12th WEEC
CONNECTING PEOPLE
CREATING TOMORROW

12TH WORLD ENVIRONMENTAL
EDUCATION CONGRESS

BOOK OF ABSTRACTS

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ABU DHABI, UNITED ARAB EMIRATES

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Introduction

The 12th World Environmental Education Congress (WEEC 2024) reaffirms the critical role that Environmental Education (EE) and Education for Sustainable Development (ESD) play in humanity's transformation towards a sustainable world.

WEEC 2024 (29th Jan-02nd Feb, 2024) in Abu Dhabi, United Arab Emirates, offers significant experiences in connecting people from all over the world to discuss, learn and share the latests advances in education programmes surrounding environmental and sustainable development.

The Congress discusses the role and importance of education for environment and sustainability at all levels; within formal, non-formal, and informal education has been presented on more than the two main categories of abstracts that have been submitted : not only academic abstracts and practitioner abstracts , but also other types/formats of abstract, such as novel, short fiction, stage performance, game, and interactive activities regarding and representative of environmental education and sustainability were accepted.

International and Local Socio-scientific Committee

The Socio-scientific committee members provided invaluable support to Congress through their diligent review of over 700 submissions. The committee comprised experts who served as national and international liaisons and established the specific themes of the Congress, persons in charge of thematic niches and those in charge of parallel activities, to develop the content of the various Congress activities to ensure coherence and holistic coverage. It is through their diligence that the 12th WEEC has such depth and quality of content, as illustrated by the abstract contained herein.

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Thematic Clusters

The content of the 12th World Environmental Education Congress, held 29th January to 2nd February, 2024, in Abu Dhabi, United Arab Emirates is categorised into four thematic clusters.

The four thematic clusters follow a deliberate sequence: *'The Challenges', 'The Goals', 'The Dimensions',* and *'The Means'*. In this manner, the environmental challenges that need to be addressed (the *"why"*), such as the triple planetary crises, are at forefront of attention. The goals, such as enviromnental education for a sustainable future are the "what", and the dimensions and means are the "how" these goals will be achieved.

01. THE CHALLENGES

The Challenges facing humanity are many and include emergencies such as natural disasters affecting education, limits in resources or access, and ingrained educational paradigms that may need revision. The focus is on identifying how best to educate about these many and varied challenges to build resilience as well as find solutions.

The Themes most closely associated with this thematic cluster are:

- **Tackling the Triple Planetary Crisis - Climate Change Pollution and Biodiversity Loss**
- **Water Food and Energy Nexus in Environmental Education**

02. THE GOALS

The Goals are actionable plans and objectives aimed at overcoming challenges in environmental education. This section of the programme explores methods for positive transformation in educational approaches, curriculum designs, or systemic changes. The emphasis is on concrete strategies and target outcomes.

The Themes most closely associated with this thematic cluster are:

- **A Worldwide Community for Sustainability as the Goal**
- **Environmental Education for a Sustainable Future**

03. THE DIMENSIONS

TheDimensionsarespecificdomainsorsubfields within environmental education. Examples include early childhood education, community-based education, indigenous knowledge systems, and the role of art in education. The objective is to explore the multifaceted nature of environmental education and its applications in different settings.

The Themes most closely associated with this thematic cluster are:

- **A Matter of Values and Cultural Diversity - Indigenous Knowledge and Culture**
- **Aesthetics Ethics and Emotional Dimensions - The Role of Art and Design in EE**

04. THE MEANS

The Means comprise tools, methods, and experiences that can be employed in environmental education. This could range from the use of specific teaching aids, software, and technologies to methods for fieldwork and interactive learning. The focus is on practical applications that enhance educational experiences.

The Themes most closely associated with this thematic cluster are:

- **Artificial Intelligence and Smart Technologies**
- **Efforts and Challenges in EE for Early Childhood Education**
- **Outdoor and Place-based Learning in the Decade of Ecosystem Restoration**
- **Promoting Collaboration and Learning Communities to Address Socio-environmental Challenges**

CLUSTER

01

The Challenges

Theme 01:
Tackling the Triple Planetary Crisis -
Climate Change Pollution and Biodiversity Loss

Theme 02:
Water Food and Energy Nexus in
Environmental Education

THE CHALLENGES THEME 01

Tackling the Triple Planetary Crisis - Climate Change Pollution and Biodiversity Loss

Theme Background: The 12th World Environmental Education Congress 2024 aims to foster a discussion around the role of EE and ESD in addressing the urgent global challenges encapsulated in the Triple Planetary Crisis: Climate Change, Pollution, and Biodiversity Loss. These crises, as underscored by the UN Secretary-General's "Code Red" declaration, demand immediate and concerted action from all sectors of society. The common thread that runs through Triple Planetary Crisis driven by decades of unsustainable consumption and production which is also amplifying deep inequalities and threatening our collective future.

Theme Objectives: The thematic track seeks to discuss bold EE and ESD actions that are essential to address the three interconnected planetary crises facing humanity, namely the climate crisis, the nature crisis, and the pollution crisis, that are no more global but planetary in scale.

The aim is also to flag the consequences of inaction, the need for systemic thinking, holistic approaches, and showcase transformative practices in EE and ESD.

Theme Focus:

- The planetary impacts of Climate Change, Pollution and Biodiversity loss due to human actions.
- How critical is it to challenge existing norms related to lifestyles, production, and consumption, by considering equity and inclusivity.
- The need for educational responses that do away with siloed understanding to an interconnected one.
- Ethical considerations in environmental education.
- Innovative curriculum designs that promote systems thinking and holistic problem-solving.
- Fostering responsible citizenship through environmental education.

Theme Outcomes: Giving a clarion call to educators, education systems and governments to integrate interconnected challenges and education and learning responses.

Underscore that EE and ESD have to play a pivotal role in responding to this call, by shaping mindsets, values, and skills needed to address the planetary crises effectively.

The track shines a spotlight on practical insights, innovative approaches, and actionable recommendations that can pinpoint what is missing and what already can for the basis for addressing Triple Planetary Crisis.

Theme Conclusions: The track emphasises the pivotal role of environmental education in fostering critical thinking, values development, and innovative competencies necessary to navigate the complex challenges of our time.

THE CHALLENGES THEME 01

Tackling the Triple Planetary Crisis - Climate Change Pollution and Biodiversity Loss

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THE CHALLENGES THEME 01

Tackling the Triple Planetary Crisis - Climate Change Pollution and Biodiversity Loss

Abstracts

086 Terrenesat-1

Aysha Saif Alkaabi[1]

Climate change has impacted a wide range of environmental phenomena, but perhaps forests were the most affected. Wildfires represent a global emergency, being one of the major contributors to global greenhouse gas emissions (GHG). They pose a serious threat to the environment and the planet, whether they are caused by natural forces or human activities. The nature of the planet cannot be controlled, but forest fire risk zones can be mapped to minimise the frequency of wildfires. This can be done through a combination of predictive modelling, early warning systems, and improved fire suppression techniques. Technology has brought us to a new age of monitoring and acting on changes more quickly, accurately, and efficiently. The importance of these technologies is more apparent than ever in fire zones, where a variety of challenges are present, such as degraded ecosystems, changing environments, increased greenhouse gases and respiratory illnesses affecting children and the elderly. This study aimed at developing a theoretical framework for incorporating early fire detection with an advanced baseline imager (ABI). Two stages can be distinguished in the proposed model: first, the collection and pre-processing of data and second, the identification of novel anomalies. Weather data from the National Oceanic and Atmospheric Administration (NOAA) have been used to track wildfire patterns. This paper may assist meteorologists in understanding fire behaviour and spread. It may also contribute to developing a processing system for incorporating early forest fire detection into advanced baseline imaging systems.

Keywords: climate change, early wildfires warning system, remote sensing, satellite imagery, weather forecasting

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Conservation at the Center of Education: How Whale and Dolphin Research can Drive Communities to be More Sustainable

Ada Natoli [1]

Climate change, sustainability, and the conservation of biodiversity and natural resources have become a global priority. Whales and dolphins are "sentinel species" of the marine environment. As they sit at the top of the marine food change, they are the first species to be affected by any disruption in the ecosystem. Less known is that dolphins and porpoises regularly occur in the waters of the two biggest cities in UAE, Dubai and Abu Dhabi, and they are threatened with extinction.

Here we present the results obtained by ongoing dedicated research and a citizen science campaign conducted in the past 10 years to address the status of the small cetacean population inhabiting the UAE waters. Year-long boat-based surveys were conducted in 2013-2014 and then 7 years later, covering the same area of Dubai waters. The collection of data for 55 sightings, confirmed the regular occurrence and residency of three small cetacean species: the Indo-Pacific bottlenose dolphin, the Indo-Pacific finless porpoise, and the Indian Ocean humpback dolphin. In parallel, a citizen science campaign was launched, and 1481 sightings were collected across the 10-year period.

We demonstrate how well-structured and scientifically validated citizen science data can be instrumental to the better understanding of wild populations especially if occurring at low density. Furthermore, we discuss how citizen science campaigns coupled with research programs, can play an important role in educating, sensitizing and engaging different levels of the community, general public, educational institutions, private and public stakeholders, on the importance of protecting biodiversity to ensure the resiliency of the ecosystems and to protect natural resources.

Keywords: whales, dolphins, citizen science, education, conservation

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Improving Environmental Education Knowledge among the Youth and Marginalised Women from Poor Coastal Communities in the Republic of Mauritius through a Mobile Environment Education Exhibit

Daksh Beeharry Panray[1]

Mauritius is a Small Island Developing State (SIDS) in the Indian Ocean which faces the severe impacts of climate change. To overcome this challenge, the government is trying to implement many educational projects in schools and around coastal villages to educate the communities. However, these practices are not really working efficiently as these sessions are too focused on theory and boring information sessions. A huge gap between what is being taught in theory and what is really being understood in practice has been observed among the youth and mostly marginalised women from those coastal communities through different interactive sessions organised with them following the recent oil spill ecological disaster of the MV Wakashio bulk carrier in Aug 2020.

As a new and innovative project, EPCO decided to bridge the gap between what was being taught in theory and what was being understood in practice by implementing an environmental education project in 5 poor coastal communities to explain the villagers about climate change and how it is going to affect their livelihood. This was achieved by preparing a mobile exhibition on climate change and its effect on our environment. The exhibition was in the form of mobile 3D exhibits which gave the opportunity to the villagers to better understand what climate change was and how it would impact their daily lives. Instead of using boring PowerPoint presentations and posters full of texts, EPCO used recycled materials to prepare those exhibits which were very interactive in nature. The exhibition was exposed and open to the public during the weekend. Since there were several exhibits covering many different topics linked to climate change and those exhibits could easily be dismantled, the exhibition was carried out in 5 coastal villages.

A pre-survey before visiting the exhibition and post-survey after visiting the exhibition were carried out among 250 participants who visited this exhibit (50 per each village), and the results revealed that more than 200 participants (mostly youth and women), had a better idea on what was climate change and how to better prepare and adapt to it in the long term. This project demonstrated that environmental education in the form of interactive 3D exhibits had a better impact as compared to theory sessions which can be boring and tiresome. This project has a high replicability as it can be implemented in other SIDS in other tropical regions around the world. .

Keywords: climate change, women, youth, Mauritius

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The Impacts of Climate Change and Global Warming Knowledge on Youth Ecologically Sustainable Behaviour: A Cross-Country Evidence

Ibrahim Landolo Cheick Oumar Niankara[(1)], *Iffat Chaudhry*[(2)], *Habib Chabchoub*[(3)], *Rachidatou Traoret*[(4)]

This research seeks to evaluate the marginal contribution of climate change and global warming knowledge (CCGW_K) to ecologically sustainable behaviour (ESB) uptake among youth in a cross-national setting. To that end, a conceptual framework based on Random Utility Theory (RUT) is used to collect stated preferences data from a bootstrap sample of 55713 youth respondents distributed across 14 economies, in the 2018 Programme for International Students Assessment.

The findings from the discrete choice modeling provide reasonable evidence in support of the three core principles of ecologically sustainable development (ESD); namely the equity principle [θˆ_ES=0.352 (0.350, 0.354)], the efficiency principle [θˆ_EN=0.368 (0.366, 0.369)], and the precautionary principle of ESD [θˆ_SN= 0.289 (0.288, 0.292)]; thus empirically validating the theoretical significance of the "equity", "viability", and "bearability" links of sustainability. However, the findings also reveal that each level increase in CCGW_K strengthens youth environmental sustainability preferences by 3.02%, through raising the marginal utility (MU) they derive from participating in activities that preserve the natural environment (ProEnvActiv). Conversely, each level increase in CCGW_K appears to conjointly weaken youth social sustainability preferences by 1.83%, hence significantly reducing their likelihood of engaging in ethical and fair trade consumption (EthiFairTradeCons); while conjointly having no significant effect on youth economic sustainability preferences, and therefore leaving their home energy saving behavior unaffected (HoEnrgConserv). Based on these latter findings, it can be concluded that increasing youth CCGW_K, whether through formal education or regular communications is a "necessary" but "not sufficient" condition for achieving ESB uptake in the global youth population. Indeed, our findings show that significant control factors with unambiguously consistent contribution to ESB include youth cognitive ability to assess the environmental consequences of economic development (CogAsEcDeEnv_K), their affective valuation of the natural environment (AffAsGlobaEnvVal), their interest in domestic environmental issues (IntDNEnv), and their global mindedness (GLOBMIND). The effect of gender appears however mixed, with no significant difference in derived MU from participating in environmental preservation activities; though males seem to derive relatively 23.98% lower MU from home energy conservation, while conjointly deriving 6.74% higher MU from ethical/fair trade consumption. Therefore, our study provides important insights for ESD policy making at the international level.

Keywords: climate change, ecological behavior, ecologically sustainable development, global warming, multi-country, pro-environmental behavior

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Integrating Biodiversity Conservation in Project Lifecycle Environmental Impact Assessment

Adnan Al Madhi[1], ***Vijaya Bhasker Reddy***[2]

ADNOC operates across large tracts of Abu Dhabi emirate both terrestrial and marine environments consisting of several threatened species which have potential to harm the environment. The exposure of biodiversity risk and mitigation is major challenge to demonstrate ADNOC commitment towards environmental stewardship. ADNOC HSE Standards provides guidance to conserve of biodiversity and minimize environmental impacts.

Paper details engineering, conservation and educational awareness activities undertaken in Greenfield and brown field operations that lies within environmentally sensitive area.

ADNOC is currently working in some of the highly sensitive areas such as Marwah Marine Biosphere and Arabian Protected area. Comprehensive ecological and environmental baseline studies are undertaken covering seasonal variations as part of Environmental and social Impact Assessment (ESIA) surveys. Focused stakeholder consultations are held to understand the concerns of all interested groups. The critical habitats, species and ecosystems are identified, assessed and mitigation and monitoring plans are developed as part of Biodiversity Action Plans.

To ensure the Hail, Ghasha and Dalma project minimizing its environmental footprint, ADNOC has conducted one of the largest marine environmental baseline surveys in the UAE's history. The survey assessed the marine life in the area to ensure that development and management plans would protect the diverse marine ecosystems and mitigate any potential impact on the sensitive habitats and endangered species.

The systematic and scientific collection of ecological data enabled ADNOC to locate artificial islands and optimize well numbers and trajectories outside sensitive areas to reduce environmental impact. The use of artificial islands will eliminate the need to dredge over number of locations for well drilling and provide additional habitats for marine life.

Further the engineering measures such Zero Discharge Policy within the Marine Protect Area and smart technologies such as remote monitoring and digital control rooms (digital and instrumented wellheads, automated and digital central control rooms and individual handheld devices for operators, technicians and other site personnel, unmanned platforms) to enhance safety of people and improve environmental preservation.

ADNOC experience and methods used in developing artificial islands while working in environmental sensitive areas and implementation of bio-diversity action plans and initiatives will help to manage biodiversity assets and manage the risk of biodiversity loss. Further it will demonstrate that economic developmental activity and conservation of biodiversity will co-exist in harmony within the local eco-system.

Keywords: biodiversity action plan, environment and social impact assessment ecological screening and scoping, stakeholder engagement, critical habitats

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Łódź Schools for Climate - Shaping Habits for Better Future

Marta Pankiewicz (1)

Change habit not climate! The main goal of the project is to tackle the climate crisis by supporting children and adults to take their own action. The mission is to educate new agents of change. Initiating a change in their mentality, willingness to give up comfort through own experience.

The clue of the programme is an experiment, in which students from 6 municipal schools were involved. We trained 150 students with their parents and teachers.

Step 1: by using attractive teaching methods we make participants aware of how the climate crisis affects us all.

- Tools
  - Trainings and workshops for teachers: the aim is to increase the level of ecological awareness through active education
    - Workshops with students preparing them to the challenge: the concept of the experiment, developed during workshops with teachers and a psychologist, assumed limiting access to resources (water, food, energy, electronic devices)

The education part is complemented by the investment element - green school yards, create to teach the value of cooperation and shared responsibility for surroundings.

Step 2: The Experiment (during at least 7 days): Everyone chose one of seven challenges: BLACKOUT, MORE PLANT DIET, I DON'T WASTE FOOD, GREEN TRANSPORT, INTO NATURE, DON'T WASTE WATER and OFFLINE. The experiment was conducted with support of the psychologist and professional education facilitator. Each participant kept a diary of the experiment in which he recorded its course, his feelings and reflections.

Step 3: wrap-up workshops - conclusions of the experiments were discussed with participants.

The best description of the results of experiment are: SATISFACTION, KNOWLEDGE and MOTIVATION:

"I managed to cycle a total of 31.16km and save about 20.5 kg CO_2" Mateusz, XXXII LO, "Green transport"

The participants felt a sense of the of the actions taken, they realized that changing habits was important both for them and for the world. A large part of the young people declared that they want to continue the experiment. For some of the participants, changing their habits was not an easy task, the more proud they felt when they managed to persevere. Some young people declared that they had the support of their families, some managed to persuade their loved ones to take up the challenge, but many people had to deal with the experiment on their own. Great involvement of children is a strong point of the project, it turns out that adults have a lesson in activity to catch up with.

It is universal programme dedicated to global education for climate change and can be easily implemented in every kind of school.

The aftermath of the project is the #ekotomy campaign. Thanks to it, everyone can see for themselves what the participants of the project faced. The action is developing in social media and it's about a post a video presenting examples of eco practices. We've already shared our eco-challenges - and you? Will you take it?

Keywords: future, values, experience, cooperation, resources

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NextGen4POLLINATORS: The Contribution of the New Generations to the Protection of Pollinators for the Protection of Biodiversity and Ecosystem Services

Simona Casavecchia[(1)], *Lara Lucchetti*[(2)], *Nicole Hoffman*[(3)], *Sara Ruschioni*[(4)]

Wild pollinators and honey bees are experiencing a period of intense global crisis, resulting in the loss of ecosystem services. The underlying causes of their decline are many and among them we can list the reduction or disappearance of their habitats, intensive agriculture, the massive use of pesticides, climate change and the introduction of alien species, including pathogenic organisms.

The project aims at making aware the younger generations of the problem of the decline of pollinator populations. The project addresses the problem with an holistic approach aiming not only at honey bees, but also at wild bees and, more generally, at the preservation of their habitats. Knowledge is transferred by experts to children, also involved in observation and citizen science activities, with an innovative approach to the local reality, involving the Botanical Garden of the Marche Polytechnic University, various schools and Environmental Education Centers of the province of Ancona.

The project started in 2023 and is going to last for two years; it is aimed at students aged 6 to 18, involved in botany and entomology lessons at their schools and in guided field trips to observe the natural environment, plants, their flowering stages and pollinator activity. Each class is given an artificial nest for wild pollinators, to be placed in the school garden and a kit with seeds of bee pasture species, so as to be able to closely observe the activity of the pollinators. Activities will go on beyond the project timeline through the creation of a free citizen science application based on the observation of blooms and pollinators, flower borders in urban green areas, a "Garden for Pollinators" and an educational apiary at the Botanic Garden. The activities proposed in the first year of the project alone involved over 1,300 students, who enthusiastically participated in the activities by sending the results of their experience such as posters, videos, *etc*. as feedback which will be evaluated in the student competition at the end of the project. Formulating a weighted approach based on the age of the children probably represented the most delicate aspect of the whole process. We believe that an educational project based on raising awareness of the loss of biodiversity, represented in our case by the pollinator crisis, is effective if tackled globally, thus also considering, for example, the environments in which pollinators live and plants, representing their food source. The project was a good opportunity to experience how, especially for children, it is necessary to integrate lessons, both theoretical and in the field, with the playful aspect, however focusing on educational games inherent to the theme of the project. Above all, we have seen how, for the success of an awareness-raising activity, it is essential to bring the kids into the field, where they can experience and become familiar with the environment and with the investigation methodologies.

Keywords: environmental education, pollinators, biodiversity, wild flower honey

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Zero Emission Agents: Licence to Act! A 3-step Educational Programme to Help Teachers Talk about Climate Change and Activate Students. With a Mission: to Change the Future, one Class at a Time

Margherita Porzio (1)

"Zero Emission Agents: License to Act!" is an educational program aimed at empowering teachers to enhance their students' understanding of climate change (CC) and inspire them to take action. The program's objective is to nurture a generation of informed, aware and proactive citizens who can influence decision-makers and strive for a sustainable and inclusive society.

The program spans one school year and encompasses 3 interconnected stages: 1. Awareness, 2. Engagement and 3. Action, aligning with the 3 dimensions of Global Citizenship Education as outlined by UNESCO: Knowledge (Cognitive), Socio-Emotional (Affective), and Behavioral (Psychomotor).

Schools joining the program are asked to involve educational staff, families, and local stakeholders in implementing "eco-actions" – tangible measures identified by students to reduce their school's CO_2 emissions. Eco-actions represent the culmination of the educational program, unfolding through 3 steps:

Awareness through Knowledge: Students learn the causes and consequences of CC, both at local and global scale.

Engagement and Skills: Through activities promoting active learning, critical thinking, and teamwork, students discover their ability to combat CC within schools and communities.

Changing Attitudes: Students develop a sense of belonging to a global community, taking on the role of citizens working for a sustainable society and implementing the eco-actions, transformative actions to reduce the school's carbon footprint.

Eco-actions combine behavioral changes and small technical interventions, with their impact measured by the students under the guidance of a scientific coordinator. The CO_2 emissions avoided are measured and shared with school, local community, and decision-makers. Through hands-on learning experiences, students gain a unique platform to exercise their rights and assume responsibility, encouraging their involvement in the global movement advocating for action from governments and corporations. Schools become hubs of good practices, fostering open dialogue and exchanges and contributing to combat CC.

A key to the success of the program is its investment in teachers' training to enhance their knowledge and equip them with innovative tools and methodologies. The program is supported by a digital toolkit ***(https://www.istituto-oikos.org/agentizeroemissioni#/)*** that guides teacher training and student workshops, facilitating program replication and scaling up.

Developed by Istituto Oikos, an NGO dedicated to environmental protection since 1996, the program targets students aged 9-14 and was tested in 20 classrooms in Italy between 2022 and 2023. Pre and post questionnaires showed an increase in students' understanding of CC's impact on conflicts and justice from 34% to 65%. After the program, 71% of participants expressed readiness to change habits to contribute to the fight against CC, and 78% considered the topics covered crucially important for their lives.

Keywords: climate change, school community, digital toolkit, global citizenship education, transformative action

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Biodiversity as a Pathway to Environmental Citizenship

Annamaria Vitale[(1)], *Silvia Sivini*[(2)]

Many of the problems faced by society are related to environment, conservation and sustainability and in this framework biodiversity loss and the establishment of healthy agroecosystem are one of the challenges of the current times. Agriculture is causing several environmental problems. In 2018, global emissions due to agriculture were 9.3 billion tonnes of CO_2 equivalent (FAO 2020). Agriculture is also a major cause of water scarcity, accounting for almost 70% of all water withdrawals (FAO, 2017). The Global Land Outlook (UNCCD, 2017) highlights that the development of a few high-yielding crop varieties has consolidated larger industrial companies oriented towards intensive industrial monocultures, heavily dependent on chemical inputs that have harmful effects on the entire ecosystem. On the other side, agriculture 'can be a key sector in which to make progress towards environmental sustainability' (Reilly *et al.*, 2022).

We will focus on agroecology as a practice that encompasses different forms of transformative praxis (Giraldo and Rosset, 2018) or what Vandana Shiva (2022) calls 'regenerative agriculture'. The main research questions are the following: How and how well do practice that are promoting an agroecological approach and social mobilizations aiming at environmental protection at local level favour an increase on the awareness, knowledge, attitude, skills and participations of the communities on environmental issues? Does political engagement in the public arena play a relevant role in constructing "environmental citizenship"?

Data have been collected through a qualitative methodology. In depth interviews were carried out with actors practicing agroecology and/or involved in social mobilizations aiming at environmental protection in 2 Italian Regions.

Preliminary results seem to confirm that collective action operates as informal peer education, disseminating environmental knowledge and visions. Safeguarding the landscape, organic/natural farming, producing healthy and good food and caring for the land are all elements that characterise the actions of the practices analysed. The implementation of concrete activities and the production of new imaginaries that show how socio-ecological relations can be rethought contribute to increasing environmental awareness and knowledge in the local community, and by encompassing different forms of transformative practices they foster 'environmental citizenship'.

Place-based mobilization for environmental justice produces grassroots local knowledge able to raise research questions that scientists may not know or ignore (Corburn, 2005). A better understanding of these mobilization can enrich and put forward academic knowledge.

Furthermore, agricultural and environmental literacy should go hand in hand and a greater effort in this direction should also be made in the design of new school programs and curricula.

Keywords: biodiversity, environmental and agriculture education, agroecology

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Environmental Responsibility in Architectural Education: Tackling the Planetary Crisis

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The building and construction sectors contribute 39% of global energy-related emissions. In this context, buildings are perceived as offenders to the environment. They are unavoidably linked to the triple planetary crisis, which is causing climate change, natural degradation, and pollution. Many unsustainable production and consumption strategies have been deeply rooted in the construction industry for decades. While architects may not be held responsible, their position in the industry is inevitable and can become a key to advancing or reversing this crisis. In fact, architects can have a key role in reversing the cycle to mitigate climate change and help in recovery and regeneration. It is never too early to start this in the life of an architect. In fact, this change must start in the early years of her education. Providing the tools and mindset to think differently, and make informed environmental decisions.

The paper illustrates an environmental design education framework and a transformative perspective that enables architecture students to analyze their existing socioeconomic model (with its four pillars: ethical, social, economic, and environmental) and to propose new scenarios for the built environment and new production methods for a sustainable future. The research is embedded in the design teaching model at Abu Dhabi University (ADU), a model that promotes environmental change through critical thinking, value development, and evidence-based design. This learning framework acquaints students in architectural design with environmental responsibility by discussing different ways to invest in nature-based solutions through site selection and assessment, ensuring material transparency, considering energy and water efficiency, *etc*. Being part of the University Climate Network, ADU aims to advocate for education's central role in tackling the climate crisis through effective educational responses, including building sustainable cities and communities. This vision is aligned with government programs such as Estidama and with the UN Sustainable Development Goals (SDGs). The SDGs promote sustainability on all levels, one of which promotes action to ensure that we design cities and human settlements to be inclusive, safe, resilient, and sustainable (SDG 11).

The paper illustrates practices and tools to promote these principles. Case studies reflect design processes that demonstrate environmentally ethical choices by considering sustainable sites for building and involve promoting a responsible approach to consumption and production through the use of circular design, regenerative design, or dematerialization and modularity. The integration of renewable energy ensures access to affordable, reliable, sustainable, and modern energy for all (SDG 7). Regardless of their approaches and focus, students' projects confirm the need for serious action to combat climate change and its impacts (SDG 13).

Keywords: architectural education, sustainable design, sustainable development goals

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496 Education to Empower Just Climate Change Action

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Climate change is an existential crisis that requires immediate and sustained actions – actions that reduce emissions, build resilient communities, ensure climate justice, & create good jobs that contribute to a healthy planet. Effective climate action requires sustained commitment & effort from individuals, communities, businesses, and governments worldwide. Every action contributes to the necessary efforts of mitigating climate change & building a just and sustainable future.

Research has demonstrated that climate education can play a crucial role in raising awareness & understanding of climate change, its causes, impacts, & potential solutions. However, we know we need to go beyond learning about climate change and building individual & collective capacity for effective climate action. Effective climate action depends on the ability to identify and critique alternative solutions and courses of action, select and plan appropriate action-taking and participate in individual and collective climate action. The question is how can we best design and implement effective climate education programs that truly empower just action.

To help address this question, the North American Association for Environmental Education (NAAEE) is developing guidelines focused on climate change education and climate justice as part of the Guidelines for Excellence series. These guidelines are designed to serve a broad range of individuals and organisations interested in using education, in its different forms and in varying settings – classroom teachers, museum educators, community educators, university instructors, career and technical education teachers, *etc.* – as a tool for working with communities to find just climate solutions.

They offer suggestions for creating learning environments that support the development of the knowledge, skills, and dispositions needed to make informed decisions and to act. They help educators build an understanding of climate justice and its importance, as well as a willingness to work toward solutions that address the impacts of climate change in People of Color, low-income, and Indigenous communities. They provide a set of recommendations for developing and implementing climate education that is centred on climate justice, is driven by community interests, and empowers climate action.

This presentation will:

- Focus on educational efforts that empower climate action, rather than those focusing primarily on teaching about climate change.
- Examine why climate education must centre on climate justice. It will argue the importance of understanding climate justice and protecting vulnerable communities.
- Provide specific, actionable guidance to a broad range of individuals & organisations interested in using education, in its different forms and in varying settings, as a tool for working with communities to find climate solutions.
- Provide real world examples of how education that empowers climate action plays out in communities.

Keywords: climate justice, climate action, community engagement, climate education

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Changing Design Mindset: Do-It-Yourself Approach to Educate towards Bio-inspired Practice

Laura Dominici[(1)], *Martina Grassi*[(2)], *Elena Comino*[(3)]

Plastic materials extremely revolutionised the production of low-cost, durable and disposable items improving the quality of everyday life and substituting rare materials like ivory. On the other hand, they have dramatic environmental impacts due to the use of non-renewable resources and very low degradation rate. Nowadays supply chains produce disposable items using durable plastics that are discarded in landfills or lost in nature at the end of life compromising the resilience of ecosystems and their biodiversity.

In this framework, the design education plays a pivotal role to foster effective changes in design practice to be able to respond to the need of a "responsible consumption and production" expressed by the SDG 12 of the Agenda 2030. In this framework, the eco-design education promotes the adoption of a circular economy mindset to explore alternative resources for innovative bio-based materials able to effectively replace fossil-based plastics. In material design discipline, the Do-It-Yourself (DIY) approach can be adopted as an educational tool to promote the creative upcycling of waste and by-products through trials and errors innovation process. The DIY approach promotes the direct interaction and experience of basic tools for raw materials manipulation as educational instrument based on learning-by-doing and learning-by-interacting processes.

This proposal discusses educational opportunities of DIY approach through two case studies focused on reusing local organic waste biomass as resources for bio-composite materials: (1) Progetto Glume and (2) EWAP. Both were developed as final projects of Master degree in Design. The "Progetto Glume" investigates potentialities offered by wheat dust derived from a milling industry of the Piedmont Region (Italy) to produce a bio-composite material for disposable plates and a bacterial cellulose for packaging. While the "EWAP – Enhancement of Wasted Aquatic Plants" project aims to use the invasive and alien aquatic plant biomass collected by the local agency for environmental protection of Po Rivers ecosystems (Turin, Italy). This plant biomass is used as secondary raw material for producing bio-based flip flops. Aquatic plant biomass and wheat dust are currently managed as waste and these projects aim to valorise their characteristics following "from waste to resource" concept. Moreover, both projects adopt the "cradle-to-cradle" concept during the design stage to face criticalities of the end-of-life management of disposable items.

The proposal shows the DIY approach as tool to learn knowledge of disciplines such as material science through learning-by-doing and project-based learning. These skills have been learnt to overcome critical issues or requirements occurred during raw materials processing and needed to obtain valuable final prototypes. At the end, this proposal discusses how the DIY culture may support ecological-aware and transdisciplinary attitude in technical and design education.

