciones permiten reconocer la importancia de conservar este ecosistema relicto y ayudan en la sensibilización para la toma de decisiones futuras.