Keywords: bio-based materials, design-based education, technical higher education, from waste to resource, transdisciplinarity, learning-by-doing

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Climate Change Education and Policies: Gaps and Opportunities!

Judy Braus[1]

What do educators and administrators in the US think about climate change? How strong are our climate change policies? In this session, we will provide an overview of the results of a national, representative survey of U.S. K-12 teachers and administrators about climate change and the implications for our collective work as environmental educators. NAAEE partnered with Edge Research, a national research firm, to conduct this survey, and the findings suggest that we need to do much more to help support teachers and administrators and build confidence in addressing the issue of our times. The survey was conducted in 2022 to gain baseline data on what teachers and administrators think about climate change education and to find out where it was being taught and what some of the barriers were to doing more. We surveyed 812 educators, which included 707 teachers and 105 administrators at the school, district, and state level.

The results highlighted that teachers and administrators are concerned about climate change and that students bring it up and expressed real anxiety about the impact from climate change.

The survey also identified key gaps in climate education across the country, and the need to make climate change education more of a priority, from inclusion in the formal curriculum to more of an interdisciplinary effort, with more professional development opportunities and access to more relevant and local resources that would help focus on student's futures, resilience, and solutions. This session will also highlight two other reports that looked at climate education policy across the United States, including at the K-12 level and in higher education.

During the session, we will highlight a number of resources that are available to educators focused on climate change and provide an update on a set of guidelines we are developing focused on climate education and climate justice.

Keywords: climate change education, climate justice

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Mise En Avant Des Contributions Des Jeunes Reporters Pour L'environnement Marocains Traitant la Thématique Pollution Environnementale

Iatimad Zair [1]

La Fondation Mohammed VI pour la Protection de l'Environnement a implémenté le programme Jeunes Reporters pour l'Environnement (JRE) en 2002 en partenariat avec le Ministère de l'Education Nationale, du Préscolaire et des Sports sous forme d'un concours annuel portant sur le Reportage Ecrit, la Photographie et Vidéo en vue de créer une génération de jeunes éduqués et sensibilisés à l'importance de préservation de l'Environnement et au développement durable. Chaque année, plus de 1000 élèves de collèges et lycées participent au concours. Depuis son lancement au Maroc en 2006, plus de 22000 jeunes ont ainsi été sensibilisés à l'environnement et en sont devenus des protecteurs avisés.

Le programme vise à encourager les acteurs clés, particulièrement à travers le regard des jeunes élèves du collège, lycée et étudiants universitaires; à la préservation de l'environnement, à en comprendre les enjeux, et à agir positivement à leur niveau, notamment à travers des investigations journalistiques sur divers thématiques environnementales. La thématique de travail étant pour cette 21ème édition du concours: "Pollution Environnementale... Notre Planète suffoque, Agissons !"

Le programme permet de :

- Prise de conscience chez les jeunes de l'impact de leurs comportements, et celui des autres sur l'environnement et favoriser ainsi l'Education à la Citoyenneté.
- Développer l'esprit critique et éveiller la conscience des élèves et les encourager à prendre part des problèmes environnementaux locaux grâce à la réalisation d'investigations et à en proposer des solutions.

Le programme JRE est basé sur une méthodologie constituée de 4 étapes de travail :

- Identification d'une Problématique Environnementale Locale ;
- Investigations & Elaboration d'un reportage écrit, photographie ou vidéo ;
- Proposition de Solutions et agir positivement ;
- Communication avec le public local sur le travail élaboré.

A noter que les JRE marocains ont pu participer avec l'appui de la fondation à plusieurs évènements au niveau du Centre International Hassan II de formation à l'Environnement et également pu représenter le Maroc et l'Afrique dans des Forums et conférences Internationales afin de partager leurs expériences et leurs opinions avec d'autres jeunes de différents pays du monde.

Mots clés: Jeunes Reporters pour l'Environnement, esprit critique, agir positivement

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Educating the Community on Mining Environmental Friendly Practices towards the Protection of Gishwati Forest Reserve in Rwanda: A Socio-scientific Approach

Florien Nsanganwimana(1)

Mining intersects with current global environmental issues including climate change. Indeed, mining activities cause severe environmental effects including loss of biodiversity, soil erosion and water pollution and on health of populations dependent or exposed to mining sites. Therefore, for its sustainability, there is a need to raise awareness about the negative impact of mining on the living environment, henceforth involve the community as key actors in ensuring a friendly mining.

Based on empirical research findings on the effect of mining on the environment, this study suggests ways of engaging the population in environmental protection through lifelong learning approach after analysis the mining effects in Gishwati forest, a part of Gishwati-Mukura National Park in north-western Rwanda.

To reach its goal, the study deliberately adopted two steps:

- First an environmental impact assessment of mining practices for concessions around Gishwati protected reserve was conducted whereby five mining sites were investigated through field observations of the landscape, physico-chemical analysis of water and soil (mine tailings) and vegetation inventory.
- Second, a desk review on mining best practices was conducted in order to select and recommend the ones fit for the context.

The findings from the mining sites revealed that mining has accelerated erosion, landslides and stream/river sedimentation and created new landforms. Miners appear to perceive these negative effects but they are hindered by lack of knowledge and a sense of responsibility for an environmental friendly mining. Moreover, the enforcement of the laws would not mitigate environmental negative effect since mining activities are mainly done illegally.

Based on the desk review findings for safeguarding the biodiversity of the Gishwati Forest, mining companies and miners and young people (potential future miners) need to be educated on the best practices which include revegetation of bare lands, refilling of excavated pits, control of erosion and establishment of a buffer zone along streams and rivers in mining areas, constructing trenches, avoiding pouring mine effluent and tailings in water bodies, construction of check dams and silt retention ponds to prevent silt runoff and deposits into watercourses, construct hard surfaces and artificial ponds to provide safe drinkable water for animals and birds.

For a more impactful awareness education on the above mining best practices, two approaches are recommended:

- **Eco-clubs approach**: This consists of promoting the culture of environmental conservation starting from the grassroots level. The students clubs should be increased in Gishwati reserve surroundings schools.
- **Community engagement approach**: This consists of organizing regular meetings with local community to raise awareness about the importance of mining, its effect on living environment and how mining negative effects on environment could be mitigated.

Keywords: natural forest, pollution, biodiversity loss, illegal mining, eco-clubs

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Model Conference of Parties for Biodiversity Conservation

Neha Raghav[1]

Young people are key stakeholders in our planet's future and powerful agents of change. This makes it essential that their voices are heard, and they are involved in decision-making at community, regional, and national levels. This inspired WWF-India, in 2020, to launch the Model Conference of Parties (MCOP), a simulation of the global Conference of Parties to the Convention on Biological Diversity (CBD COP). In anticipation of the UN Decade of Ecosystem Restoration that runs from 2021 through 2030, the MCOP programme aims to build the understanding of the young people about the importance of biodiversity and ecosystems for a sustainable world. The 3-day conference brings student leaders on one platform shaping them into environmentally conscious and active global citizens who can navigate real-world environmental challenges and lead action for biodiversity conservation and ecosystem restoration.

The MCOP programme's objectives are to:

- introduce young people to international diplomacy, multilateralism, and the role of conventions such as the Convention on Biological Diversity,
- develop in young people essential skills such as critical-thinking, negotiation, and consensus-building, and
- engage young people in environmental governance and action to address local environmental challenges.

Over the last four years, WWF-India's Model Conference of Parties has engaged hundreds of student delegates from all of India's States and Union Territories. The fourth MCOP was held in July 2023 with the theme 'Creating Green Networks'. In this workshop, Neha Raghav, Head of Environment Education, WWF-India, demonstrates the programme design and illustrates how the MCOP provides young people an invaluable platform to participate in environmental governance and action to build sustainable communities.

Keywords: youth, capacity-building, environmental governance, biodiversity, conservation, ecosystem, restoration

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Examining the Dynamics of Land Use Changes and their Impacts on Local Livelihoods: A Causal Loops Analysis

Leonard Itayi Chirenje[1]

The increased global awareness to the negative impact of climate change has led to the increased demand for alternatives for fossil fuels. Biofuels have been hyped as a more ecofriendly alternatives to oil-based fuels. The production of biofuels however has some tradeoffs. This research aims to shed light on the complex feedback mechanisms and interdependencies within land use dynamics, offering valuable insights for policymakers, practitioners, and communities to foster sustainable land management, gender equity, community engagement, and progress towards the SDGs 2,5,6 and 7 in the context of evolving land use patterns and their impacts on local livelihoods.

Research Questions

a) What are the key drivers of land use changes in the study area, and how have they evolved over time?

b) How do changes in land use patterns affect the availability and quality of natural resources critical for local livelihoods, such as water, energy, and biodiversity in the context of the water-energy-food nexus?

c) What are the barriers and opportunities for sustainable land use management in the context of evolving land use dynamics, and how can they be addressed effectively?

The study utilizes a complex systems approach to investigate the intricate relationship between land use changes and their consequences on the livelihoods of local communities in developing countries using a causal loops analysis. It examines feedback mechanisms and interdependencies between land use practices and the well-being of the inhabitants in dryland regions. Through systems thinking and causal loops, the research explores the underlying dynamics driving these changes and their repercussions on the socio-economic fabric of the local community. The study uses data collected from 140 household respondents, expert interviews, observation as well as secondary data from Zimbabwe.

Changes in land use patterns influence the WEF nexus in how local communities access resources and are involved in governance. The study also found the significance of gender imbalances in resource allocation and decision-making processes, as well as the limited participation of the local community in land use planning and management. The study also found that women have a limited voice in resource ownership and governance, yet they are the ones who do most of the work on family farms.

Recommendations

a) Integrated Land Use Planning: Developing and implementing integrated land use planning strategies that involve local communities to ensure that land use changes are guided by a comprehensive understanding of the ecological, social, and economic implications.

b) Enhanced Community Engagement: Empowering communities through capacity-building, education, and inclusive platforms for input ensures that land use decisions align with the needs and aspirations of those directly affected.

c) Solution scanning for local communities to identify challenges they face and give solutions.

Keywords: solution scanning, water-energy-food nexus, land use change, participation, governance

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Nature-Based Solutions for Sustainable Development in the Middle East: Pathways to Community Resilience

Jeremy B. Williams[1]

The Middle East – a region often characterized by its unique environmental challenges – is increasingly recognizing the potential of nature-based solutions (NbS) as a means to address pressing socio-environmental issues (Pérez-Cirera, Cornelius, and Zapata (2021). This paper presents a critical examination of NbS in the Middle East, assessing their feasibility, benefits, and challenges in promoting sustainable development.

With a growing population, water scarcity, and the increasing impacts of climate change, the Middle East faces a complex set of environmental and socio-economic challenges. NbS encompasses a diverse array of strategies, including reforestation, wetland restoration, and green infrastructure, which leverage the inherent resilience and benefits of nature to mitigate these challenges. Our research employs an interdisciplinary approach, combining case studies, policy analysis, and ecosystem service assessments to evaluate the potential and limitations of NbS in the region.

The findings underscore the substantial advantages of NbS in the Middle East. These solutions offer multiple benefits, including improved water management, enhanced climate resilience, and biodiversity conservation, while also contributing to the well-being of local communities. Furthermore, they align with international sustainability frameworks, including the Paris Agreement and the Convention on Biological Diversity.

However, the paper also highlights the challenges associated with implementing NbS in the Middle East, such as limited institutional capacity, land use conflicts, and socio-economic disparities. Effective NbS deployment requires a nuanced understanding of regional contexts and a commitment to stakeholder engagement, policy innovation, and innovative forms of finance.

Keywords: nature-based solutions, systems thinking, climate change, biodiversity, community resilience

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Green Competences: Empowering Universities with Socioecological and Educational tools for Climate Change

Mariaclaudia Cusumano (1)

The European Union has undertaken a significant initiative through its Green Deal Plan to confront the pressing issues of climate change and environmental degradation, recognizing their implications for Europe and the global community. This endeavor necessitates a fundamental shift in the prevailing economic paradigm and a heightened focus on fostering a culture of environmental sustainability within the European Union. As part of this endeavor, the EU has identified a set of Sustainability competencies that are integral to developing educational and training programs. This multifaceted approach seeks to cultivate knowledge, skills, and attitudes over a lifetime, fostering a critical perspective on prevailing economic models, which are inherently tied to the depletion of natural resources and lifestyle choices.

The concept of Green Competence, emerging from these competencies, underscores the dual responsibilities of prioritizing Earth's well-being and addressing global population concerns. This study aims to investigate the notion of green competence and its potential integration into university programs by bridging the domains of human and social sciences with STEM disciplines.

This research journey commences with a comprehensive review of the literature on competencies and skills within sustainability education, lifelong learning, and climate education. Subsequently, the study constructs a robust framework comprising intersectional, interdisciplinary, and transdisciplinary tools applicable within any university context.

Within this framework, four key fields of interest emerge:

a) Sustainable values and awareness: This dimension emphasizes the cultivation of values and heightened awareness of sustainability principles.

b) Complexity in Sustainability: Acknowledging the intricate nature of sustainability challenges, this facet seeks to equip individuals with the tools to navigate and address complex sustainability issues.

c) Critical Thinking: Developing critical thinking skills is fundamental in assessing and responding to sustainability-related problems.

d) Responsibility and Action for Sustainability: This component underscores the imperative of taking responsibility for sustainability and translating this awareness into meaningful actions.

This research underscores the need for socioecological and educational tools that empower universities to play a pivotal role in ushering in a sustainable future. By integrating Human and Social Sciences into STEM disciplines, we can comprehensively address the multifaceted challenges of climate change and environmental degradation across all facets of society. Furthermore, it calls for additional research to facilitate the transition toward sustainability across all scientific disciplines.

Keywords: sustainability, green competences, socioecological and educational tools, universities

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Citizen Science for Clean Air: Inspiring Action to Improve Air Quality through Hands-on Education

Oriol Teixido[(1)]***,*** *Susannah Telfer*[(2)]

Air pollution is one of the greatest environmental risks to health, and children are especially vulnerable. According to the WHO, every day around 93% of the world's children under the age of 15 years (1.8 billion children) breathe air that is so polluted it puts their health and development at serious risk. Air pollution is damaging children's lung function, even at lower levels of exposure and is accounting for almost 1 in 10 deaths in children under five years of age.

A report by the European Court of Auditors noted that citizens can play a key role in pushing for and contributing to better air quality. People are increasingly interested in the quality of the air they breathe, with some citizens taking steps to measure their local air quality themselves through citizen science.

Improving education about air pollution through citizen science is a hands-on, participatory method that empowers individuals of all ages to actively engage in monitoring and understanding air pollution, and importantly the actions needed to improve air quality. By engaging children from a young age, it is not only possible to provide a practical understanding of air pollution, but also to foster a sense of ownership and responsibility for environmental issues.

Some key examples of pioneering citizen science projects led by Ricardo are:

1. The Air Pollution Detectives – Scotland's national air quality educational programme for primary school age students/ Air Quality Wales – Young Dragons
2. Clear the Air – Scotland's national air quality educational programme for secondary school students/ 12-16-year-old students.
3. South Lanarkshire Clean Air Day – Science, Technology, Engineering and Mathematics – linking scientific learning with environmental outcomes.

The key lessons learnt from Ricardo's vast experience in educational projects is that citizen science, air quality educational programs:

- Are embraced by school children of all ages when designed appropriately.
- Provide tangible and credible links between scientific learning at school and real-world environmental impacts – influencing behaviour and enabling students to act as ambassadors to spread the message on air quality.
- Support students in learning practical skills that can be applied in working environment.
- Enable students to 'self-evaluate' their personal impacts on the environment and encourage behavioural change in themselves, friends, and family.
- Are well received by news agencies – raising awareness of air quality issues and positive action being taken by the agency/ authority.

Citizen science is a powerful tool for improving environmental education, it encourages critical thinking and problem-solving, bridging the gap between scientific knowledge and community action, ultimately leading to more informed and environmentally conscious citizens who can drive positive change in air quality management and beyond.

Keywords: citizen science, air pollution, innovation, hands-on, clean air

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أثر توظيف الذكاء الاصطناعي وإنترنت الأشياء (روبوت العناية بالحديقة المدرسية)في المحافظة على النباتات ورعايتها عن بعد في حديقة مدرسة أم العلاء – **الحلقة الثانية**

ناهد محمد أبوغانم [1]، حفصة العوضي، موزة الكياني

يعاني العالم من العديد من المشاكل العالمية كالتغير المناخي الذي يؤثر على الحياة على الأرض ومشاكل الجوع ، لذلك نريد تشجيع الناس على زراعة البذور لزيادة المساحة الخضراء ، إلا أن النباتات تحتاج إلى رعاية يومية لسقيها وحمايتها لذلك تذبل أو تموت خلال الإجازات أو أثناء فترات التعلم والعمل عن بعد . لذا اقترحنا نظام ذكي يعمل بتوظيف تقنيات الذكاء الاصطناعي و IOT (إنترنت الأشياء) لري الحدائق الصغيرة. حيث أنشأنا روبوت لري النباتات وإرسال البيانات إلى تطبيق في الهاتف الذكي. حيث يقوم الروبوت بقياس رطوبة التربة، وعندما تكون نسبة الرطوبة قليلة يقوم الروبوت بسقاية النبتة وبعد ذلك يرسل الروبوت درجة حرارة الجو الى موقع سحابي والذي يتم الوصول إليه عبر الحاسوب أو الهاتف الذكي. أما في الأيام الحارة جدًا والتي تحتاج فيها النبتة إلى المزيد من الماء يقوم الموقع بإرسال بريد إلكتروني للشخص المسؤول عن رعايتها. وقد تم اختبار النظام المقترح في حديقة مدرسة أم العلاء للحلقة الثانية بنات بمنطقة الفجيرة التعليمية. وأظهرت النتائج أن الروبوت فعال في سقاية النباتات عند الحاجة وعلاوة على ذلك، أظهرت نتائج استطلاع الرأي أن هذا الروبوت سيكون له أثر واضح على التشجيع على الزراعة، مما سيؤدي إلى زيادة المساحات الخضراء التي تؤدي بدورها إلى تهيئة مواطن طبيعية للحياة على الأرض، حيث تساهم المساحات الخضراء في التقليل من التلوث المناخي الذي يؤدي إلى الاحترار العالمي وبالتالي حل لمشكلة للتغير المناخي.

الكلمات الرئيسية: الذكاء الاصطناعي، إنترنت الأشياء (IOT)

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Evaluating a Social Behavior Change Program to Reduce Demand for Wildlife Consumption: A case Study in a Biodiversity Stronghold in Nghe An, Vietnam

Khanh Nguyen[1]

Vietnam is facing a biodiversity crisis with many wildlife species threatened with extinction by the illegal wildlife trade. Located in the north-central of Vietnam, Nghe An is home to Pu Mat National Park, a protected area with high levels of biodiversity, but it is also regarded as one of the priority "hotspots" for illegal wildlife trade activities. In this context, Save Vietnam's Wildlife (SVW) recognized a need to tackle wildlife demand through a behavioral change program targeting two key behaviors:

1. demand – the purchasing and consumption of wildlife products, especially bushmeat, and
2. supply – the sale of wildlife products, especially in restaurants that serve bushmeat.

In 2020, partnered with a consultant agency called Influence At Work, SVW developed a behavior change program based on the CARING TREE framework. According to IAW and Act For Good®, C.A.R.I.N.G. represents the six psychological principles we can draw upon to ensure our behavior change efforts align with how humans behave and make decisions.

T.R.E.E. is a four-step framework on the application of the C.A.R.I.N.G insights using a scientifically rigorous approach.

C.A.R.I.N.G
- **C**onnected
- **A**ccountable
- **R**ealistic
- **I**dentity Relevant
- **N**etwork
- **G**ratifying

T.R.E.E
- **T**arget
- **R**esearch
- **E**mploy
- **E**valuate

Additionally, we adopted the social norms approach, which predicts that an intervention that aims to correct misperceptions by exposing actual norms will benefit society as well as individuals because it will lead people to reduce problematic behaviors.

From there, we developed a behavioral change program centered around science-based and placed-based communication solutions to reduce wildlife demand in Con Cuong district, a buffer zone community of Pu Mat National Park. Our campaign includes a series of activities, such as community surveys to gain background insights for the development of intervention; 23 large-sized billboards and 620 posters installed at main routes, central places, and governmental offices; 18 restaurants certified as Widlife-free, and various communication products such as short films, documentaries, or social media engagement. Particularly for the billboard and poster campaign, our messages calling for an end to wild meat consumption are represented by the faces and voices of highly influential members within the local community.

To evaluate the behavioral change impact of our interventions, we adopted a pre-post survey method to identify any changes in community perceptions and consumption of wild meat. The comparative analysis indicated positive outcomes; however, this method in capturing environmental behavior change, in particular, posed some limitations, for example:

- Changes in awareness and behaviors are reliant on self-reported responses, which can be influenced by the social desirability bias
- There might be other external factors contributing to behavioral change
- Survey analysis needs to be cross-checked with other sources of information like hunting and poaching statistics to get a detailed and accurate picture of wildlife consumption trends.

Keywords: Vietnam's wildlife

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Contribution of Abu Dhabi Houbara Program to Biodiversity Assessment: Enhancing Knowledge and Awareness on Arid Land Conservation

Dr Yves Hingrat[1]

Tackling the biodiversity crisis will require cooperation at all levels of society, from intergovernmental agreements down to local community action. But how to protect and restore the unknown?

Educating people, from children to policymakers, about ecosystems, the threats they face and the opportunities to restore them, requires a sound knowledge on their biodiversity and the constitution of appropriate tools to raise awareness on their importance to environmental health. While biodiversity hotspots have been intensively studied, arid lands have long been neglected and are still considered as "empty" ecosystems of poor value.

Arid lands form about one third of the Earth's terrestrial surface, containing unique biological and cultural diversity, and biodiversity loss in arid lands can have a disproportionate impact on these ecosystems. It is then urgent to enhance global knowledge on arid land biodiversity and elaborate effective tools allowing their assessment, monitoring, and preservation.

In the past 20 years, the International Fund for Houbara Conservation (www.houbarafund.org) has deployed significant efforts to preserve and restore the Houbara Bustard, an emblematic bird of arid lands of North Africa, Middle East, and Central Asia. Sound research on houbara ecology has been launched throughout the Houbara range.

In Morocco these studies include plant and animal communities with more than 90 scientific communications related to biodiversity assessment, the discovery of new plant and animal species, the constitution of unique collections (plant herbarium, invertebrate collections, genome resource banking, etc.). The program contributes to enhance knowledge on arid lands and offers opportunities to raise awareness for their conservation.

Keywords: ---

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Climate We must Act, There is No More Time (In Honour of Massimo Scalia)

Aurelio Angelini[(1)], *Massimo Scalia*

The most serious threat comes from the climate. The quantity of greenhouse gases emitted by man has exceeded the levels of the entire Quaternary and it is not known what the consequences may be. The change was extremely faster than the most abrupt changes that have occurred in the last 740 thousand years. Carbon dioxide and methane levels are the highest ever recorded in the last 15 million years. The increase in temperature is making the planet as a whole wetter and cloudier and the added humidity contributes to global warming.

Climate changes are changes in the climate due to the natural climate variability recorded in comparable periods of time to which are added the effects of human activities which, directly or indirectly, alter the composition of the atmosphere.

The economy and the human population depend on constant flows of air, water, food, raw materials, and fossil fuels from the Earth; they constantly send waste and pollution back to the Earth. The limits to growth are the limits of the capacity of the Planet's sources to supply those flows of materials and energy, and the limits of the capacity of the Planet's sinks to absorb waste and pollution.

Under current regimes, the flows that support the human economy cannot be maintained infinitely, or even for a long time, because many sources of crucial importance are degrading and running out, while many wells are already overflowing. However, this bad news is followed by good news, namely that the current high regimes are not necessary to guarantee a satisfactory standard of living for the entire world population. It is possible to maintain or even increase the production of final goods and services by significantly reducing the load on the planet. There are many choices and paths to undertake this path, but first it is necessary to understand what the great environmental problems humanity is dealing with are.

Education for sustainable development must contribute to the education of the citizen of the future: that citizen who we cannot predict but who we can only imagine and help build. The change that is proposed is first and foremost in the way of thinking - and of thinking about ourselves - in relation to the world: it is necessary to develop skills, knowledge and attitudes in school that allow us to rethink our relationship with the world in the direction of "inhabiting the planet with lightness. In fact, at the root of the ecological crisis there would be a loss of the meaning of living, of the meaning that human beings attribute to their relationships both with the natural world and with the world of men. Climate change forces us to rethink the culture of Sustainability by placing environmental education as education for change at the center of the ecological crisis.

Keywords: Panel discussion

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THE CHALLENGES THEME 02

Water Food and Energy Nexus in Environmental Education

Theme Background:	Experts and nations have recognised the interconnected relationship between water, food, and energy in a broader context. The nexus underscores that the three essential elements are deeply intertwined, and any changes or challenges in one domain will have significant implications for the others—can we afford to build a siloed understanding? A simplistic understanding impairs abilities to address root causes, deploy synergies, and address trade-offs. The 12th World Environmental Education Congress (WEEC) 2024, to be hosted in Abu Dhabi, provides a unique platform for EE and ESD stakeholders to engage in meaningful discourse on why and how Water-Food-Energy Nexus should be the lens to understand each of them and their interconnectedness.
Theme Objectives:	This thematic track aims to explore innovative approaches to educating and involving people in understanding and addressing the challenges and opportunities presented by this nexus.
Theme Focus:	• How and why nexus approach can contribute to building public attitudes that are not hinged on simplistic understanding of critical issues. • Discuss how EE and ESD can bring in a holistic and interdisciplinary understanding to deal with nexus challenges.
Theme Outcomes:	Embracing competencies and pedagogic approaches that build a more comprehensive understanding of environmental challenges.
Theme Conclusions:	Stakeholders which include educators, researchers, practitioners, and policymakers share insights and best practices that will empower individuals and communities to navigate the complexities of the Water-Food-Energy Nexus and work towards solutions.

THE CHALLENGES THEME 02

Water Food and Energy Nexus in Environmental Education

Presentations

ID	TITLE	PRESENTER	FORMAT
041	University Students' Perceptions of Food Waste in the UAE	Tareefa Alsumaiti, Mohamed Yagoub	Oral communication
052	Review of Transdisciplinary Approaches to Food-Water-Energy Nexus - A Guide Towards Sustainable Development - Issues and Challenges	Alluri Venkata Nagavarma	Oral communication
261	The Contribution of Near-Infrared Waves, Bluetooth Connectivity, and Android Operative System to Good Agricultural Practices in Southern Africa	Quiven Inoque Ebicha	Oral communication
290	Community Agroforestry as A Sustainable Solution for Humanity and Ecologic Crisis	Leonardo Fatima Soares	Workshop
352	Swimming pools or digging tools: Adapting education on the water, food and energy nexus to rich and poor students' lifestyles	Linus Bylund	Oral communication
426	Access to Clean Water and Proper Sanitation as a Fundamental Human Right in Africa	Bruno Muyunga	Oral communication
519	Mise en avant des bonnes pratiques & Projets pertinents émanant des écoles marocaines du programme EE, en lien avec les 3 thématiques concernées (l'eau, l'alimentation et l'énergie)	Farid Alaoui	Oral communication
614	Native Mangrove Microbiota Promotes Spinacia oleracea (Spinach) Growth in Marginal Environments	Munawwar Ali Khan	Oral communication
703	Nurturing Sustainability: Exploring the Importance of Grey Domestic Water Recycling and Filtration for Planting Workshops Promoting Sustainability	Awatef Moujaat	Workshop
763	Water WEEC	Mariarita Caracciolo	Workshop

THE CHALLENGES THEME 02

Water Food and Energy Nexus in Environmental Education

Abstracts

041 University Students' Perceptions of Food Waste in the UAE

Tareefa Alsumaiti[(1)], *Mohamed Yagoub*[(2)]

This study examines the relationship between food waste and gender, income, and where students live. The research aligns with the United Nations Sustainable Development Goals 2, 11, and 12; moreover, the massive global food shortage in 2022 due to the conflict between Russia and Ukraine makes saving food a priority. A questionnaire was used to collect data from 201 students at the United Arab Emirates University (UAEU). A large proportion of the respondents were female (71.6%). The most common reasons cited by the respondents for food waste were over purchasing (31% of respondents), attitude (26.5%), and poor management (24%), while the most common reasons for having extra-cooked food were expecting guests (46%) and wanting to eat the food that had been prepared (35%). The majority of the respondents (57%) agreed that young people waste more food than older people. The methodology used in this study could be adopted by other researchers around the globe, and the output may help in developing policies and designing educational material for food waste intervention programmes. Beneficiaries may therefore include food producers/consumers, environmental departments, and charitable organisations. The research contributes to the knowledge about food waste, perception, and intervention programmes.

Keywords: UAE, food waste, perception, youth, sustainable development

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Review of Transdisciplinary Approaches to Food-Water-Energy Nexus - A Guide Towards Sustainable Development - Issues and Challenges

Alluri Venkata Nagavarma (1)

The burgeoning food-water-energy (FWE) nexus discussion for sustainable development reflects the ongoing transition from a silo-thinking to a transdisciplinary perspective in order to address challenges of the nexus practicability in real-world. Approaches to putting the FWE nexus into practice have failed to respond to the interdependent issues of resources appropriately and to devise the way societies are coordinated for such responses.

Societies are critically important for advancing sustainable development and are thus placed at the center of the FWE nexus. Transdisciplinarity allows challenges to be framed and viable solutions to be found at the outset in an extensive and equal contribution of societies.

This paper provides a systematic literature review to debate the current concepts and methods of the transdisciplinary research on the FWE nexus with the aim of developing a guide for socially inclusive sustainable development. Although the concept of transdisciplinary has been widely accepted by nexus research, an explicit cognition of its practicability in real-world is still lacking, and sophisticated methodological development is required. As such, we proposed a conceptual frame- work to explore the potential contribution of transdisciplinary towards linking FWE nexus practices and sustainability outcomes in real-world situations.

This framework is useful in steering the management of nexus issues with integrative perspectives. Relying on the proposed framework, we made recommendations for successful transdisciplinary nexus practices.

The future nexus research should be directed towards communication mechanisms and governance transition for balanced power relations among nexus actors, their representative selection, and timely involvement.

Keywords: food-water-energy nexus, sustainable development, transdisciplinary research, communication mechanisms and governance

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The Contribution of Near-Infrared Waves, Bluetooth Connectivity, and Android Operative System to Good Agricultural Practices in Southern Africa

Quiven Inoque Ebicha (1)

During the past decades, especially of the 21st century, Southern African countries have faced serious crisis concerning soil fertility. Although considered as a great problem to the agricultural sector in rural areas where subsistence as well as commercial farming are practiced, no considerable interventions where seriously taken. Many rural farming fields which were once productive in the past became almost barren, only permitting less than 50% of the expected yields. According to some researches carried done by soil scientists and agronomists, poor harvests were due to decreasing soil fertility status caused by poor soil management and fertilizer application techniques. The majority of the smallholder farmers in Zambia and Mozambique didn't have the opportunities to get the results of the actual status of their soils and were mainly dependent on agro dealers whose fertilizer application knowledge and advice is mainly based on the type of crop grown during a certain season. In many cases which were also observed during various studies carried out scientifically, there was a mismatch between applied nutrients and required nutrients for productive soils. As far as soil conservation management is concerned, the application of non-limiting nutrients results in huge economic losses and environmental degradation.

The research questions were:

1. How the dream of the smallholder farmers in Zambia and Mozambique was fulfilled through the introduction of fast, modern, reliable and affordable soil analysis methods.
2. Reflection and evaluation of the statistical data concerning the soil samples collected and analysed up to date.

All the information contained in this study is based to the data collected from the results of the work done during the first four years ever since the agrocares soil scanners where deployed in the regions where Solidaridad Southern Africa is currently operating and giving assistance concerning the implementation of the good agricultural practices among the smallholder farmers.

Findings:

- The usefulness of the quantitative and qualitative interpretations of the parameters' levels detected during the soil analysis.
- The relevance of the soil correction plan mainly characterised by the fertilizer management advice based on the actual nutrient need which also provides insights on the possible alternatives of fertilizer applications to achieve the desired crop yield and to maintain an adequate soil fertility level.

With the deployment of the Agrocares Soil scanners in Mozambique and Zambia, smallholder farmers now have the opportunity to have their soil analysed enabling them to know the nutrients contained in the soil quickly and easily and to make decisions about how to fertilize the same soils. This marked the beginning of the era of precision agriculture based on soil data to the smallholder farmers sector.

Keywords: soil, scanner, solidaridad, Zambia, Mozambique

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Community Agroforestry as A Sustainable Solution for Humanity and Ecologic Crisis

Leonardo Fatima Soares[1]

Facts reveal that Timor-Leste is facing a serious ecological crisis during the last three years. In 2019 there was the warmest year where temperature increased drastically and lots of wild and domestic animals died due to water scarcity. Other case was in 2021, there was a catastrophe occurred, torrential rain and cyclone caused huge flooding in Dili and some municipalities which were affected several local habitant's properties such homes, land and domestic properties were destroyed including the loss of 48 people (Timor-Leste National Disasters Data, 2021).

Practically all these catastrophes occurred as the effects of deforestation through the traditional farming system such as slash and burning, as well as the emission of carbon dioxide and greenhouse gases. Data from the National Directorate of Forestry revealed that annually Timor-Leste loses its forest more than 10.000 hectares which is caused by the legal and illegal forest exploitation.

Deforestation contributes to increased carbon emissions (CO_2) at least 20% for global climate change. In fact, land fires and cutting trees cause to minimizing the the composition of natural diversities, disturbing the will animals, removal of local species, disturbing the natural ecological process (natural succession, organic materials production, decomposition process, cycle of natural fertilization and changing soil structure) and reduce quality of water and the quality of oxygen (Pamungkas, 2012).

This study used the literature review of existing documents and data regarding the catastrophes and evaluation the effectiveness of community agroforestry towards environmental conservation and food production.

The findings from this study revealed that agroforestry is a proper and suitable intervention that farmers can apply as their farming system in order to reduce harm towards the environment, particularly preserving the water, soil fertilizer, and underground biodiversity which is important in the ecosystem. Furthermore, it serves permanent and smart agriculture in the slope area for food production and reduces the erosion and flood in the flat areas particularly during the rainy season.

Finally, to conclude that agroforestry has an important role for solving the issue of humanity such as; ensuring the food production and food security, reducing hunger and poverty as well as solving the ecological crisis such as; preserving the quality of water, soil fertilizer and reducing land erosion, flood and sedimentation.

Keywords: agroforestry, sustainable farming, food production, environmental conservation

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Swimming Pools or Digging Tools: Adapting Education on the Water, Food and Energy Nexus to Rich and Poor Students' Lifestyles

Linus Bylund[1]

In global policy discourse, ESD is presented as a global inclusive project uniting humanity in a common endeavor for a more just and sustainable world. The world's largest ESD-program, Eco-Schools, reflects such an inclusive logic, since it enrolls schools in 74 countries and emphasizes flexibility and adaptation to local conditions. However, implementing the program in a world marked by deep inequality raises questions about how Eco-Schools handles the stark divide between different populations lifestyles. Drawing on biopolitical theory, this study empirically explores how Eco-Schools unpacks the themes of water, food and energy and how approaches vary based on whether students are perceived to be rich or poor.

The study builds on interviews with teachers, students and Eco-Schools representatives. The data was generated through fieldwork in 31 schools in different socio-economic and geographic contexts in one high-income country (Sweden), one middle-income country (South Africa) and two low-income countries (Rwanda/Uganda). The selection thus spans from schools located in rich urban contexts to poor rural contexts. A framework developed to explore the global implementation of ESD biopolitically is applied in the analysis of the data. The framework puts emphasis on the rationalities and techniques at play when ESD is implemented in relation to different populations.

The findings show how the Eco-Schools themes of water, food and energy are implemented in different contexts. In poor rural schools lacking access to the power grid, energy conservation is not a priority, while it is prioritized in poor urban schools due to cost-saving considerations. In schools in wealthy areas, energy saving is of high importance, and schools typically invest in solar panels and other technological solutions to conserve energy. Thus, the local context plays a crucial role in shaping the schools' approaches, which is evident in relation to water. Some schools struggle to collect rainwater, resulting in students drinking directly from the river, while others employ strategies such as evening garden watering or automated sink sensors to conserve water. Regarding food, all schools in poor contexts have food production programs and educate their students to become self-reliant in supporting their basic needs. In wealthier contexts, emphasis shifts towards reducing food waste, and projects of plant cultivation rather serves academic, recreational and aesthetic purposes.

The implementation of Eco-Schools demonstrates a strong adaptability to local contexts and students are educated in alignment with the issues prevalent in their present living conditions. While recognizing the significance of adapting ESD to local contexts, the findings of this study raise concerns that Eco-Schools perpetuate existing inequalities in lifestyles. By treating these differences as unalterable, there is a risk of reproducing such conditions instead of actively seeking to transform them.

Keywords: global ESD implementation; eco-schools; inequality; biopolitics

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Access to Clean Water and Proper Sanitation as a Fundamental Human Right in Africa

Bruno Muyunga[1]

While the world is progressing to achieve SDG 6, Africa is unfortunately the only region sliding backward.

According to research, it is remembered that In 2020, around 387 million people still lacked a basic level of drinking water service, 737 million lacked basic sanitation services (including 197 million who practiced open defecation), and 811 million still lacked or had limited access to basic hygiene services. Around half of schools and health facilities lacked access to proper water and sanitation services.

Over the past decades, more Africans were without basic drinking and millions were without basic sanitation, according to research. Significant inequalities also persist between urban and rural regions within countries.

The continent is seeing a fast urbanization trend, with 350 million more Africans living in cities by 2030.

Our water security diagnostics show that by 2050, water scarcity could reduce GDP by 6%. Half of global maternal deaths occur in Africa. Poor water, sanitation, and hygiene also lead to increased diarrheal diseases, which are still the leading cause of death in the region, causing more than 8% of child deaths. Having a water source and sanitation facilities at home or close to home is most beneficial for women and children. Easy access to safe water and sanitation can help safeguard the safety, dignity, and well-being of women and girls, who are often at the most risk for gender-based violence as they collect water or use sanitation facilities.

Uganda's natural resource base is one of the richest and most diverse in Africa, resulting in the country's economy relying heavily on goods and services so provided. For example, estimates show that gross returns to the national economy from biodiversity alone can be as high as US$ 63.9 billion per year.

However, water resources are under increasing threat of degradation as exhibited in reduced quality and quantities in major freshwater bodies. Soil erosion and industrial pollution have reduced surface water quality.

Wetlands are important for controlling floods, filtering wastes, dry season fishing and livestock grazing, and tourism. They suffer from pollution, conversion to other uses such as agriculture and human settlement. This, therefore, calls for; Address policy and institutional reforms, Leveraging private and partner financing to Build resilience, and Prioritizing country and regional collaboration platforms.

Sanitation and capacity-building training to sensitize people across regions about clean water, and enlighten communities about a clean environment.

Establishment of filtered water sources in different communities as a way of improving water and sanitation.

Ensuring campaigns like the "The go green campaign" to motivate sensitive youths to preserve the environment.

Formation and establishment of an accounting system or team to carry out monitoring and evaluation processes to ensure the establishment of these ideas.

Keywords: sanitation, capacity-building, building resilience, and health

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Mise En Avant Des Bonnes Pratiques & Projets Pertinents Émanant Des Écoles Marocaines Du Programme EE, En Lien Avec Les 3 Thématiques Concernées (l'eau, l'alimentation Et l'énergie)

Farid Alaoui[1]

Eco-écoles est un programme international d'éducation au développement durable (EDD) porté par la Fondation de l'Education à l'Environnement (FEE), le programme est présent dans plus de 70 pays dans le Monde et relayé au Maroc par la Fondation Mohammed VI pour la Protection de l'Environnement depuis 2006, en partenariat avec le ministère de l'Éducation nationale, du Préscolaire et des Sports (MEN). Grâce à la démarche Eco-écoles, + 4000 écoles inscrites au programme (Urbain 56% et Rural 44%) / 11000 écoles du Maroc bénéficient gratuitement de l'accompagnement de notre équipe, soit 37% de l'ensemble des écoles public.

Le programme vise à sensibiliser la communauté, à son cœur les élèves, à la préservation de l'environnement en établissant des passerelles entre l'éducation au développement durable et le cursus scolaire classique, en leur permettant de prendre conscience de l'impact de leurs comportements sur l'environnement et favoriser ainsi l'Education à la Citoyenneté.

Basé sur une démarche volontariste et progressive, Eco-écoles encourage les écoles à travailler sur les sept thèmes : énergie, déchets, eau, biodiversité, alimentation, solidarité et changements climatiques avec un rythme de travail régulier, progressif et dynamique.

De plus, le programme permet :

- D'accroître et renforcer l'appropriation des enjeux relatifs à l'Education eu développement durable (EDD) par la communauté scolaire et acteurs locaux ;
- D'améliorer la gestion environnementale de l'établissement scolaire ;
- De reconnaître et récompenser les meilleures initiatives et bonnes pratiques à travers l'octroi progressif du label pavillon vert et sa pérennisation (certificat bronze, argent et pavillon vert).

Eco-écoles repose sur la mobilisation de l'ensemble de la communauté d'un établissement scolaire préscolaire et primaire (4-12ans) : élèves, enseignants, direction, personnels administratifs et techniques, partenaires économiques ; ainsi que la société civile (collectivités locales, associations, parents d'élèves, ...).

La mise en place des bonnes pratiques au sein des éco-écoles, a permis de voir le réel changement de comportement dans les gestes des écoliers.

La création d'une BDD des bonnes pratiques des éco-écoles marocaines est une belle initiative de partage d'expériences et de succès stories visant à avoir un impact positif encore plus important et inviter de nouvelles écoles à rejoindre le train du changement et de protection de l'environnement.

Mots clés: bonnes pratiques, protection de l'environnement, eau, alimentation, énergie, éducation à l'environnement

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Native Mangrove Microbiota Promotes Spinacia oleracea (Spinach) Growth in Marginal Environments

Munawwar Ali Khan[1]

Growing crops in marginal environments with low soil fertility and arid conditions are the main global challenges for sustainable food security amid climate change scenarios. Plant growth-promoting bacteria (PGBP) from various ecosystems have been reported to enhance the productivity of edible crops worldwide. However, PGPB applications for enhancing crop productivity in marginal environments have rarely been reported. In this study, we attempted to assess the effects of two plant growth-promoting bacilli isolated from Umm-al Quwain Mangrove on the growth of Spinacia oleracea. After screening, over eight weeks, two bacillus species with multi-plant growth-promoting traits were selected to study their effect on Spinacia oleracea growth. 16S rRNA gene sequencing identified PGPB as Bacillus licheniformis and Bacillus wiedmannii (99% match, NCBI BLAST). After the coating, Spinacia oleracea seeds were divided into treated and untreated groups for field trials under shade house conditions. During the early germination of Spinach, the data were recorded for germination rate and leaves number. SPAD and NDVi analysis was performed to measure the amount of chlorophyll and vegetation coverage. Among the three treated and the untreated groups, the Bacillus licheniformis treated group had the fastest germination rate, the most significant average leaf quantity, and the highest data for SPAD and NDVI (Fig.1). This study successfully demonstrated the potential of two Bacillus species from a native mangrove ecosystem in stimulating the growth of Spinacia oleracea in marginal environments. This study indicates the possibility of further exploring PGPB from native mangrove or desert plants in the UAE and using them as biostimulants for enhancing various crops in urban agroecosystems.

Keywords: plant growth-promoting bacteria, Spinacia oleracea, marginal environment, mangrove ecosystem

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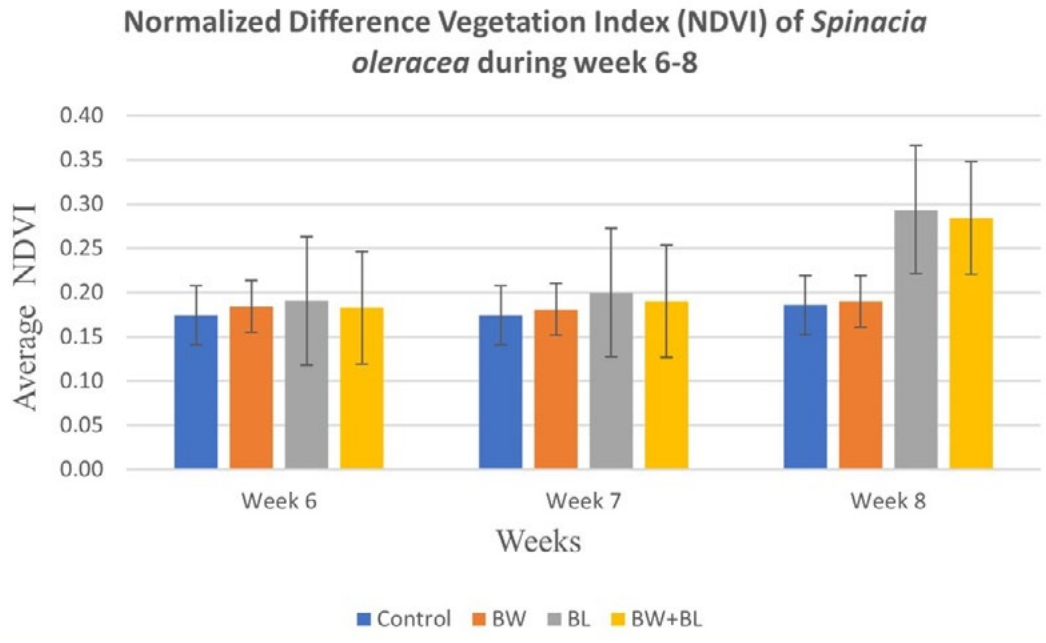

Figure 1

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Nurturing Sustainability: Exploring the Importance of Grey Domestic Water Recycling and Filtration for Planting Workshops Promoting Sustainability

Awatef Moujaat[1]

Water is a vital resource for life that should be nurtured and sustained. The objective of the workshop is to shed light on the critical role that grey household water recycling and filtration play. Rethinking how we use water is essential at a time of resource shortage and rising environmental concerns. In order to encourage a greater awareness of the significance of greywater recycling and filtration to support sustainable planting and gardening, this abstract proposes an instructional session.

The major goal of the workshop is to provide participants with the information and skills they need to maximize the potential of greywater, the gently used water.

1. Greywater Fundamentals: Participants will learn about the elements that make up greywater as well as the advantages and difficulties that come with them. Greywater must be used safely and responsibly for its incorporation into planting methods to be successful.
2. Filtration and Treatment: The course will explore several greywater filtration and treatment approaches, giving participants a thorough grasp of how to convert greywater into a clean and useable resource for plants while guaranteeing environmental and health safety.
3. Water Conservation: Attendees will learn how greywater recycling results in considerable water savings, lower water bills, and environmental responsibility.
4. Plant Health and Growth: Real-world examples and professional analysis will highlight the beneficial effects of filtered greywater on plants.
5. Hands-On Activities: Participants will get the chance to build up simple greywater recycling and filtration systems that are suited to their residential requirements through hands-on activities.

Participants will have a thorough grasp of the benefits of grey household water recycling and filtration for sustainable planting techniques at the end of the workshop.

Keywords: Grey Water Recycling for Planting

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Water WEEC

Mariarita Caracciolo (1)

With water being a vitally important element, aquatic education and capacity building are key components in providing the knowledge and skills required to face some of the current most pressing water challenges. As such, they are essential for any meaningful strategy toward sustainable development, that remains today a top priority of the international community's agenda. For this reason, water education needs to be promoted and improved.

This Water WEEC, during its 10th anniversary, wants to address the most effective strategies to build aquatic literacy around the world and promote communitywide water conservation activities. First, analysing examples of citizen science projects, production media (documentaries), digital media projects, and all those water projects that can reach an amplitude in the number of people involved. Then, assessing the current status of water education, including the progress achieved during the WEEC, through case studies that include water education projects around Italy (Es. Como lake, Po river). Finally, we would like to raise a discussion on the future challenges individuals face attempting to implement projects and possible solutions.

It's necessary and urgent to enhance the capacity of individuals and communities to tackle the water issues that affect them, only through education we can give both current and future generations the tools to empower themselves and be the actors for change.

Keywords: ---

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CLUSTER

02

The Goals

Theme 01:
A Worldwide Community for Sustainability as the Goal

Theme 02:
Environmental Education for a Sustainable Future

THE GOALS THEME 01

A Worldwide Community for Sustainability as the Goal

Theme Background:

The pursuit of sustainability has transcended the realm of mere environmental concern; it has become a fundamental goal that permeates all aspects of our lives, including education. True sustainability necessitates a holistic approach that not only addresses the environmental aspects but also integrates social, economic, and cultural dimensions. This approach must extend beyond the boundaries of educational institutions to encompass the broader community. Achieving inclusive and holistic sustainability goals requires a paradigm shift—a commitment to 'whole institutional approaches,' global networks, and regional centres of excellence.

EE has evolved into a global movement that began with the objective with diverse interpretations, all rooted in a universal context from a goal to develop a world population that is aware of, and concerned about, the environment and its associated problems..." Belgrade Charter, 1975. Numerous actors, including environmental agencies, educational institutions, teachers, NGOs, and international organisations like the UN, are working towards integrating EE and sustainability perspectives into their activities. Their motivations vary, spanning from individual and organisational change to social learning and global citizenship.

Theme Objectives:

The theme, "A Worldwide Community for Sustainability as the Goal," seeks to discuss and deliberate on:

- How EE and ESD community can integrate sustainability that leaves a lasting impact and minimizes our collective environmental footprint.
- How EE and ESD can contribute to the development of global citizenship through collaborative networks and online learning communities that connect individuals and institutions across borders.

Theme Focus:

Good practices in EE and ESD collaboration among different countries, socioeconomic contexts, and cultures, highlighting the exchange of experiences and the value of diversity in sustainability efforts.

Strategies for building and expanding networks that amplify the efforts of communities to drive effective and sustainable change at local and global levels.

Theme Outcomes:

Highlight the critical role of engaging diverse communities in global sustainability issues.

Theme Conclusions:

Educators, researchers, practitioners, and community leaders contribute to a vital conversation in Abu Dhabi around what it takes to advocate for sustainable and equitable development.

Together, the EE and ESD community will explore innovative approaches, share experiences, and build networks that empower communities worldwide to work towards a sustainable and equitable future for all.

THE GOALS THEME 01

A Worldwide Community for Sustainability as the Goal

Presentations

ID	TITLE	PRESENTER	FORMAT
067	An approach to conservation education to act for a sustainable future	Antonieta Costa	Oral communication
095	Education for Sustainable development (ESD) framework at the regional level	Fabrizio Piccarolo	Workshop
164	Embedding Education for Sustainable Development in Learning and Teaching - The Take 1 Programme as a Whole-School Approach	Valerie Lewis	Round table
178	A Global Force for Ecosystem Restoration: Empowering Rewilding Professionals Worldwide	Arend de Haas, Lina Dilly	Workshop
194	Building a decade of ecosystem restoration education on a solid foundation	Richard John Obrien Perry	Workshop
237	Water education as a bridge between Italy and Cuba: two experiences based on the development of playful-educational materials	Elena Comino	Oral communication
270	Assessing Environmental Awareness and Attitudes towards Climate Change and Environmental Issues among University Students in the United Arab Emirates	Khawlah Mitib Al-tkhayneh	Oral communication
366	Building Leadership in EE through Global Networks and Learning Communities	Nina Hamilton	Round table
456	Green Re-lake, a Special "sustainability under Water gardening" to Re-store Lake Como	Paola Iotti	Oral communication
490	Outdoor and Place-based Learning in the Decade of Ecosystem Restoration	Anita Saul	Oral communication
499	Joining Realities and Empowering Young People in Advocacy Actions in Environmental Education and Sustainability A from the Partition in the Youth Community of WWF Volunteers	Huáscar Camacho Mojica	Oral communication

ID	TITLE	PRESENTER	FORMAT
550	Local adaptation and facilitation of global online courses for environmental educators	Bomyung Seo	Pecha kucha
565	UAE Climate Change Research Network fostering research in climate action	Fatin Samara	Oral communication
584	Activist Pedagogies in Higher Education: Educating Change Makers for Ecological Sustainability and Social Justice	Jeremy B Williams	Oral communication
619	The African Manatee in Guinea: Protecting an endangered species through environmental education, capacity sharing and international networks	Lucy Keith-Diagne	Oral communication
624	دور الشباب التطوعي في المجتمع لإستدامة الحفاظ على البيئة البحرية و ما يقومون به طوال السنة من العمل التطوعي الميداني البيئي و الإنساني من خالا الانقاذ البحري و نقله للأجيال القادمة	Abdulla Muhsen Ali Ibrahim Alblooshi	Oral communication
654	Towards Meaningful Engagement of Youth in SDGs Processes	Miki Fukuda	Oral communication
696	Mimicry of Scarcity. Reproducing Shortage (in a teaching context) as Educational Practice	Elena Bougleux	Oral communication
697	Education for Sustainable development (ESD): joining an international community	Stefania Fontana	Workshop

THE GOALS THEME 01

A Worldwide Community for Sustainability as the Goal

Abstracts

067 An Approach to Conservation Education to Act for a Sustainable Future

Antonieta Costa[1]

Zoos and aquariums are unique learning environments and play a crucial role in advancing conservation through education and scientific research to meet the UN Sustainable Development Goals. This role includes ensuring higher levels of biological literacy and promoting sustainable behaviour, engaging in active citizenship, support and empowering our audiences to take positive actions towards species and habitat conservation. Zoos and aquariums have an incredible power to engage the public with their ability to create emotions, attracting new audiences and through them amplifying species and habitats conservation awareness. Our work is not only about caring for the animals in human care, but caring for all life on Earth. By fostering emotional connections, we encourage individuals and communities to take positive conservation actions and engage in more sustainable consumer behaviours.

Facts and figures rarely change hearts and minds, but profound experience of benefit to wildlife is imperative for a sustainable future. The EAZA Conservation Education Committee is supporting the European Association of Zoos and Aquariums Members in implementing a holistic and integrated approach to conservation education through the use of the Conservation Education Standards, which focus on taking a strategic approach to providing effective biodiversity-focused education that connects visitors to nature and empowers them to take positive action to contribute to conservation and aims to help the world meet its biodiversity conservation targets.

Connecting visitors to action that makes a measurable difference for conservation is a critical contribution of zoos and aquariums. Identifying audiences, tailoring messaging to those audiences, preparing staff with knowledge and resources, and planning evaluation measures are all vital to the success of the education campaign.

This presentation will outline this work with a view to sharing examples of best practices and showcase the positive impact zoos and aquariums have on species conservation, contribute optimism to the conservation movement, and inspire action.

Keywords: sustainable future, conservation education standards, effective biodiversity-focused education

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095 Education for Sustainable Development (ESD) Framework at the Regional Level

Mita Lapi[1], *Stefania Fontana*[2], ***Fabrizio Piccarolo***[3]

FLA, in the context of the collaboration agreement with Regione Lombardia - General Direction Environment and Climate, contributed to advice the setting of long-lasting regional strategies within the adoption of systemic tools. In compliance with international guidelines, FLA promotes good practices at the local scale, scientific research projects on sustainable development, and integrates ESD into regional policies and programs. Aim of the workshop would be sharing and discussion, among the regional administrations joining the networks Regions4 and 4motors4Europe which are invited to the congress, about ways they experienced in framing regional EE and ESD programs in the perspective of the UNESCO, to benchmark the most relevant outcomes and practices in a peer context.

The discussion will also pertain interregional perspective to foster cooperative relationships among European regions and consolidation of relations in the context of EE and ESD, with the aim to improve the quality of policies of the sector.

FLA will lead the workshop in collaboration with Regione Lombardia, animating the sharing and the discussion, focusing on four issues mainstreamed also by the UNESCO ESD initiative:

1. Founding ESD in regional policies;
2. Supporting the transformation of formal, non-formal and informal educative sectors toward the ESD principles;
3. Promoting the empowerment of relevant regional ESD key stakeholders;
4. Scaling up of ESD into local communities within the creation of regional initiatives.

The experience led by FLA as a technical support of Regione Lombardia administration, is the setting of a strategic document to align aims and activities, of a global web platform for relevant stakeholders to exchange information, experiences and build partnerships. FLA started a survey of all public or private stakeholders involved in EE and ESD initiatives at the regional scale, to better know the status of activities, needs and opportunities and to publish a tender to support, through a financial program, the worthiest projects. In order to strengthen the communication, but also the sharing of best practices, an annual appointment such an EE and ESD Fair at regional level, with speaker corner presentations and a seminar streamed by regional broadcast channels, was organised. If ESD is a process that involves the entire societal system, then the regional administration level must have a relevant pro-active role in catalysing the activities of networks of the business community, public administration and third sector bodies in the direction of regional sustainability objectives fulfilment: the non-formal and informal educative paths enhanced by those subjects can help promoting the acquisition of essential skills and competences, discuss values, enhance personal experiences and critical reflection onto citizenship education.

Keywords: regional governments policies, ESD Education for Sustainable Development, downscaling environmental policies, SDGs

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Embedding Education for Sustainable Development in Learning and Teaching - The Take 1 Programme as a Whole-School Approach

Valerie Lewis (1)

Competing for time in an already overcrowded curriculum means many second level educators and school leaders are struggling to engage with Education for Sustainable Development (ESD) in a meaningful way. The importance of learning about and for sustainability is not underestimated, however it is often overshadowed by issues of teacher capacity, lack of available resources and structural support.

The Take 1 Programme offers an innovative solution to engage with ESD by aligning the Sustainable Development Goals (SDGs) with the learning outcomes of lower second level curriculum subjects, enabling teachers and students to view ESD as an embedded element of learning and teaching. Exposing every student, in every classroom, to ESD in every subject not only presents sustainability and global citizenship issues as inclusive and interdependent but also supports avenues for demonstrating and expressing student voice and participation.

Learning and teaching about and for sustainable development across various disciplines communicates it as a collective endeavour for second level schools. Through whole-school engagement, Take 1 Programme training facilitates the development of critical thinking, collaborative practice and problem-based learning, underpinned by an ethic of care. It provides valuable guidance for educators, policymakers, and curriculum developers seeking to enhance and connect ESD across formal, informal and non-formal learning contexts. By embracing this innovative approach, educational institutions can create a transformative learning environment that prepares students to become engaged and active contributors to a worldwide community for sustainability.

Keywords: education for sustainable development, learning and teaching, SDGs, inclusion, ESD

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A Global Force for Ecosystem Restoration: Empowering Rewilding Professionals Worldwide

Arend de Haas[1], *Lina Dilly*[2]

The UN Decade's appeal for action amid biodiversity loss, climate change, and rising pollution resonates worldwide. Ecosystem restoration requires a robust global movement and stakeholder collaboration. Civil Society Organisation, institutions, students, businesses, land managers, policymakers, investors, and philanthropists are increasingly involved in ecosystem restoration.

Ecosystem restoration requires more qualified restoration scientists, land and project managers, entrepreneurs, and practitioners. Current training methods may not give practitioners the cross-disciplinary knowledge needed for ecological restoration. Restoration practitioners need training across a range of disciplines and techniques, from natural and social science to project management and hands-on, operational restoration and reintroduction activities requiring knowledge and skills transfer.

The UN Decade on Ecosystem Restoration aims to restore ecosystems worldwide. As official partners of the UN Decade on Ecosystem Restoration, Rewilding Academy, Plant-for-the-Planet, and Abu Dhabi's Environment Agency collaborate on an Action Plan with 12 core themes. Within our challenge (6.2), we develop local capacities in individuals and organizations across sectors and scales to support and drive environmental restoration projects.

Our primary goal is to enhance training and capacity building opportunities for early career professionals, community leaders, practitioners, administrators, and academics in the field of ecological restoration. We aim to equip individuals with the essential knowledge, skills, and passion necessary to take transformative action in rewilding and ecosystem restoration. Together, we can create a thriving planet for future generations, driven by a new wave of dedicated restoration champions.

We will develop a curriculum with core content and context-specific modules for regional ecosystem restoration and education. We propose a WEEC workshop to develop a conceptual framework with various stakeholders to drive curriculum planning and provide an original framework to plan and direct curriculum and course development. This will provide an inclusive, decentralised, inter-disciplinary curriculum incorporating the views, expertise, and aspirations of universities, educators, scientists, communities, and practitioners.

The programme also aims to develop worldwide teams that can combine university objectives with restoration practitioner demands. Teamwork will help participants adapt the UN Decade Action Plan curriculum on ecosystem restoration into materials, lesson plans, and teaching.

The workshop engages people worldwide, collects important ideas, and builds collaborations. This will provide clear strategic and practical directions for organisation, governance, financing, and strengthening the interaction between educational institutes, project implementers, and the UN Decade collaboration.

Keywords: ecosystem restoration, capacity building, curriculum, rewilding, empowering global professionals

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Building a Decade of Ecosystem Restoration Education on a Solid Foundation

Richard John Obrien Perry [1]

The 17 Sustainable Development Goals (SDGs) of UN 2030 Agenda for Sustainable Development were formally adopted by world leaders in September 2015. The UN designates specific days, weeks, years, and decades to mark particular events or topics in order to promote through awareness and action, the objectives of the Organisation. To this end, the UN declared 2005–2014 as the 'Decade of Education for Sustainable Development' and 2021–2030 as 'Decade of Ecosystem Restoration'.

This paper describes the ICE principles for Education for Sustainable Development that were developed as part of the activities for the Decade of Education for Sustainable Development, and the proposed responses identified under the 'Action Plan for the UN Decade on Ecosystem Restoration, 2021-2030', and more specifically: 'Restoration Challenge 6 – Education.

The tripartite partnership between the *Environment Agency – Abu Dhabi*, *Rewilding Academy* and *Plant for the Planet*, formed in response to the UN call for proposals to address the Restoration Challenge 6 – Education, has the following goal:

- To develop an interactive Ecosystem Restoration Curriculum for youth between 10–16 and 16+ years, using a modular framework, with interactive, context specific learning materials, and a programme of actions, including project-based learning, workshops, and real-life practical experiences.

This goal is to be realised by ensuring the curriculum is based upon a solid foundation such as the ICE principles, and it is proposed to hold a workshop at the 12th World Environmental Education Congress to test and formalise these principles as fit for purpose, as well as establish a solid foundation for the curriculum.

The curriculum to be developed will be based upon the partners' experience and best practices and will be promulgated by the partners by establishing regional hubs such as the proposed Regional Centre of Expertise (RCE) in Abu Dhabi, Plant-for-the-Planet offices and regional coordinators around the globe and providing offline and online training, education and access to resource material with a focus on ecosystem restoration.

This paper lays the groundwork for a workshop to be held at WEEC to discuss and strengthen the basis for the proposed programme of work to address Challenge 6 - education under the 'Action Plan for the UN Decade on Ecosystem Restoration, 2021-2030'.

This workshop will provide an overview of the proposed principles for, and the establishment of, a Regional Centre of Expertise for Education for Sustainable Development. Participants will be invited to discuss and refine the proposals with a view to raising awareness of and ensuring a solid foundation for the proposed RCE.

Keywords: SDG, ecosystem restoration education, environmental education

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Water Education as a Bridge between Italy and Cuba: Two Experiences Based on the Development of Playful-educational Materials

Anna Treves[1], *Ileana Jimenez, Pietro Guarino, Laura Dominici*[2], ***Elena Cominos***[3]

Water is a natural resource essential for the existence of life. Despite its importance, it is one of the most threatened resources at global scale. Countries are facing growing challenges linked to degraded water ecosystems, water scarcity caused by climate change, underinvestment in water and sanitation and insufficient cooperation on transboundary waters. Due to these aspects the sustainable management of water resource is an essential part of the United Nations Agenda2030 for sustainable development.

In this context, Environmental Education (EE) represents a strategic tool to ensure integrated water resources management, increase awareness, stewardship and promote best practices. EE encourage changes in behaviour and promote a more sustainable global society through the establishment collaborative networks.

The present paper aims to describe and compare two educational experiences carried out in Italy and Cuba. Both experiences aim to disseminate basic knowledge on the topic of water resources to children aged 6-10 years through play. Play is considered fundamental for a child emotional, cognitive and relational development because through its children learn to communicate, become acquainted with rules, learn about the outside world and relate to others. This is why these two experiences were based on the development, creation and realisation of playful-educational materials to support knowledge of the water resource complementing school programmes.

The Italian experience is represented by the realisation of playful-educational activities carried out in a Turin educational centre of a voluntary association. These activities were implemented based on the use of didactic cards. These cards were designed to make children reflect on the topic of water dealt with during the activities through short games and exercises.

The Cuban experience saw the production of an educational booklet and two games. These products were realised thanks to the support of the Centro Studi Italia-Cuba, which coordinated relations between the two countries. The finished product produced in two editions, *i.e.* Cuban by Casa Editora Abril and Italian by EPICS editions, was distributed in a school in the Havana countryside.

Overall, these two experiences permit to embrace two extremely different realities at the same time united towards a single goal: the protection and sustainable use of water resources. The playful-educational material produced and distributed to schools has created a bridge between two countries, promoting international EE collaboration, favouring the exchange of experiences and daily realities. Therefore, these experiences highlight once again the contribute of play into education and offer a guidance for deductive answers to the question: How do international collaborations and exchange of experience support the promotion of environmental awareness and the achievement of Sustainable Development Goals?

Keywords: environmental education, childhood, sustainable development, international collaboration

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Assessing Environmental Awareness and Attitudes towards Climate Change and Environmental Issues among University Students in the United Arab Emirates

Khawlah Mitib Al-tkhayneh[(1)], *Sanaa Ashour*[(2)], *Dina Tahat*[(3)], *Mastur Rehim*[(4)]

Environmental awareness refers to the consciousness and understanding of the various environmental challenges facing our planet, as well as recognizing our individual and collective responsibility to protect and preserve the Earth's natural resources. Environmental awareness involves being informed about the impact of human activities on the environment, such as climate change, deforestation, and loss of biodiversity.

Thus, our study aims to address the following research inquiries, seeking to augment scholarly knowledge pertaining to environmental awareness.

- To what extent do university students demonstrate environmental awareness and exhibit positive attitudes towards climate change and environmental concerns?
- Do gender and faculty variables exhibit statistically significant differences in the level of environmental awareness among university students?
- Does a significant relationship exist between students' environmental awareness and their attitudes towards climate change and environmental issues?

To address these research inquiries, we employed an analytical descriptive methodology. This approach involved the development of an electronic questionnaire, which was constructed by utilizing various environmental awareness scales, including the Schunn scale.

The electronic questionnaire was administered to a sample of students from 4 public and private universities in the UAE. The sample size encompassed a total of 655 participants, representing various academic disciplines. A snowball sampling technique was employed, primarily targeting educational groups on social media platforms.

After testing the study's hypotheses by using the suitable statistical analysis, the results revealed that the level of environmental awareness among students was medium with a mean of (3.3). The results revealed that there are no statistically significant differences in the level of environmental awareness attributed to the variable of gender, while there are statistically significant differences in the level of environmental awareness among students attributed to the variable of academic discipline in favor of the students of the faculties of natural sciences. The results also revealed that there is a significant positive correlation between the students' environmental awareness and their attitudes towards the issues of climate change and environment, where Pearson correlation coefficient was (0.78).

The findings of this study warrant a recommendation for universities to implement mandatory courses that focus on environmental awareness. Such courses align with the global imperative to enhance societal awareness of environmental issues, consequently fostering positive attitudes towards the environment. Furthermore, integrating environmental awareness courses into the compulsory requisite courses can help alleviate disparities in environmental awareness levels between faculties specializing in natural sciences and those centered on social sciences.

Keywords: environmental awareness, climate change, gender, university students

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366 Building Leadership in EE through Global Networks and Learning Communities

Nina Hamilton[(1)], *Judy Braus*[(2)]

With today's environmental and social challenges becoming more urgent and complex, it is essential that EE professionals across sectors have the skills, knowledge, and networks to lead lasting change across a diversity of audiences and settings. They must also be able to play an active role in building an inclusive EE movement that promotes high quality EE for all learners and communities, and be able to adapt to rapidly changing times. In line with WEEC's Theme #3, A Worldwide Community for Sustainability as the Goal, this session will dive into the role that global networks and learning communities can play in cultivating EE leaders for the world we experience today, where cross-cultural understanding, collaboration, and adaptation, among other capacities, are key.

To set up the topic, we will first briefly introduce the two NAAEE leadership initiatives below that support EE professionals in all stages of their careers, and some of our lessons learned:

- Civics and Environmental Education (CEE)-Change Fellowship: twelve-month fellowship that brings together environmental and civic engagement educators to learn from each other and collaborate to scale up their impact, through professional development, technical assistance, and networking
- EE 30 Under 30: awards young shines changemakers who demonstrate passion, commitment, and leadership using environmental education, and supports them with global recognition, a global alumni community, and ongoing professional development and networking.

These programs prioritize building communities for EE leaders to share experiences, crowdsource solutions, and tap into their network as needed throughout their career. They also recognize that leadership can be defined differently across sectors, organizations, and even cultures, and that diversity of perspectives is a real asset for any global learning community.

We then plan to spend the majority of the roundtable in a group discussion to encourage participants to share their own questions, ideas, challenges, and experiences with building leadership through fellowships, networks, and learning communities. Specific topics of discussion will likely vary based on the interests of attendees who are present, but some possible discussion topics include effective practice and challenges related to:

- Incorporating intergenerational and cross-cultural learning
- Measuring leadership and professional development outcomes from networks and learning communities
- Using global communities to promote collaboration and connect local to global
- Sustaining global communities
- Other topics related to challenges/ideas raised by participants

Participants will leave the session with a deeper understanding of the role that learning communities and global networks can plan in building leadership in EE, and will be equipped with new ideas and connections to incorporate or improve the effectiveness of learning communities in their own work.

Keywords: leadership, learning communities, networks, professional development, global

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Green Re-lake, a Special "sustainability under Water gardening" to Re-store Lake Como

Paola Iotti[(1)], *Nicola Castelnuovo*[(2)]

Como Lake plays a vital role for the livelihood of its local communities. It serves as a critical water source, generates hydroelectric energy, and provides sustainable fishing opportunities. However, escalating nutrient levels, rising temperatures, and fluctuating water levels are causing the degradation of its initial aquatic plant ecosystems. Invasive species worsen the problem by preying on native plants and disturbing their root systems, affecting the lakebed. The decline in aquatic plant diversity reduces sheltered areas for coastal fish and spawning, making the lake more vulnerable. Additionally, sunken macrophytic grasslands store substantial carbon in sediments through their root systems. This deep pre-Alpine lake, like others, faces the consequences of human activity and climate change.

Re-Lake is a significant project focused on Como Lake's coastal regions with two main aims: ecological restoration and sustainability education. As for the ecological restoration, key measures include improving water quality, addressing plastic and microplastic pollution, effective land management, preventing hydrogeological instability, conserving water and energy, and maintaining optimal water levels. Re-Lake focuses on rejuvenating submerged meadows by cultivating native species in nurseries and transplanting them into barren areas with the help of underwater biologists.

A stationary underwater webcam strategically placed in one of the selected meadows serves as a representative case study, enabling external observation of the ecosystem's dynamics. With regards to the educational aspect of the project, both local residents and a relevant number of tourists partake in a collective educational effort.

In particular, the educational aspect involves the engagement of educational institutions, from early childhood to tertiary levels. These participate through instructional sessions, workshops, and webcam-based surveillance, promoting learning and encouraging a shift toward more sustainable lifestyles. As of 2023, over three thousand students and educators are actively involved.

Besides, we think that involving the local community and administrative bodies is crucial for promoting sustainability and to foster active citizenship.

This is why regional governing bodies and the broader community participate in public activities (*e.g.* cleaning lake's banks), assemblies and conferences, and support the project through crowdfunding initiatives.

Partner hospitality facilities also contribute to the achievement of the project's environmental goals, by adopting local products, eliminating plastic waste, integrating biodegradable cleaning agents, reducing water and energy consumption.

Keywords: sustainability, fresh water, environmental restoration, citizens, educational process, re

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490 Outdoor and Place-based Learning in the Decade of Ecosystem Restoration

Anita Saul[1]

The UN Decade on Ecosystem Restoration launched in 2021, aims to prevent, halt and reverse the degradation of ecosystems across the world, on land and in the sea. This could help end poverty, diminish the effects of climate change and avert mass extinction of species. In order to realise this vision, each one of us has a unique role to play. In this backdrop, nature-based outdoor environment education provides an appropriate base for creating and connecting responsible individuals who keenly feel the necessity of creating a sustainable tomorrow.

A person's inherent connection to nature can best be nurtured during the pivotal learning years in school and this is best achieved through an amalgamation of outdoor learning with classroom curriculum. Unless we learn how to connect with nature and experience its positive impacts on our lives, we cannot be passionate about caring for nature or be truly concerned about the threats it is faced with. Outdoor learning fosters exploration, independent problem-solving and critical thinking. It also offers children a chance to develop relationships, empathy and respect for others as well as the natural world.

As the world struggles to strive past the COVID 19 crisis, where young learners had been forced into sedentary indoor learning styles, nature-based outdoor learning in contrast, develops motor skills through physical activity and helps counteract the challenging effects of prolonged screen time, like aggression and depression. It also provides opportunities for socio-emotional development and team building. Outdoor settings moreover, offer dynamic environments which provide constant new stimuli to support learning.

Place-integrated learning facilitates students to experientially study biodiversity and the adaptations made by the flora and fauna to survive in their respective habitats. In the United Arab Emirates, for example, the Environment Agency of Abu Dhabi organizes and supports field trips for students to natural habitats like mangroves, deserts and beaches and also conservation sites for the Houbara, Arabian Oryx and Hawksbill Turtle. The Agency provides resource books to schools, outlining interesting outdoor learning activities and guidelines to identify plants, insects, mammals, reptiles and birds of particular habitats. Students learn to connect and engage in research-oriented projects while exploring these natural ecosystems.

When engaged with nature, learners can visualise the consequences of climate change on our fragile ecosystems, and gauge the extent of human impact on the natural world. This in turn equips them with imperative skills to solve prevalent issues that affect the environment adversely.

In this decade of environment restoration, outdoor education makes learning an enlightening experience. More essentially, it helps hone skills and attitudes which we urgently need to restore our vanishing habitats and sustain our vibrant planet.

Keywords: ecosystem, outdoor, restoration

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Joining Realities and Empowering Young People in Advocacy Actions in Environmental Education and Sustainability A from the Partition in the Youth Community of WWF Volunteers

Huáscar Camacho Mojica(1)

This project focuses on involving young people in activities to raise awareness and promote environmental education and sustainability. It is based on collaboration with the WWF Youth Volunteer Community, a network of young people committed to conserving the environment.

The main objectives include:

Youth Empowerment: The project aims to empower young people, providing them with tools, knowledge and opportunities to lead awareness and change initiatives in their communities.

Environmental Education: Through participation in the WWF volunteer community, young people gain a deeper understanding of environmental problems and sustainable solutions.

Advocacy Actions: The project seeks to train young people to be active defenders of the environment and sustainability, promoting positive changes at a local and global level.

Community Participation: Promotes the active participation of young people in their local communities, encouraging them to organize events, campaigns and activities related to environmental education.

Collaboration with WWF: The project benefits from WWF's expertise and resources to support youth initiatives and amplify their impact.

In summary, this project seeks to unite young people in advocacy actions in environmental education and sustainability, taking advantage of WWF's volunteer community as a platform to empower young people and promote positive change in environmental conservation.

Keywords: uniting realities, WWF, volunteers, world citizenship, collaboration networks, online learning communities

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Local Adaptation and Facilitation of Global Online Courses for Environmental Educators

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Environmental educators seeking professional development can take online courses offered by universities, UN regional centers of expertise (RCEs), or other organizations. Such online courses help educators explore effective teaching approaches, revise their own practice, and learn from peers. But global online courses may present challenges:

a) disconnect from the local cultural, educational and linguistic context,

b) lack of active learning and ideas exchange, and

c) limited interaction with instructors.

Cornell University's "Environmental Education and Community Engagement" is an example of a global online course adapted to the Korean context by RCE Tongyeong. More than 800 participants from 40+ countries participated in this course in 2023, including 33 Korean educators. Although this global course was not designed to reflect a specific cultural or educational context, it sparked curiosity among many educators around the world because of its research-based contents, comprehensive case studies, and discussion opportunities. RCE Tongyeong and Cornell University recognized the need to provide language and instructional support for Korean environmental educators taking this course. Thus, RCE Tongyeong staff worked closely with Korean educators during this course, resulting in a high graduation rate (76% of Korean participants received Cornell University certificates).

Based on this experience, we developed a local facilitation model for global online courses. It contains three elements: (1) Contextual adaptation, (2) Learning community, and (3) Instructor presence. For contextual adaptation, RCE Tongyeong translated course materials into Korean. Communication and the distribution of course materials were conducted through online platforms familiar to Korean educators, such as Kakao Talk and Notion. Participants in Korea had the option of submitting their final assignments in their native language. In addition, RCE Tongyeong fostered a learning community of Korean educators through frequent online meetings for orientation, office hours, and final project work. A supportive learning environment was created by instant messaging among participants, collaboration on assignments, and live discussions. Lastly, RCE involved several English/Korean-speaking teaching assistants (mainly university students) who, along with the main course instructors, were available to answer course-related questions and facilitate learning activities.

Local adaptation and facilitation of global online courses for environmental educators can be further enhanced. For example, educators can benefit from local case studies and country-specific webinars. In addition, regional facilitators should help environmental educators connect with their peers worldwide. This model of adapting international courses for the local environmental education context can be used by various organizations that engage environmental educators in global professional development opportunities.

Keywords: educator training, online course, regional centre of expertise, environmental education

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565 UAE Climate Change Research Network Fostering Research in Climate Action

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It has been suggested that meeting the scientific challenges of climate change requires a network of experts to interpret the problem and potential solutions from an interdisciplinary perspective. Climate research is critical to understand short-term and long-term changes in temperature, sea level, precipitation, air quality, extreme weather events and other climate indicators. Additionally, climate research aims to assess the impacts of these changes on the environment, economy and society while defining appropriate adaptation measures. Climate change and its impacts constitute a rapidly growing area of research in the UAE. With the aim of expanding and strengthening this research the UAE Ministry of Climate Change and Environment proposed in 2021 the launching of the UAE Climate Change Research Network (CCRN). CCRN brings together committed climate scientists and researchers from government, universities, and other research entities to facilitate dissemination of knowledge and advance development of research collaborations. The network is divided into three main divisions including academia, youth and an advisory committee and consists of five research clusters including Climate Change & Terrestrial, Marine & Freshwater Ecosystems, Climate Change & Infrastructure, Climate Change & Food & Water Security, Climate Data & Modelling and Climate Change & Public Health. Since its inception CCRN, has introduced collaborations between expert researchers in the different institutions, initiated efforts to assess new research tools and methodologies relevant to the study of the UAE and the wider Arabian Gulf region and has participated in several workshops, hosted conferences, and participated at COP 27.

This is just an example of the power of collaborative research programs by creating a platform for engaging the academic and scientific community and to raise public awareness about the impacts of climate change in the UAE and the ways to build climate resilience. CCRN is also an example of how such networks can facilitate bridging the gaps between science and policy.

Keywords: research networks, climate action, science, policy

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Activist Pedagogies in Higher Education: Educating Change Makers for Ecological Sustainability and Social Justice

Jeremy B Williams[(1)], *Suzanna Elmassah*[(2)]

This paper explores the critical intersection of activist pedagogies in higher education with a dual focus on ecological sustainability and social justice. In an era marked by unprecedented environmental challenges and growing socio-political disparities, educators must take on a transformative role in student career development in preparing students to become engaged and responsible global citizens.

Our research delves into the theoretical underpinnings of activist pedagogies (Waghid, 2009), elucidating their potential to empower students as change agents. Drawing from diverse educational contexts, we analyze the strategies and practices that educators employ to bridge the gap between theory and action, fostering a commitment to ecological sustainability and social justice.

We investigate the transformative potential of experiential learning, community engagement, classroom-to-career integrations, and critical reflection, highlighting the ways in which these pedagogical approaches can catalyze students' activism. Additionally, we examine the challenges and opportunities educators encounter when integrating these approaches into higher education curricula.

This paper also sheds light on the vital role of interdisciplinary collaboration and cross-cultural perspectives in activist pedagogies. We explore how educators can encourage students to recognize the interconnectedness of ecological and social issues, promoting a holistic understanding of complex global challenges using systems thinking.

Ultimately, our research underscores the urgent need for higher education institutions to embrace activist pedagogies that empower students to effect positive change for ecological sustainability and social justice. By preparing students to critically engage with and address these pressing issues, educators can contribute to the development of a more sustainable, just, and equitable society. This conference paper offers insights and recommendations for educators and institutions striving to cultivate engaged, socially conscious citizens committed to creating a more equitable and sustainable future.

Keywords: activist pedagogies, ecological sustainability, social justice, global citizenship, transformative learning

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The African Manatee in Guinea: Protecting an Endangered Species through Environmental Education, Capacity Sharing and International Networks

Lucy Keith-Diagne[1]

The African manatee is the least studied large mammal in Africa and it faces many anthropogenic threats across its 21-country range. It lives mostly in very remote locations in murky and dark waterways, and the species is very shy due to illegal hunting and accidental capture in fisheries, making it exceptionally difficult to study. In Guinea, African manatees exist along the coast and in inland rivers, but its distribution, abundance and the impact of threats have been mostly unknown prior to this program, due to few people studying it.

The research question is, how can local people at all levels of society in Guinea share knowledge to effectively protect African manatees?

To better understand and protect this vulnerable species, 13 Guinean biologists were trained to study the African manatee and to conserve it by learning from people throughout Guinea who shared their traditional knowledge of manatees, as well as through a country-wide educational campaign to both raise awareness about the species and to receive information through focus groups. Education programs at schools and villages included presentations, distribution of educational materials, and art and games for children.

Since May 2021, more than 300 people have participated in focus groups throughout Guinea and more than 50 environmental education programs reaching 4000 people have been led. Through these exchanges, local and indigenous people have shared information about where manatees occur, seasonal / migratory patterns and threats, all of which will lead to more effective conservation strategies for the species. In exchange, local people have learned more about the species and its vulnerabilities throughout its range in other countries, and they now communicate regularly with the researchers to help them protect it. Environmental education and capacity sharing in Guinea has allowed us to document manatees in five rivers for the first time, to document urgent threats including mangrove habitat destruction accidental capture in fisheries and entrapment by hydroelectric dams, and to build relationships with communities to increase their protection.

In this program, specialized training was provided to Guinean biologists to allow them to study an endangered species, techniques that are also applicable to other environmental questions. These researchers then conducted their own environmental education programs for schools, communities, and government wildlife agencies throughout the country to provide crucial information that increases the ability to protect African manatees in Guinea. Environmental education programs throughout Guinea are now being scaled up for the long-term by trained researchers who are also able to join international networks to collaborate, share and exchange knowledge with a global audience. This multi-level approach led by nationals can be replicated in other countries to preserve other endangered species.

Keywords: Trichechus senegalensis, Africa, traditional knowledge, conservation

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دور الشباب التطوعي في المجتمع لإستدامة الحفاظ على البيئة البحرية و ما يقومون به طوال السنة من العمل التطوعي الميداني البيئي والإنساني من خلا الانقاذ البحري و نقله للأجيال القادمة

عبدالله محسن علي البلوشي [1]

مشاركة الفريق كمتحدث

سوف تقدم نبذة تعريفية عن فريق دبي للغوص التطوعي وما يقوم به من نشاطات متنوعة في البيئة البحرية من خلال رياضة الغوص. و نبين أثر مخلفات الصيد و باقي أنواع المخلفات على البيئة البحرية وأيضا سنعرض دور الشباب و أهميته في ما يقوم به الفريق.

نبذة عن الفريق دبي للغوص التطوعية:

فريق دبي للغوص التطوعي هو فريق بيئي تطوعي للحفاظ على البيئة البحرية و مسجل لدى جمعية الإمارات للغوص و إمتد نشاط الفريق إلى المساهمة في حالات الحوادث البحرية وكذلك المشاركة في الفعاليات البيئية المختلفة كتنظيف الشواطئ و الموانئ.

نشأه فريق دبي للغوص التطوعي سنة 1995 بإسم فريق غواصو دبي DXB DIVING على يد مجموعة من الصيادين لكشف أسرار الأعماق عن طريق الغوص الحر في الأعماق الضحلة. ثم تم البحث عن المواقع عن طريق غوص سكوبا (الغوص بالمعدات) لتسهيل عملية المعاينة و التنظيف كونه أكثر أمان على الغواصين.

يتكون عدد أفراد الفريق من 30 غواص و من عدة جنسيات و معظمهم من أبناء الدولة و من الجنسين. و يمتلك الفريق المعدات اللازمة كقارب و معدات غوص و معدات الانتشال للقيام بأي مهمة لانتشال مخلفات صيد و انتشال الأجسام الثقيلة كالقوارب و المركبات في بحار الدولة. و يترأس الفريق المهندس/ عبدالله محسن علي البلوشي و هو مؤسس الفريق و صياد حرفي و مدرب غوص و يتكون الفريق من عدة غواصين و من الجنسين و من عدة جنسيات من المقيمين في الدولة و من مختلف المستويات و الفئات العمرية في المجتمع.

مهام ونشاط الفريق:

- المشاركة في الحوادث البحرية مع الجهات المعنية في حال تم استدعاء متطوعين
- المشاركة في حملات تنظيف بيئية للشواطئ و الموانئ في الدولة و فالخليج
- المشاركة في ورش عمل و المؤتمرات البيئية
- المشاركة في المعارض و المهرجانات
- القيام برحلات دورية على مدار السنة لمعاينة و تنظيف مواقع صيد و غوص في الدولة
- القيام برحلات تنظيف مواقع الصيد و الغوص حسب البلاغات التي ترد الفريق على رقم الخط الساخن للفريق وهو 0556668070
- تزويد الجهات المعنية بالبيئة البحرية بمعلومات عن المواقع البحرية و حالتها
- انتشال الأجسام الثقيلة كالمركبات و القوارب و غيرها في موانئ الصيد و الخيران و البحار المفتوحة و الوديان و السدود و غيرها
- تدريب الغواصين بهدف العمل التطوعي في انتشال الأجسام الثقيلة كالمركبات و القوارب و غيره

أهداف الفريق:

- المشاركة الفعالة في حملات تنظيف الشواطئ و الموانئ داخل الدولة و خارجها
- المشاركة في الأعمال الإنسانية كمساعدة الصيادين في انتشال القوارب الغارقة و المفقودات و تنظيف و معاينة مواقعهم
- المشاركة في معارض و مؤتمرات عالمية و تقديم أوراق عمل لمشاركة العالم بخبرات الفريق في العمل التطوعي لحماية البيئة البحرية و استدامتها، و كذلك للإستفادة من خبرات الآخرين على مستوى العالمي
- المساهمة على مستوى عالمي لتحقيق الهدف رقم 14 لأهداف التنمية المستدامة " الحياة تحت الماء"
- العمل على تحقيق كل ما يصدر من قرار أو مشروع من قياداتنا الرشيدة و الجهات الرسمية في الدولة و له علاقة بالبيئة البحرية و من ضمن مجال العمل التطوعي

مشاركة الفريق كعارض

و سنقوم كذلك في المشاركة كعارضين للمقتنيات المضرة بالبيئة البحرية و التي استخرجها.

الفريق خلال رحلات الغوص التي قام بها و شرحها لزوار المؤتمر.

الكلمات الرئيسية: نبذة عن الفريق، تعريف عن مخلفات الصيد، دور الشباب في العمل التطوعي في المجتمع

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654 Towards Meaningful Engagement of Youth in SDGs Processes

Miki Fukuda[1]

As we approach the midpoint, the importance of achieving the SDGs becomes increasingly clear. However, the global progress is seriously off track, requiring a focused effort. The core principle of "leave no one behind" at the heart of the Agenda 2030 emphasizes the need for diverse stakeholder engagement. In this context, the role of the young people who will shape the future becomes crucial.

Recently, there has been a growing call for active youth involvement in sustainability efforts. This study investigates the mechanisms that facilitate youth participation in SDG implementation. The research aims to uncover the key factors essential for effective youth engagement at the national level through a comparative analysis involving multiple countries in Asia and Europe, including Japan, Indonesia, Finland, Denmark, and Germany.

The research questions:

1. How can mechanisms be designed to enable meaningful youth participation in SDG processes?
2. What key design features contribute to successful youth participation, and to what extent are they incorporated into engagement mechanisms at the national level?
3. What are the implications of these mechanisms for the performance of youth-related SDGs?

Text analysis was conducted on the national SDG documents published by the five countries, adopting a multifaceted approach to compare and enhance youth participation in the national SDG processes:

1. Keyword Identification,
2. Relevance Assessment, and
3. Mechanism Analysis.

The study analyzed the mechanisms and activities to promote youth participation in SDG implementation. This analysis was conducted using a framework developed from a literature review, encompassing four dimensions: Aims and Justifications, Power Sharing, Transparency and Accountability, and Support.

Based on the analysis, three considerations need to underpin meaningful youth participation moving forward:

1. Representation: Conducting thorough and iterative review processes to ensure that proposed content captures young people's diverse views, opinions, and positions.
2. Inclusivity: Being mindful of minority groups within the youth demographic and conducting consultations targeting a wide range of young people.
3. Empowerment: Continuously supporting youth-led initiatives through platforms like Youth Councils while focusing on education and capacity development to build confidence and knowledge.

Decision-makers must recognize that motivated youth are not merely passive care recipients but can provide expertise in youth-related matters. Meaningful engagement of young people is pivotal in fostering better decision-making. Achieving this may necessitate a shift in recognizing youth as equal partners in pursuing improved policies and a more equitable society. An approach grounded in social partnership, empowering young people to take ownership of the SDGs and their implementation, is crucial for accelerating progress.

Keywords: youth, participation, sustainability, SDGs

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Mimicry of Scarcity. Reproducing Shortage (in a Teaching context) as Educational Practice

Elena Bougleux[1]

Water molecules are the main actors of a Summer School dedicated to Heritage and Environment realized on board of a boat in navigation, by a community of international and multidisciplinary students and teachers. In the last two years the narrow spaces of a small wooden gulet have been acting as a floating classroom, meeting point and hostel for all School participants, while the limited spaces and fresh water available were shared among all. Sharing scarce resources represented the strongest educational texture of the Summer School on board.

The School conducted an in-depth investigation of the seas of former Yugoslavia. The choice of the East Adriatic Sea is highly symbolical: former Yugoslavia is today fragmented in smaller, controversial, diverging young countries, but its waters and seas flow across them all in the same historical way. Water keeps connecting and blending in a single watery scenario what recent history has scattered in pieces.

The experience of sharing vital assets worked as a metaphor of reciprocal interdependence, and the multidisciplinary gazes developed through the materic action of water touches the shared heritage of former Yugoslavia, across history, techniques, arts, knowledge.

Water politicies and environmental committment can actually overtake the artificial borders drawn by legislation, language and money. Water as a commons provides a decentered view over conflicts; water as overarching concept allows an educational perspective that goes well beyond environmental education.

The layers of reflection addresses in this paper:

- Multidisciplinary thinking: experiences and activities addressed history, archeology, marine biology, anthropology and geology, involving experts and academics;
- Active Policy making: many local stakeholder and communities representative were involved from a rich social texture, and they modified our lacademic language and practices, making them open and ensuring the success of the School as a participatory endeavor;
- Post-human perspective: the role of sea animals above and below the surface became increasingly important. From jellyfish to black shells, from dolphins to seagulls, all participated actively in students activities, joined the reports, spoke in the podcasts and contributed to imaginaries of seascape.
- Reframing chemistry: the molecular (odd) properties of water were deeply scrutinized, to understand how it is possible that water has no shape but sticks together, that its cohesive force is weak but just enough not to freeze in the sea, that is so contended despite it cannot be held.

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Keywords: water, navigation, scarcity, Yugoslavia, community

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697 Education for Sustainable Development (ESD): Joining an International Community

Stefania Fontana[(1)], *Bianca La Placa*[(2)], *Silvia Macalli*[(3)], *Fabrizio Piccarolo*[(4)]

FLA – Lombardy Foundation for the Environment, organization which supports Lombardy Region in the planning and implementation of sustainable development policies, and WEEC Secretariat Permanent are organizations that promote Environmental Education and Education for Sustainable Development within project practices, scientific research and integrating those issues into policies and programs, at national and international level.

In the context of the collaboration between FLA and WEEC Secretariat Permanent, a workshop is to be organized during the WEEC Conference.

The workshop will be dedicated to the organizations representatives of EU funded projects, invited to the conference, with the goal to enhance their activities undertaken around education for sustainable development (ESD) themes, designing a project proposal at international level, taking advantage of the funding opportunities offered by philanthropic foundations, operating in non-european contexts.

A representative of Italian ministry of Agriculture, expert in European project design for citizen science, will moderate and lead the workshop in collaboration with FLA and WEEC Secretariat Permanent. Donors' organizations responsible of the tender's proposals will be as well invited to the conference in order to introduce the funding specific aims and requirements.

A set of tenders will be proposed to be analyzed during the workshop, and participants, through a facilitated discussion, will select common issues to focus and to build new partnerships on, to submit a wider-ranging project. The project goal would mainly be to support organization's teams in capacity building processes, promoting the engagement and the empowerment of relevant local and global ESD key stakeholders, in the collaborative implementation of significant educational actions in their own countries or in a third country within a supportive intervention. Thematical issues may imply non-formal and informal educative paths enhanced in the acquisition of essential skills and competences, discuss values, boosting personal experiences and critical reflection onto citizenship education for a global sustainable development in compliance with international UN Agenda 2030 and UNESCO roadmap and guidelines for ESD.

The workshop will be addressed to cover all project's designing steps: discussing main project's aims and main possible outputs, in setting goals and actions, in defining roles and tasks of each partner. The final draft of proper project proposal will take place during the weeks following the conference: all participants will be engaged in setting up the final documents.

Keywords: ESD, Education for Sustainable Development, project design, international perspective, cooperation

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THE GOALS THEME 02

Environmental Education for a Sustainable Future

Theme Background:

In a world facing unprecedented environmental challenges, the role of education in fostering sustainability has never been more critical. Education, with its universal context, must prioritise environmental awareness and sustainable development to address the current global crisis effectively. Transformative educational approaches are essential to promote new ways of living and producing, focusing on environmental, social, and intergenerational justice. In alignment with the 2030 Agenda, there is a pressing need to explore how to integrate the Sustainable Development Goals (SDGs) into EE and ESD to guide society towards a more sustainable and equitable future.

This theme aims to delve into various aspects of EE that contribute to building competencies and transformative pathways across cultures. It underscores the significance of evaluating EE practices and the vital role of teacher education in advancing sustainability education.

Theme Objectives:

The theme, "Environmental Education for a Sustainable Future," aims to:

- Engage in debates, critical reflections, and sharing of experiences regarding the integration of SDGs into the field of EE and ESD. Explore the challenges, opportunities, and impacts of this integration on sustainable development.
- Showcase innovative EE and ESD proposals in higher education settings, highlighting how universities are shaping future generations of sustainability-conscious leaders.

Theme Focus:

- Strategies for incorporating SDGs into EE and ESD curricula and educational practices.
- Successful initiatives that align with specific SDGs.
- Curricular designs and programs that promote sustainability in university settings.
- Models for expanding EE and ESD initiatives to reach diverse learner populations.
- Lessons learned from global efforts to promote EE and ESD for sustainable development.

Theme Outcomes:

Share global experiences on integrating, scaling up, and sustaining environmental education across diverse contexts. Explore strategies to ensure that all learners acquire the knowledge and skills needed to promote sustainable development.

Theme Conclusions:

The thematic track on "Environmental Education for a Sustainable Future" aligns with the overarching goal of WEEC 2024, which is to "Connect People, Create Tomorrow." It emphasises the transformative potential of EE and ESD in shaping a sustainable and equitable future.

Together, we can explore effective strategies, share insights, and foster collaboration to advance environmental education and contribute to a more sustainable and resilient world for generations to come.

THE GOALS THEME 02

Environmental Education for a Sustainable Future

Presentations

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050	Environmental Education for a Sustainable Future - ISSUES AND INTRICACIES	Alluri Venkata Nagavarma	Oral communication
081	Leadership in the development and implementation of an Initial Teacher Education (ITE) curriculum framework for climate and sustainability education in England, UK	Jo Ann Reed Johnson, Sarah Marston	Oral communication
091	Comment utiliser les fresques pédagogiques environnementales dans l'apprentissage? L'exemple du département de français langue étrangère de la Sorbonne Abou Dhabi	David Sauvignon	Oral communication
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161	Integrating Sustainability Science into School Curricula: New York Sun Works case Study	Alex Kudryavtsev	Oral communication
162	Sustainability education in vulnerable communities US and UK case studies	Alex Kudryavtsev	Oral communication
165	Effect on Students' Access and Knowledge Acquisition Using a Universal Design for Learning Enhanced Watershed Curriculum for Ages 10-15: A Large-Scale Study	Nanette Marcum-Dietrich	Oral communication
167	Gamification in environmental education: balance between education and play.	Evgeniya Leshina	Workshop
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345	Proyecto Boost: Impulsando La Educación Ambiental Para La Sostenibilidad En El Pais Vasco	Mikel Ballesteros García	Oral communication
346	Nurturing Citizenship for Transforming the World to Sustainability – Public-achievement-style Education of Tokai University	Sachi Ninomiya-Lim	Oral communication
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361	Mangrove Education at the University of Guyana: A Critical Appraisal	Paulette Euranie Bynoe	Oral communication
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403	Social Ecology and Environmental Diversity in Teacher Education	Alisa Paul	Oral communication
404	Conservation Tales:A Collaborative Model for Developing Print and Digital Environmental Education Teaching Resources to Engage Children in STEM and Sustainable Development Goals	Tom J. McConnell	Oral communication
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411	Transformative learning for future teachers: analyzing of outdoor laboratories in Turin University (Italy)	Marco D. Tonon	Poster
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506	Towards a Sustainable Future: Integrating Environmental Health and Modern Pedagogical Techniques in Training Environmental Health Practitioners in South Africa	Sean Mark Patrick	Oral communication
520	Renforcement de la compréhension des concepts du programme Global Schools au Maroc par le biais du jeu et de l'innovation	Faiza Baheddis	Oral communication
533	C.A.R.E. (Climate Action through Reflection and Emotions) for the planet	Anantha Duraiappah	Workshop
534	Shaping Sustainable Mindsets: Exploring Climate Change Education Practices in Riyadh Science Classrooms	Hiya Almazroa	Round table
542	Every Child Outdoors and the rare Chain of Learning: A model for Environmental Education for a Sustainable Future	Istafa Sufi	Oral communication
544	Learning from Young People: Examining Young Ideas for Climate Change Education in Europe	Kathy Reilly	Oral communication
548	Exploring The Challenges, Key Factors of Success, and Suggestions for Change to Implement Sustainable Education in UAE Primary and Secondary Schools	Sandra L Knuteson	Oral communication
551	The ESD free semester "Sustainable me and world"	Unji Lee	Poster
552	Integration of Participatory Environmental Education into the 'Quality School Framework' of Primary Schools under the Ministry of Education and Sports in Laos	Khamseng Homdouangxay, Lang Sengdala, Phoulisay Duangmiksavong	Oral communication
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574	Compulsory Environmental Education in the undergraduate college level	Dalal Alshamsi	Round table
588	Climate Change Education for Primary School Children in Kenya	Emmanuel Gichuru Muchora	Oral communication

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596	Assessment of gold miners' awareness of environmental risks in Rwanda: re-thinking the contribution of environmental education in formal and informal settings	Florien Nsanganwimana	Oral communication
611	Effective citizen science: playing a role in marine life restoration	Ahmed Nabil Abdel Kader	Workshop
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657	Learning to Run a Sustainable Business – Use of a Green Business Simulation Game in an Undergraduate Business Communication Course	Simon Burfoot	Oral communication
674	School as Sustainable Enterprise: Building Climate Resilient Communities Through Investment in the Girl Child	Rebecca Keogh	Oral communication
681	Research about students' and teachers' views on sustainability - to support evidence-based sustainability education development	Katalin Czippan	Round table
712	The Gaia (Earth) Education Philosophy - A Journey Back to the Future	Darius Singh	Oral communication
714	A Worldwide Community for Sustainability	Mary-Virginia (Ginger) Potter, Judy Braus	Round table
717	Climate change education in Latin America: the ALEC project, a large-scale initiative for primary and secondary schools	David Wilgenbus	Oral communication
724	Air Quality at New York University Abu Dhabi: Measuring the Effects of Information Provision on Knowledge, Behavior and Policy Preferences	Hilina Bayew	Oral communication
744	Bridging theory and practice through transdisciplinary learning labs to build sustainability leadership and competence in higher education: Insights from the TRANSECTS Programme	Eureta Ronsenberg	Oral communication
758	Showcasing a Case Study from India on Integrating, Scaling Up, and Converging Efforts on Sustaining Environmental Education to Ensure that All Learners Acquire Knowledge to Act Sustainably and Become Leaders of Change	Taru Mehta, Livleen K Kahlon	Oral communication

THE GOALS THEME 02

Environmental Education for a Sustainable Future

Abstracts

016

From Recycling to Sustainability Principles: The Perceptions of Undergraduate Students Studying Early Childhood Education of an Education for Sustainability Course

Adiv Gal[1]

This study examined the perceptions of undergraduate students studying early childhood education who took an academic course in which transformative pedagogy was adopted as part of a holistic approach designed to create transformative change and strengthen the students' self-efficacy for sustainability, and thus, help reduce the environmental crisis in which we live.

By means of a phenomenological approach, this exploratory qualitative research used three research tools, reflection analysis, drawing analysis and analysis of course summary work, to identify changes in the perceptions of students undertaking the course. Data analysis was based on an inductive approach and included first and second cycle coding.

The results of the study show that the transformative pedagogy adopted in the course created transformative change in the students' knowledge, attitudes, emotions and self-efficacy to act to reduce the climate crisis, not just through recycling.

The study was conducted with a relatively small, single class of undergraduate early childhood education students. The impact of certain activities may be different in larger classes. The gender imbalance, with the majority of students being female adds a further limitation. Male students may have different perspectives than female students, and those with different backgrounds and interests may respond differently.

This study provides some important insights into how sustainability education can be applied in a higher education curriculum. The study also contributes to the current dialogue on sustainability education by providing a rich description of how students experience alternative approaches to teaching in the field.

This study demonstrated that it is possible to integrate courses in academia that will encourage environmental action, not just emphasize the acquisition of theoretical knowledge.

Keywords: education for sustainability, higher education, self-efficacy, transformative pedagogy, transformative education

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050

Environmental Education for a Sustainable Future - ISSUES AND INTRICACIES

Alluri Venkata Nagavarma[1]

This research examines how transformative learning has been conceptualized and operationalized in education for sustainable development (ESD) and sustainability learning, and gathers evidence on how to promote transformative learning in formal and non-formal settings.

The author performed a systematic literature review to create a bibliometric overview that combines a quantitative description of the body of literature with a qualitative study of the learning processes, results, and circumstances. The current investigation shows that transformative learning theory may help in designing and implementation of educational interventions and evaluations of learning towards sustainability by analyzing the learning process, results, and circumstances in the core sample of studies.

This systematic review allows for a better understanding of how transformative learning theory's concepts and mechanisms are operationalized in sustainability learning and ESD research, and it serves as a source of encouragement for researchers and practitioners working to make sustainability education, teaching, and learning more transformative.

Keywords: environmental education, sustainable future, learning, results, ESD research

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081 Leadership in the Development and Implementation of an Initial Teacher Education (ITE) Curriculum Framework for Climate and Sustainability Education in England, UK

Jo Ann Reed Johnson [1], *Sarah Marston* [2]

This framework was developed as a response to strategy 2 of the National Climate Education Action Plan (NCEAP) in England in response to COP 26 and piloted in one Higher Education Institute in 2022-23 across three phases of the teacher education sector: early years, primary and secondary (Majid *et al.*, 2022). It was designed as a flexible framework to help develop understanding of climate change, through the development of the required knowledge, skills, values, attitudes, competences, and capabilities for both the teacher educator and the training teacher.

This oral presentation will present insights into the development and implementation of the innovative, creative, unique, and pioneering Initial Teacher Education (ITE) Framework for Climate and Sustainability Education. In it we will share the stories of those who engaged in its' implementation and explore how this helped to develop agency (self-efficacy and metacognition) of both training teachers, teacher educators. In drawing out the key successes, issues and challenges this work contributed to the further development of the framework and helps to inform the DfE Policy Statement for Sustainability and Climate Education (DfE, April 2022) and the NCEAP.

Leadership is a key part of this implementation of change in educational curriculum and an important part of that is a collaborative approach. This model for implementing change will be explored in more depth. Finally, we will describe the rolling-out process of this framework at a national level and how the framework has the potential to be adapted for wider educational use, beyond ITE.

Keywords: climate and sustainability education, policy, initial teacher education practice, primary, secondary

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091 Comment Utiliser Les Fresques Pédagogiques Environnementales Dans l'apprentissage? L'exemple Du Département De Français Langue Étrangère De la Sorbonne Abou Dhabi

David Sauvignon (1)

Les fresques pédagogiques liées aux problèmes environnementaux connaissent un succès inédit. Dans une ambiance postpandémie, où les activités numériques ont pris une énorme importance dans la pédagogie, ces ateliers ludiques, composés de cartes à organiser et à exposer sous la forme de fresque, se sont faits une place. La Fresque du climat, créée en 2015, est le plus célèbre de ces outils puisqu'elle a déjà été déployée pour expliquer les causes et conséquences du dérèglement climatique pour plus d'un million de personnes dans 132 pays. Ce type de mode opératoire se retrouve dans d'autres fresques concernant d'autres thématiques comme les océans, le numérique ou la mobilité. Le concept est simple et permet d'embrasser le ou les problèmes en un coup d'œil et d'en exposer un panorama exhaustif.

Comment expliquer un tel engouement ? Pourquoi le nombre de participants de ces fresques double tous les six mois ? Comment garder une approche neutre et objective dans le déroulement de l'atelier ? Quel rôle joue l'enseignant ? Quelle dynamique de groupe crée cette démarche ? L'atelier présente-t-il un intérêt pour l'apprentissage du français ?

Pour répondre à ces questions, nous partageons notre expérience de la mise en place d'ateliers de la Fresque du climat à l'université Sorbonne Abou Dhabi dans le département de français langue étrangère. D'abord utilisé comme une séquence de cours ponctuels pour les étudiants, l'atelier de sensibilisation a été partagé avec l'équipe enseignante de l'ensemble du département. Des projets d'ateliers à plus grande échelle ont pu voir le jour en cette année de COP aux Emirats arabes unis.

Si l'impact de la sensibilisation sur les étudiants et les animateurs est difficile à mesurer, nous avons pu dresser un tableau des points positifs de l'atelier mais aussi ses limites et les champs d'amélioration. Le format ludique simple alliant illustrations, débats, intelligence collective et logique permet une pratique nouvelle des acquis linguistiques tout en offrant une réflexion sur nos propres comportements. D'un autre côté, l'atelier peut sembler anxiogène au risque de faire ressortir un sentiment d'impuissance.

La Fresque du climat est un premier pas dans la prise de conscience du réchauffement climatique, il ne remplace en rien une formation plus complète sur le sujet menée par des spécialistes. Dans le cadre de l'apprentissage des langues étrangères, il se révèle un outil innovant pour libérer les compétences acquises en classe sur un sujet qui nous touche tous. Le mode opératoire de ce jeu de cartes ouvre le champ de possibilités à d'autres thématiques mais également à la création de son propre jeu dans la classe.

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Benyezzar, M., Ringenbach, C., Comment ça marche ?, L'Obs HS 114, juin 2023, p.32

Site : https://fresqueduclimat.org/

Mots clés: fresque, pédagogie, climat, sensibilisation, apprentissage

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103 Approaches to Teaching Ecocriticism in the Humanities

Doris Hambuch[1]

The College of Humanities and Social Sciences at United Arab Emirates University does not yet offer a program in Environmental Humanities or specific courses related to this field. This presentation demonstrates how ecocriticism can nevertheless play a significant role in the curriculum of humanities programmes. The General Education Programme includes a course on "Sustainability," but this course is part of the cluster on "The Natural World." My presentation emphasises that it is equally important to discuss the ways in which sustainability affects creative expression, and case studies from our BA in English Literature (BAEL), housed in the Department of Languages and Literature, emphasise how ecocritical approaches enhance the content of courses in literary and film studies.

Examples from diverse seminars, such as "Modern World Literature" (LIT365), "Criticism and Theory" (LIT410), and "Film and Culture/World Cinema" (FIL245) illustrate the design of respective course content. They further demonstrate how publications, which apply ecocritical approaches to the study of prose, poetry, and film can enhance preparations for the teaching of ecocritical content (Hambuch). The content is positioned in a rapidly growing body of global (Oppermann) ecocritical scholarship that contributes to what Ursula Heise has famously termed "sense of planet" (Heise; Garrard), and the pedagogy of which has been studied in many locations (Garrard; O'Gorman), but not yet in the Arabian Peninsula context.

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Keywords: ecocriticism; eco-poetics; humanities; pedagogy; UAE

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Development of an Education for Sustainable Development Curriculum Design Framework for the Technological University of the Shannon (Ireland)

Noëlle O'Connor[(1)], *Kelly Maguire*[(2)], *Redmond Condon*[(3)], *Paul Archbold*[(4)], *Chris Hannevig*[(5)], *David Honan*[(6)]

The main objective of this study is to discover and establish the most effective strategies for integrating Education for Sustainable Development (ESD) within the Technological University of the Shannon (TUS). This initiative aims to create a customised Community of Practice (CoP) within TUS, which will facilitate the implementation of ESD curricula that align with the professional values upheld by TUS educators. These curricula will be designed following the principles of curriculum development, which prioritise creativity, innovation, responsiveness, inclusivity, and global perspectives as outlined by UNESCO's ESD guidelines.

The research will introduce ESD into the curriculum by employing a student-centered active learning approach, emphasising applied learning and the development of employability skills. It will also support personal growth and the holistic development of students, implement effective assessment practices that encourage deeper learning, foster an inclusive, engaging, and supportive learning environment, and cultivate a culture that enhances research capacity. Additionally, the study will strive to develop and integrate a culture of quality enhancement through the CoP framework.

The development of a best practice CoP framework for introducing an ESD framework to the curricula in TUS.

Our research will allow the newly formed TUS to develop a working partnership between the campuses of Athlone and Limerick whilst creating a real-life practical ESD CoP best practice framework that can be adapted across all campuses and borders as a very sustainable educational module at a critical time for the Higher Education (HE) sector.

This research applies transformative learning theory (through ESD) using a hospitality, events, tourism and a built environment lens to examine the factors influencing the implementation of ESD within TUS and the processes and outcomes of transformative learning in a real-life setting. A key output from this research will be the focus groups and online forums on creating and implementing a best practice CoP of ESD.

This research will engage key stakeholders including industry experts through the two focus groups, real-time workshops / the online masterclass, and finally the development of a best practice CoP framework (Digital Badge in ESD for Staff and a Special Advanced Programme for students). TUS Athlone and Limerick will represent the lecturer forum, while international, national, and local experts within the ESD discipline will be selected based on their knowledge. When all aspects of sustainability are taken into consideration, our students can truly enjoy responsible and sustainable education (Jauhiainen, 2021).

Keywords: education for sustainable development framework, Technological University of the Shannon, Ireland

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Using Global Learning through the Collaborative Online International Learning Model to Achieve Sustainable Development Goals by Building Intercultural Competency Skills

Kelly Tzoumis [1], Eduardo Veri Liberado [2], Elena Douvlou [3], Mona Pearl [4], Margaret Workman [5], Christelle Daceus [6]

Preparing learners to be global citizens is critical for securing a world which is more sustainable (UNESCO 2014, 9). As the world moves towards achieving the UN Sustainable Development Goals (SDGs), global citizens require intercultural competency skills. This is a missing piece in the education of our learners which can cause delays or derail the SDGs (Grant & Portera 2017) and prevent building a global view on environmental education (Cacciattolo & Aronson 2023; Guillén-Yparrea, & Ramírez-Montoya 2023; Rodríguez-Izquierdo 2018).

The goal of this symposium is to examine pedagogical pathways developed in the US to achieve intercultural skills with the intent to improve environmental, social, and international justice through the development of intercultural understanding. This approach hinges on using virtual exchanges where students work together on projects at the post-secondary educational level focused on sustainability. The pedagogical model is known as Global Learning Experience or GLE (***https://resources.depaul.edu/teaching-commons/programs/global-learning/Pages/default.aspx***) adapted from the SUNY Center that created COIL. The GLE course has virtual exchanges inside of courses for global learning without the need for geospatial relocation (O'Dowd 2021:1-2).

In this approach, the focus is on learners working together worldwide on a task required in their course. These assignments relate to the SDGs where students collaborate to solve a problem or complete a task together (O'Dowd 2021, 1-2). Experienced faculty affiliated with the COIL/GLE model explain the best practices for global learning

Figure 1

using innovative techniques implemented across five continents that include the Global South and North (as illustrated in Figure 1). The presentation begins with demonstrating the intercultural training required through self-assessments preparation for the learner before global interaction begins among the students. Learners then participate in an icebreaker meeting before the second meeting on comparing environmental worldviews. It is in this second meeting, students begin to understand the similarities and differences across cultures regarding sustainability. Then, the collaborative assignment begins. We review a variety of assignments used in the COIL/GLE model such as case studies with project-based learning using virtual reality (3d/360) experiences, role-playing game simulations, debates, and experiential community-based learning. Accessibility adaptations are included for the learner with disabilities, work-life balances, and during challenges such as the pandemic or weather-related issues.

Evaluations of the benefits and some problems of this model are discussed using data from both the instructor and student's perspectives. Conclusions and recommendations for moving the model into subject matter disciplines to connect the SDGs across the individual targets are discussed as the next steps for moving the model forward.

Keywords: global learning, intercultural competencies, and virtual exchanges

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Establishment of Schools Supporting Environmental and Sustainable Education in Estonia - an Overview

Mihkel Kangur[(1)], *Liisa Puusepp*[(2)]

The national curriculum of Estonian primary and secondary schools defines environmental and sustainable development education as a common theme at all school levels. Although such a curriculum has been valid since 2011, the main responsibility of transferring environmental and sustainable development education has remained to environmental education centres. There are nearly 150 environmental education centres in Estonia, and schools can apply for state support in order to participate in the educational programs offered. With such a large number of educational programs, it is important to establish quality criteria and monitor their fulfilment. A competency model for environmental education has also been created to support environmental education centres. The competence model defines the levels of knowledge and skills and the criteria of attitudes that supervisors should meet.

In the case of the programs offered in the environmental education centres, an important drawback is that they focus mainly on environmental issues. At the same time social, cultural and economic issues are dealt with less in these programs. Therefore, it is important that environmental and sustainable development education integrates more closely with the formal education system. In recent years, there has been a significant shift in this regard. By January 2024, at least five state secondary schools will have started, which have set education for sustainable development as a central component of their curriculum. Rakvere State Secondary School, whose leaders are the authors of this presentation, is the first of its kind, started to operate in 2022. The Estonian national secondary school curriculum defines the learning outcomes to be achieved and leaves schools free to find suitable ways to achieve them. When building new state secondary schools, new school concepts focused on education for sustainable development have won the competitions of school managers. When establishing the Rakvere State Secondary School, we have based the concept of Gaia education, we have adapted it to the goals of the Estonian national curriculum. In addition to the substantive approach of the topic, the methodological support of learning and the general structure of the teaching are also important in sustainable development education. In this regard, secondary schools cooperate very closely with Estonian universities in pedagogical and didactic issues and in the development of digital learning tools.

In our presentation, we will provide an overview of the competence model of environmental education in Estonia, the co-authors of which are the presenters, and the concepts of state secondary schools in supporting sustainable development education.

Keywords: formal education, non-formal education, secondary school, education for sustainable development, competence model

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Conservation Units as Sustainable Educational Spaces to Implement Environmental Education Activities

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Brazil has a high biodiversity in its territory. For these reasons in recent decades, it has assumed a very important role in the international environmental scenario, signing various treaties for the conservation of its environmental assets. Therefore, one of the measures taken by the country to protect their natural resources has been the creation of Conservation Units (CU), according to the National System of Nature Conservation Units (SNUC). Thus, CU can be considered a protect area for safeguarding parts of Brazil's ecosystems. Furthermore, these units contribute to developing scientific research, ecological tourism and environmental education (EE) activities. The state of Mato Grosso do Sul has a large number of CUs and, among them, the Prosa State Park (PSP), located in the city of Campo Grande, is a space open to both visit and EE activities. Therefore, a CU could represent an important space in which carrying out EE activities for educating citizens to respect the natural environment.

In the light of the above-mentioned, the present work aims to evaluate the activities of EE in the PSP that would make it a sustainable educational space. The methodology adopted was qualitative, so were used documentary analysis, direct observations and semi-structured interviews. Managers who deal with public policies on EE in the State of Mato Grosso do Sul principally provided data.

Results indicate that already exist important documents and tools for proposing EE at Prosa State Park, although they need to be re-discussed, since these were approved without the acceptance by environmental educators of the region. Moreover, results underline the need to evaluate the current educational practices carried out in the CU in relation to agri-food activities that, at present, have not yet incorporated socio-environmental sustainability. The results also show that, when proposing a CU as a sustainable educational space, it is necessary to implement Critical Environmental Education, as specific and preventive training for park rangers, managers and those directly involved in EE activities. Consequently, management plans must be in agreement with a larger EE agenda. Then, it is proposed to adopt the concept of the Environmental Education Pedagogical Policy Project for the CU, in accordance with the management plan of each CU to achieve democratic environmental management, the construction of an educational space and a Critical Environmental Education.

Finally, the study demonstrates the need to reassess and revise public policy strategies involving the EE in environmental protection areas of the Mato Grosso do Sul (*i.e.* Prosa State Park or other CUs) and more generally Brazil's member states, in order to ensure the conditions for the creation of sustainable educational spaces.

Keywords: critical environmental education, conservation units, environmental education, sustainable educational spaces

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Environmental Education Activities at the Sustainable Schools of Mato Grosso Do Sul – Brazil

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The National Sustainable Schools Programme (Programa Nacional Escolas Sustentáveis - PNES) introduced in Brazil in 2014 provided financial resources to the country's school system to transform some schools, included in the state educational network of the state of Mato Grosso do Sul, into sustainable educational spaces (Sustainable Schools). Their identification and selection was based on some characteristics such as educational programmes (curriculum), sustainable management of activities and availability of physical space, as required by the PNES.

In this context, the research presents the environmental education activities conducted in sustainable schools of the State of Mato Grosso do Sul - Brazil, in the period 2014-2019. The theory, which guides the work, is the Science of History conceived by Marx and Engels and the central category of analysis is the contradiction.

The research highlighted the existence of transformative activities of environmental education resulting from the implementation of Sustainable Schools in the region considered. The results also show that the official texts of the PNES propose some neoliberal concepts, in particular as regards public-private partnerships; the expansion of school functions; and the explicit absence of issues of conflict and social inequality. Moreover, although there is convergence between the PNES and national environmental legislation, there is lack of consolidation of the program and equity among the actions of management-curriculum-physical space, with predominance of physical space activity. In addition, the study found that the historical forms of organization of teaching work have undergone changes with the activities financed, although not at the level of passing the Comenian School. However, the reported educational activities restructure knowledge through dialogue between individuals, respect plurality and cultural diversity and consider the complexity of the environmental issue with the foundations of the Transformation of Environmental Education. Finally, the proposed activities have modified the modalities of relationships among humans, other living beings and the environment, as they provide participatory and democratic moments of citizenship.

Keywords: transformative environmental education, sustainable schools, Comenian school

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Model My Watershed: A Free Professional-grade GIS Watershed-modeling Web App for Students, Community Scientists, and Professionals

Benjamin Dietrich (1)

Our planet is changing, and we are major agents of that change (Williams, 2005). Concerns about drought, access to clean water, and destructive floods are global concerns. As more and more land is converted to impervious surfaces, runoff adversely affects the availability of clean water and increases the likelihood and severity of floods from small and large storm events. Understanding how our land-use impacts the health of our local waters is possible with a free scientifically valid watershed-modeling web app, Model My Watershed® that educators and students can use to learn how land-cover changes impact the health of local waters.

We can only determine how to protect and preserve the vital resource of water by knowing how healthy streams and rivers work and what happens when they become polluted. MMW gives students, community members, and professionals access to REAL scientific tools for REAL places to make REAL decisions about protecting their local watershed.

This session will introduce the audience to the impact of landcover changes on the local waters and show how to use the Model My Watershed® web application to visualize these impacts. Presenters will demonstrate how to use MMW and share curricula to teach students ages 12+ about local watershed issues.

MMW simulates a single 24-hour storm by applying a hybrid of the Source Loading and Management Model (SLAMM), TR-55, and the simplest of the Food and Agriculture Organization of the United Nations evaporation models for runoff quantity and U.S.A. EPA's STEP-L model for water quality over the selected Area of Interest within the continental United States. The results are calculated based on actual land cover data (from the USGS National Land Cover Database 2011, NLCD2011) and real soil data (from the USDA Gridded Soil Survey Geographic Database, gSSURGO, 2016) for the selected land area of interest. Learning activities have been created for students aged 12+. In these activities, students model the impact of conservation practices (*e.g.* rain gardens, pervious pavement, vegetated roofs) and land use changes (*e.g.* forests, high-density development, pasture/hay). An accompanying Runoff Simulation helps students understand the distribution of rain (evapotranspiration, infiltration, runoff) resulting from different types of land use and hydrologic soil groups.

MMW supports students and the general community to learn how their actions impact local waters and how they can collaboratively advance knowledge and stewardship of fresh water.

ModelMW is a powerful REAL GIS tool for student learning and adults to make predictions of human impacts on stormwater runoff and water quality.

Keywords: watershed modeling GIS

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Integrating Sustainability Science into School Curricula: New York Sun Works case Study

Alex Kudryavtsev[(1)], *Manuela Zamora*[(2)], *Megan Nordgrén*[(3)]

Schools can play a crucial role in transforming our society towards sustainability. New York City (NYC) public schools teach some sustainability topics embedded in the US Next Generation Science Standards. In addition, many schools collaborate with nonprofits to implement more comprehensive sustainability programs. For example, about 300 NYC public schools have adopted the New York Sun Works (NYSW, ***http://nysunworks.org***) sustainability science curriculum. NYSW helps schools build classroom-based hydroponic learning labs, provides sustainability/climate lessons for all grade levels, and offers teacher training. The role of such external educational curricula in urban sustainability is vaguely understood.

The potential impact of environmental curricula in schools extends beyond students' knowledge. While programs like NYSW enable school teachers to cover some required science and social science standards through hands-on learning, they may also help schools connect learning with real-life social and environmental issues in their communities. Through this research, we aim to illustrate how climate and sustainability science programs can be integrated into urban schools, and understand a range of potential impacts of such programs.

To get an insight into NYSW sustainability curriculum integration in urban schools and its possible impacts, we used a case study research method, which is appropriate for in-depth and contextualized research (Baxter and Jack, 2008; Johannson, 2007; Stake, 1994). A narrative video interview with NYSW's executive director was recorded in three sessions. This narrative interview was supplemented by commentaries from teachers, staff, and collaborators, and by videos of NYSW classrooms in four schools. This case study is being analyzed for emerging topics, which will be presented at WEEC 2024.

This case study records the development of NYSW curricula and hands-on learning approach, which over 15 years helped 400,000+ school students address global environmental issues (*e.g.*, climate change) and local issues (*e.g.*, access to healthy food). NYSW attributes students' interest in hydroponic-based sustainability learning to connections between science and real-life problems, building on students' cultures, facilitating choice-based learning, and amplifying students' voices in their communities. We also found that NYSW potential impacts that can be evaluated in the future fall into four categories: students (*e.g.*, sustainability literacy, civic engagement, and social-emotional learning), schools (promoting plant-rich meals and teacher training), communities (vegetable donations, and parents involvement), and city (reducing urban ecological footprint).

This case study invites researchers to explore the broader impacts of sustainability education programs, and helps teachers reflect on their own practice that prepares the next generation of civically engaged citizens and facilitates green and just transitions in their cities.

Keywords: sustainability education, climate education, hydroponics, schools, New York City

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162 Sustainability Education in Vulnerable Communities: US and UK case Studies

Alex Kudryavtsev[(1)], *Beth Christie*[(2)], *Akiima Price*[(3)], *Bianca Hernández*[(4)], *Madhavi Apparala*[(5)], *Zarina Ahmad*[(6)]

Civil society can address the current environmental crisis through sustainability actions. For example, youth and adults can engage in environmental policy-making and political activism, critique and influence social norms, facilitate civic ecology education, and organize stewardship projects. However, in developed countries, some communities and groups of people have been denied equitable participation in sustainability actions. They include low-income families, communities of color, rural and geographically isolated communities, native and tribal communities, as well as other marginalized people whose voices in environmental governance should be amplified.

Formal and nonformal environmental education programs have the potential to engage these communities in sustainability action, and thus contribute to community sustainability and social equity. However, professional development programs rarely prepare teachers and educators to work with vulnerable communities and make environmental topics relevant to all people. Through this research, we aim to explore how educators in community organizations identify and foster inclusive sustainability education approaches in vulnerable communities.

To answer our research question, we used four case studies. Two case studies are in the US (Friends of Anacostia Park, and YES Nature to Neighborhoods), and two are in the UK (SCOREscotland, and Climate Sisters). Because this research is participatory, representatives of these organizations are collaborating on research design, data collection, and interpretation of results. We recorded four narrative interviews in all four organizations (*e.g.*, watch an example from SCOREscotland: ***https://youtu.be/bDDw2mmKbf4***). Currently, all interviews are analyzed, and results will be presented at WEEC 2024.

Preliminary results of this research show several principles used across these organizations. First, educators in these organizations connect sustainability topics (climate discussions, outdoor experiences, or food justice projects) to real-life experiences of their community members. Second, instead of emphasizing individual and competitive learning, they tend to engage whole families or create tight cohorts of learners involved in outdoor experiences and community-based projects. Third, they create inclusive spaces for learning by celebrating participants' cultures, languages, histories, and identities. Next, we plan to situate our findings within the broader context of sustainability education literature.

While this research contributes to our understanding of sustainability education, we also will use it to develop recommendations for the professional development of teachers and educators who foster sustainability action in marginalized and underrepresented communities.

Keywords: sustainability education, outdoor learning, vulnerable communities, sustainability action

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Effect on Students' Access and Knowledge Acquisition Using a Universal Design for Learning Enhanced Watershed Curriculum for Ages 10-15: A Large-Scale Study

Nanette Marcum-Dietrich [1], *Steve Kerlin* [2]

The Watershed Awareness using Technology and Environmental Research for Sustainability (WATERS) project developed and researched an accessible 10-lesson watershed content curriculum for middle-level students that utilizes the Universal Design for Learning (UDL) framework. The UDL framework aims to improve and optimize teaching and learning for all people based on scientific insights into how humans learn (CAST, 2022). Using this framework, WATERS integrated and tested multiple UDL tools that are guided by two of the three UDL principles: multiple means of representation and action and expression, to increase students' access to information (closed captioning), to build upon this access in order to improve clarity and comprehension of language (interactive glossary), to provide alternate modalities for sharing thoughts and ideas (draw tool), and to offer graduated levels of support for practice and performance (scaffolded hints). The ultimate goal of UDL implementation is for students to internalize learning through self-regulation, comprehension, and executive function.

The project collected qualitative and quantitative data to answer the question: How does the curriculum support all learners? 29 science teachers located in the US implemented the WATERS curriculum between September 2022 and March 2023. For the research project, two versions of the curriculum were made. The curriculum content was identical in both; the experimental group had UDL enhancements, and the control group did not. The 29 teachers were randomly assigned to one of two groups - 867 students in the experimental group and 270 in the control group. To measure student learning gains, a 17-question multiple choice watershed content knowledge assessment was administered as a pre- and post-assessment to all students. Students' use of UDL tools was tracked via metadata, surveys, interviews, and classroom videos.

The study found that students in both the experimental and control group made statistically significant gains in watershed content knowledge. A comparison of the watershed content knowledge gains between students in the experimental and control groups did not find statically significant differences in learning gains, but a comparison of only students who receive special education services found that special education students used the UDL features more often than other students and special education students who had access to the UDL enhancements made statistically significant higher gains in watershed content knowledge when compared to special education students in the control group who did not have access to the UDL enhancements.

If we truly strive for equitable learning opportunities for all students, integrating UDL tools and teaching strategies is essential as it provides needed support for special education students access to the curriculum.

Keywords: water watershed curricula learning research

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167 Gamification in Environmental Education: Balance between Education and Play

Evgeniya Leshina[1]

On behalf of Centre Zapovedniks (Moscow based Non-governmental organization, IUCN CEC, IUCN WCPA member, Europark member) together with IUCN Commission for Education and Communication (please find a Declaration of Partnership attached) I would like to perform a workshop on games and other interactive activities in environmental education.

We would like to introduce the congress participants to some good practices in environmental education and its gamification based on hundreds of sources collected in the #NatureForAll Discovery Zone and Centre Zapovedniks library.

We'll focus on new methods that help to face the new challenges of the changing world and find a better way to communicate new generations though their values.

At the same time, we would like to learn from the participants about their experiences.

The workshop will highlight the following practices:

a) Table games - how to implement educational ideas in game process and not to lose your message
b) Personal experience and real objects\live animals vs. stories and presentations.
c) Quests and with open ending - when the participants define the cognition process and become co-authors of your educational activity.

We also would like to present an old-new educational approach – discussed by IUCNCEC members worldwide - that contributes to human and planetary health by guiding us to live in harmony with nature and collecting feedback and reflection from participants.

We appreciate practical approach and developing new skills of the participants so we'll focus on hands-on practice in each part of the workshop.

Keywords: lessons, games, best practices, methodology, nature for all

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168 La innovación y transformación digital desde una visión cliente centrista: un proceso de construcción compartida

Ainhoa Diez de Salazar[1]

La innovación de la Red Ekoetxea se basa en:

1. El cambio cultural dentro de la organización con un nuevo propósito. Desde un enfoque bottom up y cliente centrista.
2. La integración de la tecnología a través de un ecosistema digital.

¿Por qué innovar?

El proceso de innovación de la Red Ekoetxea (denominado "el futuro es ahora") partió de la definición de un nuevo propósito: "cambiar en las personas la manera de pensar y actuar de manera para que sean más sostenibles" Con el fin de hacer crecerla Red y aumentar la implicación de la ciudadanía, así como acercar a las personas las políticas ambientales de la Administración. Se trata de evolucionar de ser centros de interpretación del entorno a través de actividades cortoplacistas, a ser centros ambientales de proximidad ciudadana para poder impactar en las personas, a través de experiencias significativas y activar su compromiso por un futuro sostenible. Una red de centros visitados por más de 100.000 personas al año. Con un alto potencial para dar un paso más allá de la visita. Se trata de activar a la ciudadanía a través de experiencias significativas en cada Ekoetxea, comprometiéndose con nuevos hábitos y conductas por hacer un futuro sostenible.

Resultados a corto plazo y proceso de construcción compartida

Un primer análisis del Equipo Líder del Proyecto concluyó en que una las principales claves del éxito del proceso de innovación era obtener resultados a corto plazo. El mayor reto era desarrollar una fuerza de trabajo y una nueva cultura organizacional que incorporase nuevas competencias y habilidades para la innovación. Y qué mejor que diseñar una nueva estrategia de manera compartida con las personas.

En 2022 se llevó a cabo a través de un enfoque integral mediante la creación de 3 equipos además del Equipo Líder:

- Equipo Motor / Equipo Prototipador / Equipo Estratégico. Al que en 2023 se una el Equipo Impulsor de Ihobe.

Palabras clave: Ekoetxea experiencia digitalización propósito

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Educational Goal: The Portal for Sustainability Education

Gerardo Santucci[1]

Educational Goal is an environmental education project that aims to educate school students about sustainability issues and the achievement of the sustainable development goals (SDG's) of the UN 2030 Agenda.

The portal is a point of reference for schools through the proposal of an annual "billboard" which includes contests, events and educational projects using innovative digital tools that are easily accessible to all students and teachers.

The project was born from an idea of Officine Sostenibili benefit company: since 25 years the company has been carrying out environmental education projects in Italy, developing proprietary formats and collaborating with a network of over 90 environmental educators.

The Educational Goal project establishes its main objective in making students and teachers aware of sustainability issues through a strong push towards digitization and the involvement of these subjects, remotely and in the classroom, thanks to innovative tools. To achieve the aforementioned objective, Educational Goal uses technologies ranging from artificial intelligence to machine learning, from the use of SCORM content to the viewing of video content.

The Educational Goal project with its innovative technologies in support of environmental sustainability, relying on training and therefore on raising the awareness of the reference target, has the purpose not only of educating the citizen on good practices, but also of ensuring that the citizen himself becomes an active part of the process.

Keywords: sustainability, machine learning, ai, education, SDGs

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Capacity Building for Environmental Education in West Asia Region

Giacomo de' Liguori Carino[1], *Olgica Bimish*

This proposal aims to highlight the need for a strategic action plan on capacity building on environmental education across the wider West Asia region. The root causes of environmental problems in the region will continue to be ignored unless people are galvanised together to take collective action. The lack of awareness of environmental issues has already been highlighted by other international fora including two Eye on Earth Summits held in Abu Dhabi in 2011 and 2015 and various independent reports.

The problem affects both the formal and non-formal environmental education sectors. The region has an international mix of residents many of whom have a transient presence that pre-empts their sense of sustained responsibility to care for the environment in which they live thereby exacerbating the problem. Cultural factors may also be at play and these need to be identified.

A regional capacity building action plan on environmental education will need to be formulated around three basic strategic pillars:

a) Content, *i.e.*, what to teach
3. Platform, *i.e.*, how to reach people
4. Partnerships, *i.e.*, how to network people and institutions to take collective action.

The means of implementation of the action plan will require a multistakeholder approach involving Governments, research and academia, NGOs and the private sector. It is unlikely that such a plan will be formulated in its entirety at WEEC as time will not permit but the key elements can be identified at WEEC to articulated as a set of guidelines to be included in the overall WEEC outcome statement. The guidelines can then be brought to an international meeting to be convened later in 2024 with international partners such as UNEP and UNESCO. An invite to host this international meeting could be issued at WEEC.

The session at WEEC will bring together experts from the region to identify the key elements of the regional action plan.

EAGLES 2030 International will identify these experts in consultation with the host country and other stakeholders in the region.

Keywords: capacity building, networking, international cooperation

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Exploring Psychological Factors Influencing Pro-Environmental Behavior and Climate Change Mitigation in the United Arab Emirates

Shirin Alimour[(1)], *Ibtehal Aburezeq*[(2)], *Abdellateef AlQawasmi*[(3)], *Maryam Abualrish*[(4)]

Human behavior plays a crucial role in both the causes and responses to global climate change (CC). Understanding the factors that drive pro-environmental behaviors (PEBs) is essential for mitigating anthropogenic CC and developing effective strategies, initiatives, policies, and socially robust technologies to alleviate the risks of CC.

This article aims to delve into the psychology of climate change, investigating the cognitive, emotional, and social factors that influence human responses to the environmental crisis of global climate change.

An exploratory population-based electronic-open survey was conducted among members of the general population in the UAE, with a sample size of 1,340 participants. The survey employed a convenience sampling technique to gather data.

The findings revealed that individuals with higher environmental concern (EC), personal efficacy (PE), and biospheric value (BV) orientation were more likely to engage in PEBs. Social norms (SNs) and perceived benefits (PB) of such actions also played significant roles. The study further identified the impact of cognitive biases (CB) such as the availability heuristic (AH) and confirmation bias (CB) on individuals' perception and willingness to act environmentally.

Based on these results, interventions should focus on enhancing environmental concern, personal efficacy, and biospheric value through educational campaigns, promoting positive social norms, and emphasizing the individual and collective benefits of pro-environmental actions. Emotional appeals, such as storytelling and emotional imagery, can be used to evoke positive emotions while raising awareness about cognitive biases and providing accurate information to encourage informed decision-making toward pro-environmental behaviors.

Keywords: pro-environmental behavior, climate change, cognitive bias, biospheric value, personal efficacy

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Development of a Regular ESD Education Program in Japanese Junior and Senior High Schools Three Years of Educational Practice and Evaluation of Educational effects

Rumi Yatagawa[(1)], *Hideaki Kurishima*[(2)]

Until now, once a year, we have held the "Future Mayor Workshop" as an Education for Sustainable Development (ESD) initiative for junior and senior high school students, with the aim of not only overcoming population decline and climate change but also cultivating young human resources who will support sustainable local communities.

Thereafter, we measured the educational effect of the workshop, however it was evident that the educational effect did not last from a one-time workshop.

Therefore, in this research, we developed an ESD program as a regular curriculum that could be continuously studied in school education for one junior high school and one high school in a remote island area of Japan. Then, for three years from April 2021, we conducted educational practice and verified its effect.

This program took place on an isolated Japanese island, Tanegashima. The island has various geographical restrictions, so future sustainability is a concern.

This program was structured around the "Future Mayor Workshop," which was designed to support ESD and Sustainable Development Goals (SDGs), widely regarded as important in Japanese school education. Its purpose is to develop future leaders of the local community by learning how to solve the

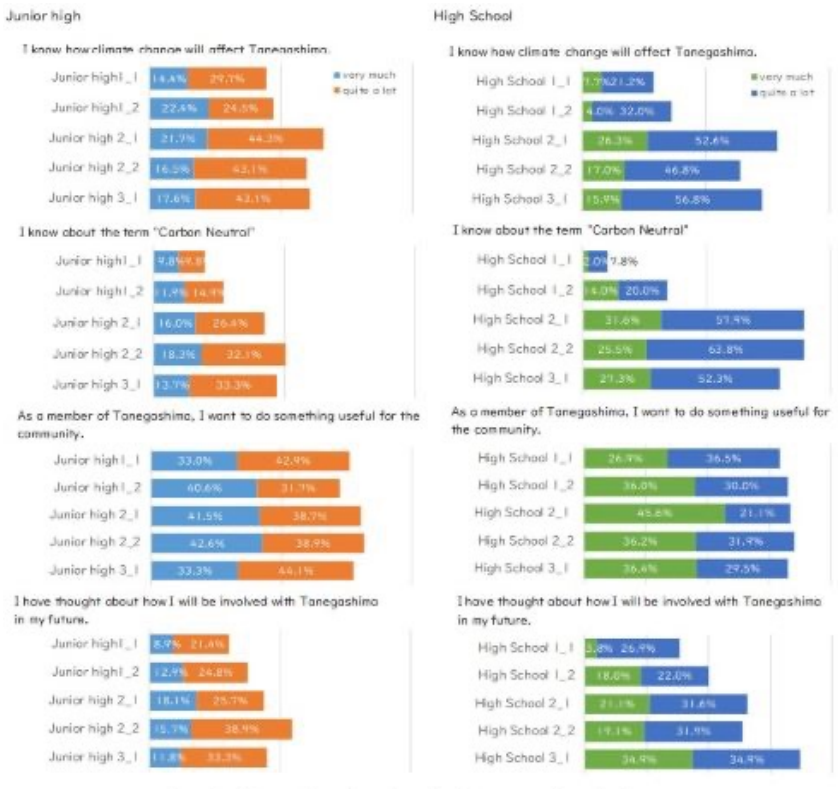

Figure 1 – Changes in students through a three- year educational program

local community's future environmental problems through a collaboration of middle and high school students.

In terms of the structure of the educational program, in both junior and senior high schools, first-year students learn about the SDGs and backcast thinking, and second-year students learn about climate change and sustainability. Then, in the third year, they will experience the "Future Mayor Workshop" (The high school program is a more advanced version of the junior high school program).

We measured the students' literacy on environmental issues in the community and their changes in awareness at every six months after their admission. As a measurement, we created a questionnaire based on each ability-based viewpoint, such as knowledge and skills; thinking, judgment, and expression abilities; and willingness to learn, established by the Japanese Ministry of Education, Culture, Sports, Science and Technology as a school education goal.

The result is depicted in figure 1. We found that both junior and senior high school students acquired more knowledge about climate change and decarbonization as they progressed through the grades. These tend to increase significantly in the second grade. However, the sense of contribution to regional sustainability increased in the second year and decreased in the third year. This is seemingly because the educational program is structured as such so that many classes are held from the first to the second year.

The students surveyed in this time have not yet experienced the "Future Mayor Workshop" that is held in the third grade. We would like to confirm the following findings and consider improving the educational program.

Keywords: education for sustainable development (ESD), Japanese education, junior high school, high school, regular curriculum

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246 5S of Sustainability : Application of Whole School Approach of Sustainability to GSF Schools

Smita Warnekar[(1)], *Rathin Khandhadia*[(2)], *Sweety Gathani*[(3)]

At Global Schools Foundation (GSF), we consider it as our duty to shape young minds and instil in them a deep sense of responsibility towards the environment and society. We have the unique opportunity to nurture our present generation for sustainable collective future. Our goals to develop the programme were:

1. To foster a generation of conscious, knowledgeable, and dedicated future leaders and citizens who actively promote sustainability.
2. Create a comprehensive whole school framework for sustainability which would integrate sustainability principles and practices into all facets of school operations and curriculum and measure current status as well as progress.

The five pillars of the framework encompass Structure & Governance, Students & Learning, School Management & Operations, Skill Development, and Stakeholder Connect:

a) Under Structure & Governance, we establish effective governance structures and providing guidance for sustainability-related matters at both the group and school levels.
b) The Students & Learning pillar highlights the responsibility to cultivate future responsible citizens. This is achieved through curriculum integration, experiential learning opportunities, and student-led initiatives.
c) The School Management & Operations pillar emphasises the adoption of school-wide practices aimed at reducing energy and water consumption, minimising waste production, and calculating and reducing the carbon footprint. We also are focusing on our buildings being green and sustainable.
d) Skill Development recognises the importance of equipping both students and staff with the necessary tools and trainings to make informed decisions, think critically and creatively and collaborate effectively.
e) The Stakeholder Connect pillar highlights the significance of engaging stakeholders, including students, staff, parents, and the community, in sustainability efforts.

Monitoring and evaluating the status and progress of sustainability initiatives within the framework of the "5S of Sustainability" is crucial for GSF schools. To ensure effective tracking and continuous improvement, a range of Key Performance Indicators (KPIs) are established for each pillar. These KPIs are assessed on a quarterly basis, providing valuable insights into the implementation and impact of sustainability measures.

Our framework gives a comprehensive and systematic approach to sustainability within GSF schools. Through the implementation of targeted activities and the monitoring of progress using Key Performance Indicators (KPIs), GSF schools actively foster environmental consciousness, social responsibility, and sustainable practices among students, staff, and the wider community. Our model's adaptability, scalability, and flexibility make it highly beneficial and applicable to other educational institutions.

Keywords: 5S of sustainability, whole school model, global schools, sustainability education

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The Plastic Waste Crisis in the EU: Options for Action in Context of European Sustainability Policy - a Simulation Game for EU-related Learning and Teaching in Education for Sustainable Development

Andreas Brunold[1]

The oral communication addresses the important issue of learning and teaching about the European Union using the example of plastic waste in the context of Education for Sustainable Development (ESD). The main premise is that the topical issue of plastic waste offers the didactical potential of combining EU-related learning and ESD at institutions of secondary and tertiary education. The paper shows that the knowledge of German citizens about the EU is not adequate and that topics concerning climate change, plastic waste, circular economy and cradle to cradle-strategies offer a high motivational potential for learning processes.

The paper outlines EU legislation concerning plastic and plastic waste and analyses its didactical potential for EU-related learning and ESD. Concerning teaching the EU at school, the cognitive competence dimension is constituted by knowledge about the EU and the affective one includes attitudes towards the EU. Concerning ESD the cognitive competence dimension contains knowledge regarding critical consumption patterns and the affective area focuses on the sustainability awareness of individuals. For this purpose, the plastic waste problem is shown by a simulation game, which shows the functions of the circular economy. The educational goal and the didactic impetus are directly linked to UN-Sustainable Development Goal No. 12, which is dealing with responsible consumption and production necessities. What matters here is the increase in knowledge as well as the political judgement, action and decision-making skills to EU related learning.

The participants simulate a stakeholder meeting on the plastic waste crisis. The EU Commission invites actors from politics, business and civil society to the negotiating table to Brussels. In order to evaluate the knowledge and decision-making skills of the students concerning the simulation game, six roles of actors or veto players are provided.

From a political perspective, the players slip into the roles of the EU Commission, the German Ministry of the Environment and the delegation of Southeast Asian countries. Lobby representatives of the European recycling industry and the plastics-producing industry form the roles for representing economic interests. The non-governmental organization (NGO) Zero Plastic Alliance complements the negotiations. In this role constellation, concrete and consensual solutions for the future of plastic waste export, for increasing the recycling rates in the EU and for reducing plastic waste are to be negotiated and found. Ideally, this can only succeed if, on the one hand, the sustainability principles of the SDGs are taken into account and the functional logic of European decision-making processes is considered. The simulation game is a partial result of an EU Jean Monnet project on this topic.

Keywords: plastic waste, EU-related learning, ESD, SDGs, simulation game

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The Making of Environmental Citizenship in Emirati Educational Systems

Tilde Rosmer[1], *Magdalena Karolak*[2]

One of the key factors in creating preparedness and changing the mindsets towards conservation and away from over-consumption is the educational system (UNESCO, 2016). The European Network for Environmental Citizenship put forward the concept of Education for Environmental Citizenship. The latter provides the right to participate in environmental policy making, choose sustainable personal actions, obey just environmental law, and promote sustainable arrangements (Bell 2005). Education should develop pupils' ability to act as informed and empowered citizens (Schulser *et al.*, 2009). Nonetheless, it is only recently that scholars have begun to assess in detail how sustainability is evidenced in educational textbooks (Biström & Lundstorm, 2020), what educational activities strengthen the motivation for sustainability among the youth (Jaufar, 2021) and how education can help promote environmental citizenship (Hadjichambis *et al.*, 2020). Consequently, there is still a shortage of studies that evidence the specifics of education in the making of youth into environmental citizens. This is especially true for the Middle East, and for the GCC in particular.

The present study asks how sustainability is incorporated in the UAE curriculum and teaching in national schools and one international school, thus mapping how Emirati and resident pupils are taught about sustainability.

We opted for a mixed method: firstly, content analysis of the place sustainability holds in the curricula for the national and one international schools in the UAE, and secondly, interviews with the stakeholders involved in the process of curricula creation, implementation and delivery, namely: the Emirate bodies for education in the three Emirates to be assessed (such as KHDA in Dubai); and interviews with teachers/principals.

The ongoing research will present its findings at the conference. Our study is the first evaluation of this kind. It is timely considering that the educational sector in the UAE has recently undergone changes with regards to teaching sustainability. In 2009 Abu Dhabi initiated the Sustainable Schools Initiative implemented teaching of awareness of climate change, sustainability and energy-saving measures. More recently, the UAE has announced a sustainability roadmap to be implemented in schools across the country, including creating a new eco-friendly curricula; training schools principals; and introducing a green accreditation program by the time the UAE hosts COP28 in December 2023.

The present study will provide a new case study to this continuously evolving new area of study in terms of both sustainability and education, and, in particular it will help assess the level of preparedness of the Emirati educational system to foster the necessary social transformation for a sustainable future. The outcomes of this study will help policy makers and educators to shape the educational approaches to teaching sustainability in the UAE.

Keywords: educational citizenship, curriculum, schools, UAE

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Anthropocene: Educational Research and Interventions

Raffaella Trigona[1]

The work I intend to present is the result of Academy Educandosi educare's training.

Academy was born in 2017 as a fundamental part of an important business reality in Bergamo ROBUR solidale ONLUS - already present at WEEC 2019 - and since 2022 it has become an integral part of Centro Coscienza A.P.S. in Bergamo, where it also has its operational headquarters.

The Academy course is aimed at trainers, teachers, educators and anyone who wishes to share and develop knowledge, practices and innovative ideas related to environmental issues and sustainable development within the organizations in which they work.

The notion of the Anthropocene, in particular, is the focus of this talk, in which this concept has not remained a dry abstraction but has been a stimulus for individual and group research in the educational field, and has produced educational interventions that are innovative in content and form.

The sequence of slides proposes a real "colorful picture," in which pictorial images (authored by Academy founder Luisella Traversi Guerra) alternate with references to research and educational experiences lived and described by Academy participants in the context of the province of Bergamo (Italy): a reflection on the human-environment relationship by Centro Coscienza of bergamo as a self-educating community; an account of the initiative the "Siepe of Biodiversity" by Green School of Bergamo's Istituto Natta; and finally, the inter-polytrans disciplinary educational intervention of a high school class and the collection of students' stories on sustainable development, in the framework of Agenda 2030.

Keywords: anthropocene, education

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Programme De Création d'un Laboratoire Junior D'écologie Et De Santé Environnementale Dans Un Lycée En France : Une Approche Pratique Pour L'éducation à L'environnement

Khouloud Abdallah Chatti[1]

La question de l'éducation en santé environnement à l'école est remise à l'ordre du jour avec l'avènement du nouveau Plan national santé environnement (PNSE 4), qui affiche une volonté d'action (Ministère de l'Écologie, du Développement durable et de l'Énergie, 2023) . Les rapports des inspections générales, à savoir l'Inspection générale des affaires sociales (Igas) et le Conseil général de l'environnement et du développement durable (CGEDD), ont souligné l'insuffisance des PNSE successifs en ce qui concerne la formation initiale et continue dans ce domaine (Reis *et al.*, 2022). Afin de combler cette lacune et de promouvoir une éducation plus complète en santé environnementale, notre étude se concentre sur la conception et l'évaluation d'un programme innovant : le laboratoire junior d'écologie et de santé environnementale en établissement scolaire du second degré.

En effet, il s'agit d'une initiative novatrice pour l'éducation à l'environnement, mettant l'accent sur la pratique et l'engagement des élèves. Ce programme vise à fournir aux élèves un environnement d'apprentissage stimulant où ils peuvent mener des recherches, réaliser des expériences scientifiques et développer des projets concrets liés au développement durable et à la santé environnementale. Ainsi, les élèves sont encouragés à concevoir et à mener leurs propres expériences, à collecter et à analyser des données, et à présenter leurs résultats sous forme de rapports ou de communications scientifiques. Cette initiative a pour objectifs de sensibiliser les élèves aux enjeux de l'environnement et de la santé, en mettant l'accent sur les principes du développement durable et les politiques de santé environnementale (Considère & Tutiaux-Guillon, 2013).

L'implémentation de ce programme a permis aux élèves de développer des compétences pratiques en matière de recherche scientifique, de résolution de problèmes, de collaboration et de communication. Les élèves ont démontré un fort engagement et une prise de conscience accrue des enjeux environnementaux et de santé. L'évaluation du programme a été réalisée à travers des enquêtes auprès des élèves, des observations en classe et des évaluations des projets réalisés. Les résultats ont montré une amélioration significative des connaissances des élèves et de leur motivation à agir pour préserver l'environnement. Le programme s'est avéré être une approche efficace pour l'éducation à l'environnement axée sur la pratique. Pour assurer le succès continu du programme, nous recommandons de renforcer les collaborations avec des experts en environnement et en santé, d'élargir les possibilités de financement et d'encourager la participation des élèves à des événements tels que des manifestations scientifiques autour de l'éducation à l'environnement.

Mots clés: environnement, santé environnementale, engagement, élèves

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Educational Tools Grounded in Art-Based Methods, Aboriginal Wisdom and Ethnography to Restore Our Bond with Mother Earth

Catalina Ramirez[1]

Climate crisis is a reality; therefore, we need to adapt to climate change, which means modifying our behavior, systems, and lifestyles since most of our daily routines are not coherent with sustaining current life on Earth. It's necessary that we deconstruct our daily practices, questioning, why we are acting in the way that we are, and develop alternate, sustainable social practices that can alter the current course of human-caused environmental degradation.

My research plan is to develop two workshops for 2 groups of 3 children from 9 years old and up. Workshops will be grounded in Art-based Research Methods, in which students will be asked to interpret their daily lives in relation to sustainability, deconstruct daily unsustainable practices, and learn about the way humans interact with natural resources. This research aims at enabling students to understand how certain values and perspectives and practices, related to Capitalist systems of production, set-up utilitarian relationships with nature, and to identify and develop other orientations and ways of living that are more sustainable. Arts based methods derived from land-based pedagogies will be utilized to achieve these learning outcomes.

Keywords: art-based methods, aboriginal wisdom, ethnography, Earth

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265 Sustainability Competencies – Conversations for the Heart, Mind, and Skill Sets for a Sustainable Future

Aditi Garg[(1)]

Students of all disciplines (not only environmental science) must feel empowered to, and responsible for, sustainable solutions for planet, people, and prosperity. When students are empowered to assess their own abilities effectively, educators can focus on developing the associated high impact teaching practices (HIT). Thus, educators require a framework by which they can help students reflect on their competencies for sustainability. Through collaboration and reflecting on assumptions, educators can work together to redesign transformative opportunities for students to move from education about sustainability (content-driven) to education 'as' sustainability. While this programme does not draw directly on the UN Sustainable Development Goals (SDGs), they are integrated into the learning objectives and key competencies articulated below. The SDGs provide common vision for a better future that can inform decisions for sustainability.

To advance conversations on student heart, mind, and skill set, this is a practice-oriented presentation in the round table format. This session will introduce a framework of sustainability competencies where each table will consider one specific competency:

- Communicating Meaningfully
- Engaging in our intercultural society
- Nurturing Successful Relationships
- Leveraging Technology
- Adaptive Design and Problem Solving
- Cultivating Well-being

Each table will be presented with criteria that students may demonstrate from the beginning through to the completion of their undergraduate education. This framework will allow participants to reflect and share on the competencies we anticipate and nurture in universities. The focus will be on curricular implications as these are the pathways by which educators can most influence students' experience and transformation.

Then, participants will articulate the types of assessments that allow students to demonstrate proficiency at each stage of learning. Each table will be invited to share how their students take action for sustainability and how it is assessed. Further, educators will consider aligning HIT opportunities for students to have agency, practice reflection, work in an interdisciplinary way, and build community connections.

Participants should be able to identify aligned competencies, assessments, and HIT activities that allow students to demonstrate competencies for sustainability. They will enrich the framework for competencies and leave with an openly-licensed tool that they can use in their own university learning context.

Through extensive discussion and opportunities for reflection and sharing, this session offers an opportunity to align teaching and learning for sustainability. Empowered educators of all disciplines are necessary for a regenerative future. Through the language of the SDGs, educators can design effective curriculum for advancing economic, social, and environmental needs.

Keywords: competencies, skills, assessment, teaching practices

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"Not So far Away, not so different." The Contents and Attributes of Chilean Business Education.

Esteban Andrés Gómez Sotta[1]

The Schools of Business Engineering in Chile occupy an essential space in the enrollment and graduation of Higher Education, third and first place in the entire spectrum of university students in 2022. The above allows for characterizing the graduate profile and the declared programs of these schools, allowing for evaluate the contribution to Education for Sustainable Development (ESD); and to advance in risk management and its possible impacts (positive/negative) on companies, organization's markets, industries – among others – in the country and other regions of the world. In turn, the advanced dialogue between the different industries and markets, with the world's financial statements regarding their investments, encourages the monitoring of Environmental, Social, and Governmental (ESG) criteria to be more responsible at all business levels. They are looking at what and how to adapt degree profiles and programs oriented to Business Education and Sustainability. In turn, the competencies declared in the graduate profiles and the training and knowledge lines of the educational programs become essential to evaluate and compare a framework for Education and Sustainable Development and the different Sustainability agendas.

Then, it is essential to answer the following questions: Is Business Education in Chile an innovative proposal to observe? Are the Commercial Engineering programs a referent of Sustainability concerning other regional actors? How do the competencies declare in the study programs analyzed differ? Are there significant differences in the different graduate profiles, and what are the characteristics of the graduate profiles? Furthermore, what are the characteristics of the graduate profiles about Education for Sustainable Development?

From the Neo-institutionalist theory, we analyze different characteristics that compose business curricula; this allows us to organize the mechanisms that coordinate the spaces of imitation, correspondence to norms, and compliance with standards. For this, a descriptive and quantified analysis of the Commercial Engineering programs in Chile (45 evaluated) and the best ten Schools of Business, Administration, and Economics in Latin America will complement a qualitative methodological analysis that will evaluate the contents with the profiles of all the schools.

First, the status of the competencies that contribute to ESD in Business Engineering Schools is updated, then the content of the profiles and programs of the Chilean schools is compared with the other Latin American Schools selected.

The analysis ends by responding to the gaps between Sustainability and Business Higher Education to develop proposals for future research to guide the systematization and organization of attributes and criteria of Education and Sustainable Development in Business Education.

Keywords: business education, education for sustainable development, degree profiles, degree programs

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Previous Conceptions and Perspectives on Nature-focused Field Trips in Students of Primary Education and Early Childhood Education Degrees from University of Barcelona and University of Granada

Cinthia Pereira[(1)], *David Aguilera*[(2)]

We are presenting an exploratory study on the previous conceptions and perspectives of the students of Primary Education and Early Childhood Education Degrees of two Spanish universities (University of Granada, UGR; University of Barcelona, UB) about nature-focused field trips (NFFT). This educational activity is scarcely used in course's syllabuses, even when it has been widely recognised as an optimal educational resource (Aguilera 2018). Thus, it is important to reconsider the way to approach this type of activity in teacher's training programs and establish a balance between its scientific and didactic content (Sáez and Cortés 2020). A motivated and prepared teaching staff can arouse in their students' curiosity about nature and interest in learning Natural Sciences.

The research questions:

- What is the level of knowledge on Natural Sciences of university students training for being teachers?
- Do they have any previous experience in NFFT organization?
- Are they able to organize a NFFT?
- What do they think are lacking for being competent for NFFT organization?

A total 158 students (110 from UB and 48 from UGR) participated in the study. These included 75 enrolled in the Double Degree in Primary Education and Early Childhood Education, 51 studying only Primary Education and 32 inscribed only in Early Childhood Education. A questionnaire of 18 open and closed questions, some with a Likert scale, was used to know the characteristics of the participating students. The questions included items on their academic profile, previous experiences in NFFT, previous conception about the importance, how it should be, what skills to work on, how logistics are organized, and what they need to know to organize a NFFT, and ideas about how and where they would like to do a future NFFT.

The results show that more than 70% of the students surveyed had no previous experience in NFFT organization and a low level of knowledge in Natural Sciences. However, 87% of the students believed that knowing how to organise a NFFT is essential and a priority in their university training. They think that a good training should include activities enabling them to participate both as students and organisers in the NFFT.

Students from two different Degrees in Education and from two Spanish universities agree in the need to be trained for designing specific theoretical-and practical activities in environmental education outside the classroom. Our study also highlights the importance of training motivated and enthusiastic teachers for organizing NFFT activities.

Keywords: outdoor education, natural sciences, environmental education, primary education

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Education Promotion Society PARIS in Cooperation for Strong Sustainability

Marija Grinberga[(1)], *Ligita Riduze*[(2)]

A non-governmental organization is a good opportunity for various generations to get involved in education on ESD goals and taking practical action in implementing them. The statutes of our NGO provide for learning new knowledge, sharing experience, and applying it in action. The organization brings together people of different ages with a high level of education and their activities are related to youth and non-formal adult education.

The goals of the NGO activity program include:

- Support for youth initiatives in the development and implementation of research projects in the local community
- Coordinates youth international exchange activities to acquire global education and experience
- Non-formal adult education builds bridges between the school and the community in research projects and in practical environmental activities support Erasmus opportunities for teachers professional development.

The organization builds bridges between generations in environmental education and ensures cooperation in identifying local and global ESD goals. The main emphasis is on the local environment as a value in which community life takes place - economy, shopping, education, entertainment. The youth living in the IT environment moves away from nature, but they know how to work virtually with information, also about the environment of their community. In environmental education it is important not to lose connection with the environment and biodiversity. Everyone needs to understand human-environment interaction in community and see itself in context with the global environment. Ecosystem interactions are much older than human economic activities in a community, country or geographical region. Madliena is a small rural community, but global ties can be felt, for example, in connection with migratory birds, whose nesting places are rural areas of Latvia. The atypical drought of the spring and early summer of 2023 is also a signal of global change. A rural village and the urban environment are responsible for promoting the preservation of biodiversity. The main understanding is because the environment is the basis of everything, that without it there would be neither society nor economy. It is a strong sustainability development model that we should strive for.

Regarding environmental education as part of understanding the future, in our program it is important to strive for the gradual formation of environmental maturity:

- Learn to enjoy the outdoors learning
- Experience and observe nature
- Understand the ecological relationship and the interplay of man and nature
- Make decisions on environmental issues and be responsible for the future

The most important thing is to combine knowledge, gain new knowledge, acquire skills, and strengthen the will to create strong sustainability.

Keywords: strong sustainability, cooperation in education, biodiversity as value, bridges between generations

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A.K.A.Noah Student Team Experience: a Boat for Increasing Competence and Collecting Plastic from the River

Elena Comino[(1)], *Niloofar Kazemi Esfeh*[(2)], *Alisher Sharipov*[(3)], *Margherita Tamietto*[(4)], *Mirko Trinelli*[(5)], *Giulia Monacò*[(6)], *Filippo Venturini*

Most of the time the University are charged to develop innovative methods to reinforce Environmental Education. New courses, specific workshop and thematic lectures are proposed for the students involve in Master and PhD career.

But there is always a lack between educators - learners and common people.

In this framework take place the activities of A.K.A.Noah a students Team, of Politecnico di Torino, Engineering Department of Environment, Land and Infrastructure.

Through the experience of the student's team we can affirm that this can be considered an innovative and alternative environmental education form.

Nowadays plastic pollution poses a significant environmental challenge, particularly in rivers and lakes where extensive accumulation of plastic debris threatens aquatic ecosystems. Spread the knowledge related to the effect of macro-micro plastic on river ecosystem is an issues that must be pursued.

To address this issue, a collaborative project is proposed by A.K.A.Noah students Team, leveraging diverse expertise from mechanical engineering, ecology engineering, industrial design, and hydraulic engineering.

Two are the main mission of the Team: the primary is to create an innovative collection system that can be seamlessly integrated with a riverboat and efficiently collect plastic trash from the water surface. The system will target the efficient retrieval of medium-dimension plastic debris, which are known to persistently accumulate and cause environmental harm. The secondary is to increase citizens awareness of plastic pollution through public activities.

This strategy has the potential to open new opportunities for city businesses and to bring educational values not only to students directly involved in the project, but also to the citizens who benefit from a healthy, thriving urban river environment and its related ecosystem services (leisure activities, urban parks, storm flows regulation).

The AKANoah team approach is an example for new educational approach.

The presentation will refer about the inter-disciplinarity of the Team, the technical issue that they have develop and the activities that has been promote and or programmed to increase citizens awareness on plastic pollution.

In conclusion weaknesses and potentials of the student Team, as EE form for all generations, will be highlighted.

Keywords: environmental citizens awareness, plastic pollution, river ecosystem, innovative environmental education

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A Review of Environmental Education Policies and Its Implementation in Japan

Miwa Tatsuno[1]

In Japan, Education for Sustainable Development (ESD) including Environmental Education (EE) have been designated as an important national priority. The Japanese government has been making effort to transform the educational system to enhance ESD/EE in the last few decades, including establishing Law on the Promotion of EE as a milestone legislation in 2003. In this context, it is critical to comprehensively understand the national policies and framework as well as its implementation to make the effective shift.

This research aims at analysing the governmental policies on ESD/EE and its implementation focusing on 1) How ESD/EE is promoted in policies in Japan (regulations, learning contents, teaching methods, institutional support, and others); 2) National curriculum; 3) Gaps in policy and practices. The research result will help to understand how national policies have been functioning, key challenges and future recommendations.

The research takes the following steps:

a) Japan's national policy documents including roadmap, strategies, legislations, and official curriculum are screened.
b) The research takes qualitative analysis approach rather than quantitative analysis, the online software tool for qualitative analysis, "NVIVO" is utilised for identifying the qualitative features of the scoped policies.
c) As for the implementation, the author conducted survey with Ministry of Environment, Japan on the current implementation status, including interview with EE experts and stakeholders.
d) The author further analyses the policies and implementation status in Japan to find out how the national policies have been functioning or dysfunction in the country.

According to OECD's "Programme for International Students Assessment (PISA)", Japan's international ranking continued dropping. In such background, with the aim of making the shift in educational approaches, the Japanese education system has been in a remarkable transition period, and 2020 was a milestone year, as Ministry of Education, Culture, Sports, Science and Technology launched the new national curriculum guideline which was drastically changed. This newly revised curriculum guideline aims at achieving the international standards through the active learning approach. The research discusses its challenges and opportunities.

The Japanese conventional education approach which put much priority on academic performance is no longer functioning as before. In recent years, due to the rapid development of technology, global environmental crisis and so on, the significance of Volatility, Uncertainty, Complexity and Ambiguity, so-called VUCA, has been increasing in Japan as well as other countries. The Japanese education should focus on the importance of education to guide younger generation to survive such VUCA world, and should provide the key competencies which are necessary ability for all children and youth.

Keywords: Japanese policy, national curriculum, gaps in policy and practices

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296 Inspired by Laudato Sì': an Ecological Approach to Education and Teaching

Cristiano Chiusso[1]

Pope Francis' Laudato Sì' is a precious document for practitioners working in the educational field. The Encyclic suggests a new paradigm for teachers, trainers and educators.

The research questions are:

- How can sustainability be taught in a sustainable way?
- Can teaching be the same as before, just changing the content and not the method?
- How the Integral Ecology paradigm affects teaching and education?
- Is it just a spiritual perspective or a secular approach too, speaking to the world of education regardless of one's beliefs?

IUSVE (Salesian University Institute of Venice) has implemented an interdisciplinary course: "Integral Ecology and New Lifestyles".

The aim is:

- to offer new knowledge and habits capable of appreciating and putting to use the Integral Ecology paradigm;
- to provide a level of cultural and scientific in-depth study necessary for the creation of new lifestyles, translated into behavior, new personal and civic choices aimed at new practices of responsible care;
- to articulate the development of a new ecological citizenship, capable of combining the search for social justice and concern for the common home;
- to enrich professional training, so that scientific approaches and coherent interventions can be practized in the light of a new ecological humanism.

IUSVE learning outcomes are divided into:

- Competences:
- interpreting the signs of today's environmental crisis by proposing a possible change in individual and collective behaviour;
- arguing about the 'sustainability' of lifestyles, in their impact on personal and social growth and maturation;
- knowing how to set up an essential Integral Ecology project in different areas of the world of work, associations, education, recreation.
- Abilities:
- identifying and recognise the links between social crisis and environmental crisis;
- grasping in a transdisciplinary perspective those constructs that underpin integral ecology;
- developing a critical approach to Integral Ecology, knowing how to intrinsically grasp its complexity.
- Knowledges:
- a scientific information, awareness and prevention approach to environmental risks;
- Agenda 2030 and all main documents from international organizations;
- Ecological virtues: sobriety, simplicity, humility, solidarity, gratuitousness, justice, love. Virtues that dispose to move from consumption to sacrifice, from greed to generosity, from waste to the ability to share, shaping new mentalities and lifestyles.

The Integral Ecology paradigm promotes a vision and practice of politics that is entirely focused on and animated by a new 'ecological citizenship', which breaks the asphyxiated patterns of current political representation and belonging by calling each and every one into the agora, so that everybody becomes responsible actor for the collective good, in which what is 'common' constitutes the key value, connects people and constitutes them as a community.

Keywords: ecology, education, sustainability, skills, values

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Climate Change and Marine Litter Education in the Middle East: Fostering Environmental Literacy and Stewardship through Localised English-Arabic Resources

Rachel Mulholland[1]

This project involved the production and utilisation of school resource packs on climate change and marine litter, designed specifically for primary and secondary schools in the Middle East region. This initiative was undertaken by the UK Centre for Environment, Fisheries and Aquaculture Science (Cefas), in collaboration with local partners.

Environmental education plays a crucial role in fostering awareness, knowledge, and action to address pressing environmental challenges. The Middle East region, known for its unique ecosystems and diverse cultures, faces significant issues related to climate change and marine litter. However, limited accessible resources and language barriers often hinder effective environmental education in the region.

The aim of this project was to develop comprehensive and localised school resource packs on the topics of climate change and marine litter, tailored to the Middle East context. By creating materials in both English and Arabic, we aimed to bridge the language gap and facilitate inclusive education for students in the region. The focus on locally relevant species and habitats within the resource packs and use of locally recognised locations represents an innovative approach to personalise the issues being addressed and promote personal responsibility and environmental stewardship.

Cefas collaborated with local educators, environmental experts, and stakeholders to develop the resource packs. A multidisciplinary approach was adopted, integrating scientific knowledge, pedagogical expertise, and cultural insights. The packs incorporated interactive activities, engaging visuals, and age-appropriate content to ensure effective learning experiences for primary and secondary school students. Focus was also given to providing teachers with the tools they need to educate students on the causes, impacts, and solutions to these important environmental issues. Emphasis was placed on promoting critical thinking, problem-solving, and positive behavioural change.

By partnering with local stakeholders, Cefas ensured cultural relevance and contextual accuracy in the materials. The interactive format provides a valuable resource for educators to effectively communicate complex concepts. The long-term aim of this project is that by raising awareness of these issues, and promoting engaging interdisciplinary learning, we can encourage students to take an active interest in environmental sciences, whilst empowering future generations to protect our oceans.

Preliminary feedback from pilot schools highlighted increased student engagement, improved understanding of environmental issues, and the promotion of sustainable practices within school communities. These resource packs demonstrate the significance of localised, inclusive, and language-sensitive environmental education materials. This approach can be used to bridge educational gaps, promote environmental literacy, and foster sustainable practices in diverse regions worldwide.

Keywords: climate change, marine litter, Middle East, school resource packs

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306 Education on the Boat- A New Hope for Tomorrow

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Bangladesh is one of the poorest and most densely populated (170 million UN 2022), country of South Asia is 10 meters above the sea level, located on the Bay of Bengal in the delta of Ganges and on the front lines of climate change.

Over the next 40 years, 17 percent of the land will be lost to the sea resulting in 20 million climate refugees because of climate change. Along with a very poor literacy rate (38%), Bangladesh has not only been struggling for basic human needs as well as also fighting against the incoming climate change by different means. The Northeastern regions are underdeveloped due to ecological reasons. These areas are fully marshland locally known as "Cholon Beel" and it is inundated by water 8 to 9 months a year; the inhabitants of this area are completely depended at the mercy of the environment for survival. Traveling on boat is the only means of transportation for communication.

The sort dry season allows only one crop and the people have turned to fishing as their only souse of income. Naturally, with such meager resources to be tapped, the people live well below the property line. Moreover, as communication in this reason is poor at the best, infrastructural benefits is almost non-existence. Inhabitants are deprived from their basic needs as a result due to the scarcity of high land schools; the children suffer the most with very limited access to education.

This has been the way of life for generations. The only thing they can hope for is luck. In such despair, a non-profitable organization came forward with an amazing idea to promote education and basic human needs of impoverished regions. They tried to use the natural events of these regions --'Water' and 'Boat' simultaneously to build up a scheme called "Education on the Boat". Boat schools are the combinations of a school bus, schoolhouse, training boats, library and medical centers *etc*.

Boat schools move from different riverside villages to collect the students & its beneficiaries and finally docking at the last destination, arrange on board classes and training as well as provide other facilities accordingly. After the end of session, the boats drop recipients at their places and then move forward to pick other groups. Certainly, this exceptional concept will inspire all levels of people of the world how to deal with the future climates change and to promote education, all basic human needs as well as at the same time to lift people out of poverty in any given situation within the least cost effective manners.

Keywords: innovation, adaptation techniques, ecological conservation, impact

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Semantics and Isomorphism. Business Education and Sustainable Development in Chile

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The curricula in business education around the world are oriented to train leaders for any industry and organization, installing capabilities in the governments of educational institutions in order to ensure that students recognize and participate in all areas and administrative instances of any company, fulfilling the conditions to integrate into different functions and departments. In addition, these study programs declare skills, knowledge, and attitudes that seek to define the course of the organizations; promoting changes, solving problems, leading teams, and assimilating ethical dilemmas, among others. We complement the above with competencies that originate critical thinking, foresight, and strategy -for example- in financial risk management. Thus, Business Education can organize new states of development and evolution in favor of business sustainability criteria. However, the discussion about the expectations between business and Sustainability reinforces the schemes of distinction, classification, and symbolism of higher education institutions, idealizing the strategies and decisions between Business Education and its stakeholders.

If the above is true, what is the role of semantics in the stated profiles of graduates in Business Education, and how do these link to sustainability attributes? What expectations can we derive from the stated profiles of Business Education concerning Education for Sustainable Development? Is it relevant to advocate for the governance of competencies and graduate profiles for Sustainable Business Education?

Social Systems Theory and its concept of Semantics allow us to analyze the foundations of differentiation, where each system gives legitimacy and grounds the functioning of curricula and graduate profiles. In particular, we introduce the debates on the purpose of entrepreneurship education and how it articulates with the Sustainable Development Goals from the comparative literature review. We then design a classification of graduate profiles using Neoinstitutionalist Theory that allows us to observe isomorphic patterns. Likewise, we conducted semi-structured interviews analyzed with Grounded Theory, complemented with indicators and descriptions of 46 Chilean and 20 international Business Education Programs, organizing the conditions of legitimacy for a Business Education that contributes to Sustainability.

We suggested that business education is strongly associated with the global economic axes, business, financial-accounting risk, social development, innovation and entrepreneurship, and the environmental component; however, the latter, concerning the previous ones, gather semantic attributes that seek differentiation between the different trends and changes of Sustainability in Business Education.

The article ends with a syllabus-type example, which orders the stakeholders' expectations of the Business Schools and establishes a summary for new lines of research for a Sustainable Business Education.

Keywords: business education, education for sustainable development, degree profiles and programs, legitimacy, semantic differentiation

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Contribution à l'élaboration d'une Stratégie Nationale d'éducation Environnementale En République De Guinée

Kadiatou Barry[1]

Aperçu Du Contexte Mondial Et Local

C'est un euphémisme de dire aujourd'hui que le monde traverse une grave crise environnementale. En effet, après plus de trente ans de la tenue du Sommet de Rio en 1992, et la succession de rencontres mondiales appelées Conférences des Parties, cela est revenu dans toutes les déclarations et résolutions précédées de rapports et de discours d'engagement des États-Parties. Et pourtant l'environnement reste toujours menacé. D'où cette nécessité de penser à conduire l'éducation environnementale.

Vers Une Stratégie Nationale d'éducation Environnementale: Principes Et Grands Axes

En matière de stratégie d'éducation environnementale, ce ne sont pas des expériences et des leçons apprises à travers le monde qui manquent. Elles sont nombreuses qui sont documentées et qui peuvent bien inspirer les pays qui en manquent comme c'est le cas de la Guinée. Bien qu'ici aussi ce ne soit pas un vide absolu depuis qu'en 1996, avec un appui d'un projet financé par l'Union Européenne, il a été produit un premier document-guide sur l'éducation environnementale en milieu scolaire. Le pays a, en outre, crée une institution entièrement dédiée à cette préoccupation qui est le Centre d'Éducation à l'Environnement et au Développement (CEED) de Pita qui a vocation de former les enseignants capables de conduire des activités pédagogiques d'éducation environnementale à travers sur l'insertion des thèmes environnementaux dans les curricula. Cependant, ce qui fait défaut c'est le manque d'une vision stratégique qui pourrait s'énoncer ainsi qu'il suit: « Des élèves, jeunes citoyens engagés et responsables vis-à-vis de leur environnement grâce à des connaissances, des compétences et des pratiques solides de protection des milieux naturels et des cadres de vie ». Il s'agit comme disent certains sous d'autres cieux « préparer le futur dans le présent ».

L'objectif global de cette stratégie serait de dégager dans un document de référence les principes et les axes permettant de préparer des plans d'action et des projets pertinents d'éducation environnementale.

Ce document pourrait être préparé sous l'égide de l'Institut National de Recherche et d'Action Pédagogique (INRAP) en étroite collaboration avec d'autres parties prenantes y compris Guinée Ecologie, en se basant sur quelques principes à prendre en compte, à savoir, et pas seulement:

- Intégration aux curricula en vigueur;
- Thèmes liés aux réalités locales;
- Approche pédagogique basée sur la pratique de terrain;
- Rattachement aux engagements internationaux en matière d'environnement;
- Participation des parents d'élèves;
- Communication des résultats;
- Capitalisation et réutilisation des meilleurs pratiques.

Mots clés: éducation, environnement, curricula, stratégie, protection

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332 Promoting Education for Sustainable Development: The Whole School Approach

Angela Lam[1]

WWF-Hong Kong has been actively promoting the concept of "Whole School Approach" in school campuses, aiming to mainstream sustainability in the Hong Kong school sector. Acting as an enabler among schools to form a Community of Practice, WWF plays a key role to enhance teachers' professional competencies in Education for Sustainable Development (ESD), and facilitate the integration of environmental conservation and sustainability principles into school curriculum and long-term development.

Recognizing that schools are microcosms of society, WWF advocates for a holistic and integrated "Whole School Approach" that encompasses the 4Cs - Culture, Curriculum, Campus, and Community. Sustainability is embedded in the school ethos, teaching and learning, management of the school estate, and connections with the wider community. This shared purpose brings together everyone involved in the school to identify changes, set priorities, plan solutions, and put them into action.

WWF-Hong Kong acts as the technical consultant for an environment award launched by the local government, the Hong Kong Awards for Environmental Excellence's Schools Sector, by formulating a comprehensive award assessment criteria that provides clear direction and action areas for schools. Best practices are also identified from participating and winning schools, that are shared through experience exchange activities such as site visits at schools and educator training workshops. These initiatives facilitate co-learning among schools and cultivate a more environmental conscious ambience within the Hong Kong school sector.

Furthermore, WWF-Hong Kong conducts school partnership projects that co-create unique experiential learning experiences for students with teachers. Examples include project-based learning programme on endangered species for lower primary school students, STEAM programme on marine and wetland conservation with design thinking elements, that enable students to conduct field investigation and research, and subsequently create eco-friendly facilities for coastal organisms, waterbirds and Eurasian otter respectively.

These projects enhance students' understanding of the environmental elements in the curriculum, allow immediate application of knowledge and concepts, and contribute to wildlife conservation efforts, fostering positive memories and connections with nature.

Through the experiential learning, students' motivation and efficacy in learning are effectively enhanced, leading to a deeper understanding of sustainability and a stronger commitment to environmental conservation.

Keywords: whole school approach, education for sustainable development, sustainability, environmental conservation, experiential learning

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338 FuturePitch@Smartfeld: Prototyping Tomorrow with Entrepreneurship and New Technologies

Mathias Kirf[(1)], *Fatmir Racipi*[(2)], *Stephanie Eugster*[(3)], *Cornelia Gut*[(4)]

In 2015 17 Sustainable Development Goals (SDGs) were defined as an urgent call for action by all countries in a global partnership. "Creating tomorrow" with such a sustainable world in mind provides excellent opportunities for the innovative use of new technologies. But this demands numerous creative and diverse minds working efficiently together, with an interdisciplinary understanding of the challenges at hand and a mindset that individual capabilities can shape a powerful team. The pool for these diverse minds is represented by the future key-stakeholders for the creation and implementation of these innovative solutions: the young people.

The FuturePitch workshop combines STEM education with education for sustainable development. The aim is to provide learners with self-efficacy experiences in the combined areas of new technologies, entrepreneurship and SDG-based challenges by gaining their own experience in implementing conceptual solution ideas on the one hand, and to acquire methods and a mindset for problem solving and to recognize the scalable benefits of the generated application on the other hand.

A second goal is for as many young people as possible (Sek I, Sek II) to discover that their personal imagination and problem-solving skills can make the difference for a more sustainable future.

The workshop is designed with two phases. In the initial phase at school, students engage with various SDG-challenges and form interest-based groups to address a specific SDG challenge. After collaborative discussions to develop an effective conceptual solution, they use simple materials such as cardboard, glue, *etc*. to create their first conceptual prototypes. In the second phase, participants visit Smartfeld, an education laboratory in St. Gallen, Switzerland, where they benefit from the valuable expertise of specialists in the fields of education, sustainability, economy and programming. Working together, students refine their analog prototypes using the micro:bit, an educational microcontroller, to technologize their designs. At the end of the workshop, students present their conceptional prototypes in a pitch format.

SDG-challenges cannot be solved within school-lessons. However, students report that they experience self-efficacy as they already work towards an innovative solution by prototyping instead of just talking about problems.

Overall, the FuturePitch workshop is an example of how entrepreneurship and programming can be used to build students' SDG and STEM competences. By fostering self-efficacy, we inspire students to believe in their own ability to contribute meaningfully to sustainable development. Through hands-on activities and collaborative discussions, they gain valuable skills in critical thinking, teamwork, and effective communication. By combining problem solving, technologizing, and persuasive pitching, this workshop provides a practical framework for integrating sustainable development principles into environmental education.

Keywords: self-efficacy, entrepreneurship, conceptual prototype, SDG-challenges, Micro:bit

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339 Education for Sustainable Development in Teacher Training: Perceptions of Teacher Educators

Antje Goller[1]

Education enriches people's understanding of themselves and of the world in which they live. Teacher training plays an important role here, since teachers can be multipliers for sustainable development. In addition to the institutional framework, the influence of the teacher trainers is significant. Their attitudes and perceptions are crucial in preparing future teachers to conduct ESD in schools.

The work presented is part of a cumulative dissertation on "Education for sustainable development (ESD) in teacher training". Under the overarching question " What perceptions of ESD do teacher educators have?" (status), the results of four publications are linked and discussed in depth:

- A systematic literature review including a qualitative content analysis (Kuckartz, 2018) of the finds presents the state of research on perceptions, attitudes and reported implementation of ESD in teacher training (Goller & Rieckmann, 2022).
- Subjective theories (Groeben & Scheele, 2010) collected from teacher trainers in various disciplines using the qualitative method "structure-laying-technique" (Lohmann & Goller (2023), Goller & Markert, in prep.).
- The autoethnographic analysis of an implementation process supplements these surveys with the perspective of a teacher trainer as a coordinator in the implementation process (Goller, in print).

The results show that perceptions, attitudes, reported implementation and subjective theories of teachers are very divers and different elements of it are focused or less considered. The self-image as a teacher trainer between neutrality and activism for a global transformation is also very individually pronounced. Perceived framework conditions support or inhibit engagement and are evaluated differently. These findings reveal fields of tension. Different understandings of ESD or one's own role as a teacher trainer can be irritating when working together. At the same time, if revealed and collectively reflected on there is the potential to open up diverse approaches to (E) SD and to promote critical thinking among teacher trainers and students.

- Groeben & Scheele (2010). Das Forschungsprojekt Subjektive Theorien.
- Goller (in print). Autoethnographie in der hochschuldidaktischen Begleitforschung am Beispiel der Implementierung von Bildung für nachhaltige Entwicklung in eine interdisziplinäre Fachdidaktik
- Goller & Markert (in prep). Teacher Educators´ Subjective Theories on Education for Sustainable Development in Higher Education
- Goller & Rieckmann (2022). What do we know about teacher educators' perceptions of education for sustainable development? A systematic literature review.
- Kuckartz (2018). Qualitative Inhaltsanalyse. Methoden, Praxis, Computerunterstützung.
- Lohmann & Goller (2023), Physical education teacher educators' subjective theories about sustainability and education for sustainable development.

Keywords: education for sustainable development, teacher training, subjective theories

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Proyecto Boost: Impulsando La Educación Ambiental Para La Sostenibilidad En El Pais Vasco

Mikel Ballesteros García (1)

La Educación Ambiental para la Sostenibilidad tal y como la entendemos en el País Vasco, debe ser un proceso de formación continua de una ciudadanía informada e implicada, que disponga de herramientas creativas para la resolución de problemas, una cultura científica y social, y el compromiso de liderar actuaciones responsables, tanto individuales y colectivos. Estas acciones ayudarán a garantizar un futuro sostenible considerando todos los ejes de la sostenibilidad: social, ambiental y económico, fomentando la acción transformadora eco-social.

La idea central es el uso de la inteligencia colectiva y el trabajo en red con las distintas organizaciones que están trabajando intensamente en el campo de la sostenibilidad (Autoridades, Sector de Educación, Ciencia e Investigación, Tercer Sector, Entidades Privadas,..) sobre y cómo podemos convertir el trabajo realizado en un activo para la sociedad vasca, contribuyendo así a la consecución de una nueva ética medioambiental en Euskadi.

Creación colaborativa de una red para el intercambio de expertos y buenas prácticas que facilite el desarrollo de capacidades en educación ambiental para la sostenibilidad, active comunidades de conocimiento, favorezca el aprendizaje per to per inter entidades y, en definitiva, contribuya a la construcción de una nueva ética medioambiental en la ciudadanía (habilidades sociales, generales y específicas), utilizando una estrategia de transformación digital que contribuya al logro de los objetivos.

Construcción de puentes colaborativos para llevar la educación más allá de las aulas (educación no formal e informal).

Co-creación de un ecosistema en forma de red de entidades que trabajan en Euskadi en el ámbito de la Educación Ambiental para la Sostenibilidad (EAxS), que interactúe en los ámbitos de la capacitación, innovación y gestión del conocimiento, active comunidades, favorezca el aprendizaje per to per inter entidades que, a través una plataforma tecnológica y canal digital de comunicación referentes en Euskadi conecte con la ciudadanía, para posibilitar su concienciación, capacitación, desarrollo de habilidades y sensibilización, tanto en la protección del medio como en la consecución de una nueva ética medioambiental fundamentada en esa necesaria relación inteligente entre dicho medio y la actividad humana.

Palabras clave: transformación digital, sostenibilidad activa, capacitación cambio climático, acción transformadora, inteligencia colectiva

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Nurturing Citizenship for Transforming the World to Sustainability – Public-achievement-style Education of Tokai University

Sachi Ninomiya-Lim (1)

The expectation toward environmental education is higher than ever in our world facing the catastrophic climate change and biodiversity loss. To overcome this overwhelming crisis hindering a sustainable future, environmental education needs to nurture citizenship among all to act for transformative shifts in the world. This presentation will report the practice, outcomes, issues, and prospects of the Tokai University's citizenship education program for transforming our society toward a sustainable future.

Tokai University, one of the largest private universities in Japan, has introduced the unique university-wide citizenship education program named "PA-style Education" in 2018. It aims at empowering students to actively participate in sustainable development with a mindset and skill sets as local and global citizens.

The program incorporates concepts and methods of Public Achievement (PA), a youth civic empowerment initiative originally developed by Harry Boyte to be used in schools, universities and communities in the United States and other parts of the world (Boyte 2018). At the base of Tokai curriculum are four compulsory courses for the first-year students of all its sixty-two departments – "Concept of Citizenship I", "Concept of Citizenship II", "Understanding Local Communities" and "Understanding Global Communities". Students are divided into classes consisting of around sixty students from multiple departments for these courses, to exchange their views with others to explore their own interest and potential as active citizens. Those who seek to develop their civic competencies further can take advanced PA courses, which let them participate in dialogues and actions in smaller classes. In addition, the university supports students to plan and implement their own collective civic actions as extracurricular activities.

Since its foundation, the program has sought for ways to ensure the participation and autonomy of students, accommodate diverse interests and ways of learning among students, connect students' learning with actions, and promote understanding of the concepts of PA and citizenship among faculty members. Some of the efforts include the development of the course guidebooks for faculty highlighting topics and methods to relate students' personal experiences and interests to the concept of sustainable development, and workshops and questionnaires for faculty to exchange both successes and failures in classes. Based on the experience during the six years, the curriculum reform to improve the quality of the program is now under discussion.

Environmental education must respond to the urgent need for social transformations to sustainability. At its core needs to be the development of citizenship for everyone to participate in such transformations. Tokai University's challenge provides a case for other universities and schools to refer to for developing their own citizenship curriculum for sustainability.

Keywords: transformation, sustainability, citizenship, public achievement, university

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Bridging the Gap between Higher Education and Industry Implementation in the Field of Sectoral and Cross Sectoral Environmental Education. - Case Studies from the Textile Industry

Mariella Noto (1)

The ZDHC Academy was set up in 2016 to share the knowledge and skills needed to implement and improve a sustainable chemical management within the textile, apparel and footwear industry in an aligned approach that could not only be used by ZDHC Contributors but publicly around the globe.

Having evolved from an ambitious startup, we are now an organisation that is rapidly scaling. The past six years have seen a substantial increase in our global footprint, and a growth in the number of courses and trainers operating in the Academy.

In 2021 the ZDHC Academy started actively working with educational institutions in Italy that focussed on Textile Engineering and Sustainable fashion. The success of the programme caused a domino effect. In our continuous efforts to expand and strengthen our relationships with academic institutions, we are developing strong educational relationships which are and have been significantly impactful and mutually beneficial.

After stakeholder engagement the ZDHC found that there is:

a) a gap between the industry on the ground, the actual implementation of sustainable chemical management, wastewater management, environmental management within the Textile, Apparel, Footwear and Leather Industry.

b) a strong need for educated young professionals who can bridge the gap between science, innovation, education and implementation on the ground. Young professionals that will start their career in a more operational setting with both theoretical and practical background.

c) a need for educational funding to scale environmental education to close the gap between education and industry implementation and mainstream environmental education within the sector.

Based on these findings the ZDHC Academy and its stakeholders concluded that there is a need for a uniform, global strategy to build a framework that can drive the environmental education within the sector forward and drive students from outside the sector education to become involved in the sector with their expertise.

Examples of current collaborations:

- IHE Delft
- ITS Cosmo
- Bahir Dar University

In the proposed practice oriented round table we ould like to invite scholars, governments, representatives of the private sector, educational institutions to open up the dialogue on:

- how to make environmental education mainstream within sector education;
- how to move beyond the sector when we encounter cross cutting areas;
- how to bridge the gap between theory and train the trainer programme implementation by graduates;
- how the industry and governments can benefit from a globally offered, unified training and education approach on related topics;
- Showcase the strength of industry and cross sectoral collaboration in relation to education and implementation, to reach the goal to reduce hazardous chemicals in wastewater discharge and thereby its impact on the environment and human health.
- Identify ways to fund and scale environmental education.

Keywords: education, industry, implementation gap, cross sectoral collaboration, framework

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Principles of Education Practices for Sustainability in the Amami Islands -A Structural Analysis of the Amami "Environmental Culture" Education Programs of Higher Education Institutions

Yuko Oguri[1]

Since FY2021, Kagoshima University, led by the author, has been engaged in the development, implementation, and institutional design of the Amami "Environmental Culture" Education Program for working people living or planning to live in the Amami Islands (8 inhabited islands, 12 municipalities, total population 103,462 (2021)). The Amami Education Program is the collective name for several courses, and the total number of hours for each program is approximately 70 hours.

Amami "Environmental Culture" is a term used to describe the culture (ideas, wisdom, skills, production, lifestyle, *etc.*) nurtured by land ancestors in the diverse natural environment of the islands and their unique historical environment, which is different from that of mainland Japan. The concept was born in the 1990s on Yakushima Island, the first island in Japan to be registered as a World Natural Heritage site, as a strategic image for new regional development. The strategy was to evaluate the historically accumulated relationship between nature and people on Yakushima Island as an "Environmental Culture" and to make the most of it for regional individualization in order to create a region that aims for both nature conservation and development. At the same time, this attempt had the double meaning of addressing the historical issues of civilization that have upset the balance between the natural world and human activities since the modern scientific and technological civilization.

The purpose of the Amami Education Program is to help people understand the regional characteristics of their own islands and communities from the perspective of Amami's "Environmental Culture," to gain a deeper understanding of the unique characteristics of each island and community, to enhance its value, and to support the creation of new jobs and creative solutions to life and community issues. To this end, the Amami Education Program has organized its curriculum with the goals of forming a mindset for sustainable utilization of local resources, acquiring basic knowledge and skills, and encouraging the creation of friendships.

This presentation analyzes and organizes the theory underlying this educational practice, focusing on the principles that drive the program and the logic behind the curriculum organization. It then presents ideas on the principles that should be followed in the development of social education and lifelong learning practices with the SDGs in mind, based on the reach of ESD theory in social education research. In conclusion, author clarified that both academic and indigenous knowledge are needed to understand the "complexity" of SD, and that productive activities are required to discover and enhance the value of the connection not only with people but also with the nature and history of the local area. It has also become clear that the 17 goals of Agenda 2030 are embedded in a hierarchical structure within the Amami Education Program itself.

Keywords: higher education institutions, environmental culture, Amami education program, curriculum principles, SDGs

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Mangrove Education at the University of Guyana: A Critical Appraisal

Paulette Euranie Bynoe [1], *Denise Simmons* [2]

Mangroves are essential tropical ecosystems that provide a nature-based solution to climate change's existential threat to coastal and terrestrial environments, particularly in low-lying states such as Guyana. However, mangrove ecosystems are depleted, and their ecosystems are degraded due to neutral and anthropogenic factors. Environmental education, at all levels, has a critical role to play in reversing this trend.

The research questions were:

- What is the status of mangroves in Guyana?
- To what extent does the University of Guyana's curricula promote mangrove protection?
- How can the University curricula on mangroves be more orientated towards sustainability?

This study was conducted using a qualitative approach, characterised by content analysis of the course outlines that included mangroves as a topic directly or indirectly, a descriptive survey targeting University students in the faculties of Agriculture and Forestry (FAF), Biology, and Earth and Environmental Sciences (FEES), plus semi-structured interview questions via emails. Environmental education objectives, namely awareness, knowledge, attitudes, skills, evaluation ability and participation formed the analytical framework. Sustainability education, as defined by UNESCO, provided the reference point to evaluate gaps in the existing courses.

Mangroves are threatened on Guyana's coastline, while their protection is treated differentially in curricula across faculties. The study revealed that the FEES offered the highest number courses that directly or indirectly facilitated delivery of lectures on mangroves. Courses offered by FAF, including Forest Conservation (FOR 3105), do not specifically mention mangroves. Lecturers and students showed positive attitudes towards mangrove protection and affirmed the importance of their integration into university curricula. While all lecturers agreed interdisciplinarity is critical to teaching about mangrove protection and that knowledge of the subject was adequate, most of the content was oriented to awareness and knowledge. Students identified the need for more field activities that promote interaction with the resource. Some constraints mentioned were teaching time, interdisciplinary integration, access to experts, finance, and limited data on the current mangrove status.

Education on mangrove protection is critical for individual and collective proactive management responses in Guyana; however, integrating the subject into the University's curricula is not uniform across facilities and requires reorientation to foster sustainability. Recommendations include collaborative approaches to foster interdisciplinarity and sustainability education, introduce key components in existing curricula, establish external partnerships and seek funding opportunities, integrate case studies and real-world examples in lectures, leverage online resources and virtual experiences, and actively engage with local communities.

Keywords: environmental education, university level, mangrove protection, Guyana

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Climate Change: Are We only Watchers or Can Education Enable All of Us to Be Builders of Change?

Giovanna Lucia Piangiamore[(1)], *Alessandra Maramai*[(2)]

Environmental Education by using reflective learning activities can be a powerful tool to engage students in non-formal activities in order to discuss with researchers the causes and the effects of Climate change, finding solutions together to implement virtuous behaviours. In recent years the researchers of the Istituto Nazionale di Geofisica e Vulcanologia (INGV) have experienced, also with remotely during the Pandemic, different methods to keep students' attention high on climate change issues. During these scientific meetings, serious games and interactive storytelling are the tools used to clarify misconception, addressing complex topics of the integrated Earth system. The main goal of the designed activities is to promote critical thinking in order to foster the automation of best practices in the perspective of team building to save the planet. We address various aspects of the Climate change, focusing on which daily actions we can do to reduce the impact of the antropic activities on the environment. We want to encourage active environmental 'nudges' to trigger changes towards the right choices for the Society as a whole.

Dealing inductively with climate change issues, a set of digital games, a partecipative escape room, a digital adventure and a fake-news laboratory have been created, involving more than 3000 students in the last four years. They have been used as tools of school-based civic education during both online races and in presence challenges. In particular, the above-mentioned activities have been performed in some occasions such as special events of the World Environment Day 2022, the European Researchers' Night 2021 and 2022, the Words for Earth day 2022 and the Fosforo Science Festival of Senigallia (MC) 2023. These innovative teaching techniques have been successfully applied also in a multidisciplinary project addressed to Classical and Scientific High Schools and at the EPALE EDU HACK 2022 competition: 'Making peace with the environment. Territorial proposals for digital innovation for green transition'. At the end of each educational activity, satisfaction questionnaires have been administrated, different between the ones for teachers and those for students. The enthusiastic feedback shown by the questionnaires from both teachers and students was a powerful motivation to continue developing similar educational activities and confirmed the importance of collaborations between school and research for educating future generations of responsible citizens.

Keywords: environmental education; best practice dissemination; challenge based learning; tranformative learning; life long learning

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Social Ecology and Environmental Diversity in Teacher Education

Alisa Paul[(1)], *David Zandvliet*[(2)]

This paper offers reflections on the development and potential of a transformative teacher education project as one component of the Professional Development Programs (PDPs) at the Faculty of Education of a comprehensive Canadian university. The work of our teacher education program is set in Vancouver and utilizes the lenses of social ecology and environmental diversity (or SEEDs) to examine the roles of teachers in bringing an awareness of local/global sustainability issues to student learning experie

nces. Using auto-ethnographical methods our project reflects on a critical and place-based teacher education agenda highlighting democratic and participatory methods in its approach. We use our experiences combined with relevant literature to explore what inspirations might be drawn from our evolving approach. Drawing from Bookchin's social ecology, our teacher education practices are based on the conviction that most of our present ecological problems originate with/in deep-seated social problems. It follows, from this view, that ecological problems cannot be understood, let alone solved, without a more careful understanding of our existing society and the irrationalities that often dominate it. In our most recent work, our teacher education candidates identified strongly with the related theoretical notions of Social Ecology and Diversity; hence, our identity (as seeds or seedlings) is in a state of flux as we continue to move and adapt to our current socio-political conditions.

Keywords: autoethnography, education for sustainable development (ESD), professional development, social ecology, sustainable development, teacher educationg

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Conservation Tales: A Collaborative Model for Developing Print and Digital Environmental Education Teaching Resources to Engage Children in STEM and Sustainable Development Goals

Tom J. McConnell[(1)], *Barbara Giorgio-Booher*[(2)]

The Conservation Tales Project is a transdisciplinary immersive university course that has developed children's books, science activity plans, and digital storytelling resources to foster interest and understanding of conservation science and activism. The project's goals are to teach children that everyone can impact conservation by making informed decisions, and that anyone can be a scientist by learning the science "practices."

The project engages teams of university students as authors, illustrators, photographers and designers. Each story tells of a child who meets real scientists studying a species or ecosystem. The children learn about wildlife research and how they can contribute to science and conservation efforts.

Since 2016, the project has published 26 books and over a dozen science activities. The books are used in classrooms and nature centers and were selected by the Global Center for Species Survival as a model for environmental education. In 2023, the team branched out to develop digital resources including a video documentary and a planetarium show. Figure 1 shows samples from Conservation Tales: Coral Reef Ecosystems. The proposed presentation will share design

Figure 1 – Samples from Coral Reef Ecosystems – page, science acitivity, cover and video

features of the series, discussing how the features help educators address nine of the UNESCO Sustainable Development Goals.

One of these features is a focus on real scientists. Conservation scientists serve both as characters and "content consultants" who review the books for accuracy before publication. Telling authentic stories helps learners develop an accurate idea of the science practices. The books deliberately select diverse scientists. Other characters are also created to show diverse children learning about conservation, including characteristics like gender, ethnicity, family structure, and disabilities. These characters help convey a key message: "Anyone can be a conservation scientist."

The books also include "Conservation Actions" that readers can do to help them learn that they can make a difference at home or in their community. Each book includes "Inquiry Activities" to help readers develop science skills. By providing hands-on science investigations and links to "citizen science" projects, we hope to help students begin to see themselves as scientists. These two elements of the series contribute to our efforts to strengthen partnerships between the scientific community and the general public.

Presenters will discuss feedback from stakeholders that contribute to recommendations for developing new environmental educational resources. These include the importance of authentic representations of living things, habitats, and scientists rather than anthropomorphism. Teachers and students have also emphasized the need to include positive action plans ("dos") rather than a just list of "don'ts." We will also discuss the need to offer digital resources like videos, podcasts, and social media posts to meet the needs and learning preferences of today's youth.

Keywords: environmental education; curricular materials; digital storytelling

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Conservation Educator Academy at the Indianapolis Zoo: A University-Zoo-School Partnership to Strengthen Teacher Education for Conservation and Sustainable Development

Tom J. McConnell[(1)], *Tolly Foster*[(2)], *Michelle Kolar*[(3)]

Environmental education (EE) is a leading strategy in conservation activism to inform, motivate, and rally the public to conservation action. In today's world of environmental crises, we need a wide range of educational programs to reach as many people as possible. EE programs should reach the widest possible audiences through informal and formal education programs.

One approach is to create partnerships between conservation organizations and teachers to develop EE materials that help learners develop scientific knowledge, attitudes of concern for their environment, and a set of skills and plans for taking local action with a global impact.

The Conservation Educator Academy (CEA) at the Indianapolis Zoo is one example of such a partnership. In 2013, a collaboration began between the Indianapolis Zoo and Ball State University to establish the CEA. The goal of the program is to help K-12 teachers learn about the conservation efforts supported by the Indianapolis Zoo as they develop lessons and unit plans to help their own students learn how to use science practices to understand their impact on the environment and make a difference in protecting habits in their local communities or across the globe.

Each year, a cohort of teachers meets at the Zoo for four days of activities. The workshop is led by education staff at the Zoo and a science teacher educator at Ball State. Teachers go behind the scenes at the Zoo to see how keepers, veterinarians and other staff use science practices (NGSS Lead States, 2013) we teach in schools. The teachers also hear from guest speakers who help them understand current conservation and research projects. Speakers have included Zoo staff who have taken part in conservation work with radiated tortoises, rhinos, and hellbender salamanders, as well researchers from other institutions who study urban wildlife, cranes, macaws and more. In recent years, the CEA includes Conservation Coordinators from the Global Center for Species Survival who describe global efforts to understand environmental issues related to frogs in South America, or fungi and fireflies around the world.

Teachers also take part in sample inquiry learning activities to see how conservation researchers collect data in ways that their students can emulate. Activities have included observing patterns in plant adaptations across different habitats, radio telemetry, and water quality monitoring. Participants also learn about citizen science apps and programs. Teachers use the information they learn at the CEA to develop a science lesson or unit that addresses conservation themes, authentic science practices, or conservation activism that they use in their own classroom in the following school year.

In our presentation, we will share recommendations for the design of the similar programs, with examples from 10 cohorts to show how the program helps zoo and education partners between achieve some of the Sustainable Development Goals (UNESCO, 2017).

Keywords: conservation education; teacher professional development; educational partnerships

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Transformative Learning for Future Teachers: Analyzing of Outdoor Laboratories in Turin University (Italy)

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The challenge of teaching to live in a sustainable way needs an innovative education, adequate in a globalized world: it is necessary to find another way to understand our role in the planet and the relations that we have with other living and non-living elements. For these purposes, the pre-school and primary school period is widely considered crucial to preparing for early forms of action and activism around environmental issues; furthermore, the initial education of teachers, its values and practice are the main drivers of change in schools and among the students. This large-scale study reports the results of a survey conducted during the academic years 2021/2022 and 2022/2023 between the participants to several laboratories proposed within a training course for student teachers at the University of Torino (Italy): the aim was to understand these outdoor learning experiences may have a transformative potential in the level of connection with nature perceived by the students, as well as in their willingness to apply the same teaching methodologies in their future profession. Results of the survey show that there has been a significant empowerment of the perceived connection to nature of the participants; in terms of transformative impact, more than half of the respondents declared that the laboratories led to a change in their beliefs or behaviors. We suggest thus to increase the number of these kind of educational experiences in order to promote a paradigm shift in teacher education toward sustainability.

Keywords: transformative learning, primary school teachers, outdoor education, sustainability education

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L'humanité à L'épreuve Des Déchets Plastiques: Quelle place Pour L'éducation?

Manguele Daniel[1]

Au moment où la communauté internationale se penche de plus en plus sur les effets des changements climatiques dans la vie de tous les jours, la production des emballages plastiques et leur corollaire immédiat qu'est la pollution plastique ne faiblit pas. Une question se pose: Que faire pour apporter des changements réels dans nos comprtements ? Les modes de consommation et de production durable- ODD12-peuvent-ils nous aider ? Bref l'éducation environnementale a-t-elle encore un rôle à jouer ? Les différents rapports du GIEC (GIEC, 2023) nous obligent à enfin passer à l'action. Au niveau individuel chacun de nous a un rôle à jouer. Les 300 millions de tonnes de déchets plastiques déversées dans les océans entrainant la mort des animaux marins ne sont pas pour arranger les choses. Le climato-scepticisme a-t-il encore sa raison d'être ? Les chercheurs sont formels: si rien n'est fait les phénomènes climatiques extrêmes vont s'amplifier. Les stratégies politiques de réduction des GES à travers le démantèlement des centrales à charbon sont en train de connaître une volte-face.

Pourtant nous sommes loin du bout du compte, les partisans d'un développement scientifique et technologique en vue de la satisfaction des besoins matériels restant crampés dans la logique selon laquelle les changements climatiques n'existent pas. Les défenseurs de la théorie inverse restant eux aussi focus dans la leur. Mais tout porte à croire que ce sont les derniers qui auraient raison étant donné les dérives climatiques qui ont cours à nos yeux. De toutes façons, il faudrait agir avant que le laxisme et la somnolence ne viennent nous faire sombrer dans la destruction que nous ne voulons pas du tout. Il faut opter pour la théorie des équilibres laquelle veut que nous trouvions le juste milieu nous permettant de continuer de vivre sur la terre dont la survie est de plus en plus menacée. Aussi pensons-nous que l'éducation est l'arme la plus puissante pour changer le monde. Oui, de même que nous tombons malades du fait du paludisme la terre tombe malade du fait des actions anthropiques qui la mettent à mal. Nous devons donc vérifier tous nos faits et gestes au quotidien pour s'assurer que nous ne participons pas à l'aggravation des conditions climatiques de la terre qui est notre unique lieu de vie. Le sommet 'Une seule terre' de Rio92 en est la preuve patente.

Puissions-nous ne lever comme un seul homme pour prendre la défense des intérêts communs tout en rejetant l'égoïsme aveugle qui compromet nos chances de survie.

Keywords: éducation environnementale, changements climatiques, GES, GIES, consommation durable

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Empowering Youth through Climate Education and Advocacy: How Climate Education and Advocacy Will Foster Economic Growth, Opportunities for Marginalized Communities, and Solutions to the Climate Crisis

Bryce Coon[1]

Empowering youth with climate education and opportunities for advocacy is crucial to building a sustainable and equitable future. This session will highlight the opportunities, current state, and importance of collaboration between policymakers, business leaders, and the education sector on climate education and advocacy. We will highlight how a climate-literate workforce is needed to tackle the climate crisis, provide opportunities in the green economy, and promote economic equity.

Across the world, communities are experiencing the effects of climate change, from flooding to extreme heat and many other disasters. Children across the globe are not spared from these adverse effects, and it is through education that we will give youth the ability and power to understand climate change, build resiliency in their communities, and innovate solutions to the climate crisis. We will explore the interconnectedness between climate education, advocacy, and socioeconomic development. We will feature current research, policy, and case studies of climate education in classrooms around the world to illustrate these connections and opportunities.

We will provide audience members with engaging case studies and developments that will foster attendee participation. We will encourage audience participation by responding to these issues with their unique expertise and provide opportunities for evaluation and further communication.

We look forward to the opportunity to share our perspective and case studies with stakeholders from various sectors. Our session will conclude with recommendations for policymakers, businesses, and educators to find opportunities to support and integrate climate education into their work.

Keywords: collaborative learning

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Programa De Formación Ambiental En Reducción De Riesgos De Desastres Para Estudiantes De Universidades De Cuba, Latinoamérica Y El Caribe

Mirurgia Aguilar Velázquez[1]

La investigación contribuye a la formación ambiental en los estudiantes de universidades de Cuba, Latinoamérica y el Caribe para la gestión en la reducción de riesgos de desastres. La elaboración del programa crea nuevas herramientas para el desarrollo del proceso docente educativo referente a conocimientos, habilidades y el refuerzo de valores, que garanticen una actuación consecuente en el desempeño de las funciones así como en el accionar responsable hacia el medio ambiente. La investigación aborda la gestión de riesgos de desastres, en el aumento de la resiliencia a los posibles impactos negativos de los peligros de origen natural, tecnológico y sanitario, la reducción de la exposición, no crear nuevas vulnerabilidades y reducir los riesgos de desastres. La propuesta tiene relación con: La Convención Marco de Naciones Unidas sobre Cambio Climático, La Agenda 2030 para el Desarrollo Sostenible de gran relevancia a la reducción del riesgo de desastres como elemento clave para el logro de los Objetivos de Desarrollo Sostenible (ODS), El Marco de Acción de Hyogo, El Marco de Sendai para la Reducción del Riesgo de Desastres 2015-2030, a la Directiva No. 1 del Presidente del Consejo de Defensa Nacional de Cuba actualizada y perfeccionada en el año 2022 y la Tarea Vida, prioridad que el Estado cubano brinda a la prevención o mitigación de los eventos naturales peligrosos. Es muy oportuna la investigación en un momento que el mandato es avanzar con pasos sólidos hacia la búsqueda de soluciones preventivas ante el actual incremento de los desastres de origen natural y las necesidades de adaptación a los impactos del cambio climático. La propuesta se valora mediante el criterio de expertos y se realiza la evaluación de impacto del programa indica su pertinencia en la formación de estudiantes universitarios. Los resultados de esta investigación constituyen la base principal para la concepción del Plan de Estado para el Enfrentamiento al Cambio Climático en la República de Cuba "Tarea Vida".

El programa de educación ambiental dirigido a estudiantes universitarios desarrollado por diferentes instituciones a nivel nacional e internacional, con el propósito de crear capacidades para el enfrentamiento ante situaciones desastres como respuesta a los problemas que se encuentran en los diagnósticos previos a su elaboración y tiene de base la orientación de acciones posteriores, caracteriza la educación ambiental en el importante rol de apoyo e impulso de un nuevo paradigma del desarrollo hacia una sociedad sostenible y resiliente.

Keywords: educación ambiental, programa de formación sostenible, gestión de riesgos de desastres, enfrentamiento al cambio climático

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Towards a Sustainable Future: Integrating Environmental Health and Modern Pedagogical Techniques in Training Environmental Health Practitioners in South Africa

Sean Mark Patrick[1]

To equip Environmental Health Practitioners (EHPs) with the knowledge and skills to address the issues posed by Endocrine disrupting chemicals (EDCs) and their exacerbated impact due to inadequate waste management practices. The programme aims to provide a comprehensive education, taking into account diverse learning styles and facilitating hands-on, practical experiences.

Acoursewaspilotedin2022forN=35Environmental Health Practitioners. The course utilized a flipped classroom approach where traditional lecture content was shifted online, enabling students to prepare before in-person sessions. This format allowed more in-classroom time for interactive activities, promoting engagement, critical thinking, and problem-solving. The curriculum integrated scenario-based learning, immersing participants in real-world situations and challenging them to apply theoretical knowledge in practical contexts.

The five-day face-to-face course was designed for a wide range of learners. Day One: Introduction to EDCs and waste management using multimedia presentations. This catered to visual, auditory, and reading/writing learners. Day Two: Hands-on activities targeting kinesthetic learners. Days Three and Four: Scenario-based sessions for spatial and logical-mathematical learners. Group discussions and role-playing supported interpersonal learners, while introspective moments were included for intrapersonal learners. Day Five: Consolidation of learning with reflections, group activities, and presentations.

Feedback highlighted the course's success in catering to various learning styles. The multimedia content of Day One and the hands-on activities of Day Two were particularly appreciated. The practical nature of scenario-based sessions and the opportunities for peer learning through group interactions were also commended. However, some suggestions were made, such as introducing more interactivity on Day One, simplifying complex scenarios, allocating additional time for group discussions, re-arranging the busy Day Five schedule, providing guidance during introspective moments, and offering supplementary resources.

Drawing from Gardner's theory of multiple intelligences, it is imperative to align EDC education with the UN's Sustainable Development Goals through an interdisciplinary approach. This ensures that Environmental Health Practitioners are well-prepared for community engagement and continuous growth. To cater to diverse learner needs, from visual to kinesthetic, it's vital to integrate environmental topics across curricula. Regular feedback mechanisms should be in place to maintain course relevance and to recognize the varied intellectual strengths of students.

Keywords: environmental health practitioners; South Africa; endocrine disruptors; sustainable development goals

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Renforcement De la Compréhension Des Concepts Du Programme Global Schools Au Maroc Par Le Biais Du Jeu Et De l'innovation

Faiza Baheddis (1)

À une époque où les défis environnementaux et sociaux sont de plus en plus préoccupants, l'éducation au Développement Durable joue un rôle crucial dans la formation de citoyens responsables et engagés. Le programme Global Schools, appuyé par des outils pédagogiques innovants, s'engage à renforcer cette éducation essentielle. Ce résumé mettra en lumière l'impact des outils développés dans le cadre du programme dans la sensibilisation, l'intégration des concepts de durabilité et la préparation de la nouvelle génération pour un avenir plus responsable et respectueux de l'environnement.

Le programme Global Schools pour l'éducation au Développement Durable vise à sensibiliser les élèves aux enjeux environnementaux et sociaux, intégrer la durabilité dans les programmes scolaires, renforcer les compétences pour devenir des acteurs du changement et encourager les initiatives locales. L'objectif ultime est de former une nouvelle génération de citoyens conscients, responsables et engagés envers un avenir durable et équitable pour tous.

Le programme Global Schools pour l'éducation au Développement Durable sensibilise les élèves, renforce leurs compétences et promeut la citoyenneté mondiale. A cet effet, le Centre a développé un outil pédagogique interactif et innovant qui engage les élèves et leurs enseignants ensemble à comprendre les défis mondiaux du 21eme siècle et les impliquent dans des projets durables pour leur communauté, formant une nouvelle génération responsable et engagée pour un avenir durable.

Un jeu interactif sous forme d'une application associée à une plateforme, portant sur les compétences du 21ème siècle et abordant les 17 objectifs du développement durable a été mis en place par le Centre dans le cadre du programme Global Schools pour l'éducation au Développement Durable. Ce dernier a obtenu des résultats encourageants grâce à des méthodes pédagogiques innovantes et une approche globale. Les élèves sont sensibilisés aux enjeux environnementaux, renforçant leur compréhension des principes de durabilité et développant des compétences pour agir en faveur du changement durable dans leur communauté.

Le jeu élaboré dans le cadre du programme Global Schools a non seulement renforcé la formation des éducateurs, mais il a aussi agi comme un moyen privilégié pour faciliter la compréhension des concepts de durabilité chez les élèves. Grâce à cette approche ludique, les élèves ont été sensibilisés de manière particulièrement efficace aux enjeux environnementaux et sociaux. Les outils pédagogiques novateurs utilisés et l'approche holistique adoptée ont contribué à ce succès en offrant une perspective globale. Pour maintenir sa réussite, il est crucial de renforcer la formation des éducateurs, d'encourager l'innovation pédagogique et de sensibiliser les parents et la communauté.

Keywords: Programme Global Schools, jeu interactif, objectifs du développement durable

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533 C.A.R.E. (Climate Action through Reflection and Emotions) for the Planet

Anurag Deep[(1)], *Ananya S Rao*[(2)], *Nandini Chatterjee Singh*[(3)], ***Anantha Duraiappah***[(4)]

Behavioural change for proclimate choices and action is an urgent need and environmental education must take a holistic and transformative learning approach. The recent International Science and Evidence-based Assessment report (ISEEA, 2022) highlighted the CASE (Cognitive, Academic, Social and Emotional) approach for whole brain learning for behavioral change. In response, UNESCO MGIEP designed an online interactive course on climate change that adopts the CASE approach using multiple digital pedagogies maximizing digital affordances. The course designed for 13yrs+ titled C.A.R.E. - Climate Action through Reflection and Empathy, has 3 levels, where each level progressively builds on domains of cognition, academic knowledge, & social & emotional competencies and is available on Framerspace.com. It uses the EMC2 framework (Singh and Duraiappah, 2023) to cultivate competencies of Empathy, Mindfulness, Compassion & Critical Inquiry toward positive climate action.

Using immersive pedagogy this workshop shows how a learning experience that integrates cognition and emotion can action behavioural change. It shall highlight the interconnectedness of all beings on the planet.

The Goals of the Programme are:

- To provide a learning experience employing the CASE approach.
- To foster an awareness of interconnectedness among all life forms and the vital role of SEL for effecting climate action.

The programme comprises:

Welcome: participants and set the workshop's purpose (Emotions check-in) (5 min)

Engage: participants in a group activity illustrating the interdependence through the "Web of Connection: EmoCon Game" (30 min)

Overview: C.A.R.E's structure and the digital pedagogies used & Highlight how the course integrates CASE approach (15 min)

Reflections and Wrap-up (10 min)

(TOTAL 60 mins)

The impact of the learning experience will be evaluated through creative pre-post cognitive, academic and emotional check-ins, focused group discussions and a climate action board.

Participants are encouraged to enrol in C.A.R.E course. Educators provided opportunities to use this course in their classrooms by blending real-world cases with existing environmental education. Practical applications encompass community projects translating knowledge to action and policy recommendations for national Climate Action.

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Keywords: climate action, emotional resilience, proactive engagement, behavioural change

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Shaping Sustainable Mindsets: Exploring Climate Change Education Practices in Riyadh Science Classrooms

Hiya Almazroa[1]

Climate change has emerged as one of the global challenges of our time, with far-reaching implications for the environment, societies, and economies worldwide. As awareness of the impacts of climate change continues to grow, the role of education in addressing this issue becomes increasingly significant. Research on climate change education has predominantly focused on Western contexts, leaving a gap in understanding the practices and perspectives of science teachers in gulf region.

Research Question:

This research paper aims to fill this gap by investigating the climate change teaching practices among science teachers in Riyadh. Saudi Arabia. Understanding how climate change is taught in Saudi science classrooms is essential for designing effective educational strategies that align with local contexts and contribute to building climate change literacy among students.

The survey was distributed to a sample of science teachers across Riyadh different educational district areas. The data collected were analyzed using both a survey and interview technique methods to provide a comprehensive understanding of the teachers' perspectives.

Regarding frequency of teaching climate change among teachers, only 7.6% of teachers reported practicing it regularly, while 10.2% did not include climate change topics in their instruction at all. The study identified factors that influenced the integration of climate change into teaching, including curriculum content, teacher confidence and knowledge, availability of resources, and time constraints.

Regarding the content covered, the survey revealed that science teachers addressed a wide range of topics related to climate change. The survey found that climate and weather were addressed the most frequently, with a percentage of 64.3%. On the other hand, the topics of political discourses and climate activism were covered the least, both with a percentage of 5.5%. These findings indicate a clear need for more comprehensive and standardized approaches to climate change education.

The survey also examined the educational methods utilized by science teachers to teach concepts related to climate change. The results uncovered a variety of instructional strategies employed. The most frequently used methods included documentary research, (44.7%), projects (38.1%), Other approaches employed to a lesser extent were games (10.2%), outdoor visits (6.6%). These findings indicate the teachers' dedication to engaging students and fostering active learning experiences by employing diverse instructional approaches.

This study provides valuable insights into science teachers' perspectives on climate change education. It is anticipated that the research outcomes will inform future initiatives aimed at strengthening climate change education within the Saudi educational system.

Keywords: environmental education, climate change, science teacher, teaching practices, Saudi Arabia

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Every Child Outdoors and the Rare Chain of Learning: A Model for Environmental Education for a Sustainable Future

Istafa Sufi[1]

The rare Charitable Research Reserve is an urban land trust and environmental institute in Waterloo Region, Ontario, Canada, that protects over 1,350 acres of highly sensitive lands. Our ultimate goal is to make the world a more sustainable place by stewarding a diverse network of natural landscapes for ecological integrity and for future generations through conservation, research and education. Since inception, rare has taken care of the land on behalf of the community through the use of Western tools in conservation, research and education. As rare becomes engaged in reconciliation with the Indigenous Peoples of Turtle Island (North America), these pillars now equally include and value Indigenous ways of knowing and being – becoming three strands of a strong braid. Together we steward these lands with respect for generations past, present and those yet to come, intact in perpetuity with trees more than 250 years old, 24 habitat types, and over 5000 unique species.

Since its inception in 2003, over 21 000 students have participated in youth environmental education programs at rare, called Every Child Outdoors (ECO). This name reflects our belief that every child should have the opportunity to be outdoors in a safe natural environment, guided by strong role models that promote an enthusiasm for learning and caring for our planet. At rare, we offer experiences that build a lifelong love of nature as well as empower students to make a positive change in the world by inviting them to have physical interactions with nature and experiencing true place-based learning. ECO allows children and youth to explore large tracts of protected natural landscapes supporting many unique and globally rare habitats that are home to diverse flora and fauna. Through ECO, children build interest and bond with nature, feel a greater sense of purpose in life and a stronger sense of belonging to their community, in both a local and global sense. This is done through the rare Chain of Learning: a concept that allows for the cross-generational exchange of knowledge and experiences among learners and teachers of all ages and backgrounds. Environmental Education at ECO includes learning through gardening, hiking, research, games/activities and indigenous education. Specialized Mirrored Research programs – programs that allow students to "mirror" the research and monitoring activities conducted on rare lands allow youth to build research experience and contribute to monitoring efforts. Our Mirrored Research Mentorship programs extend the learning by getting secondary students that have visited rare for a Mirrored Research program to revisit to teach younger students what they learned at rare. ECO also includes a youth led environmental network called the rare Environmental Youth Network (rEYN). With rEYN, youth aged 15-18 can network and collaborate on tackling local environmental issues they are passionate about and have their say in what goes on in their communities.

Keywords: outdoor learning, experiential, place-based, sustainable

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Learning from Young People: Examining Young Ideas for Climate Change Education in Europe

Kathy Reilly[1]

Drawing from data collected as part of the 'Challenging the Climate Crisis: Children's Agency to Tackle Policy Underpinned by Learning for Transformation' (CCC-CATAPULT) project, this paper centres on young people's experiences of climate change education (CCE) and outlines a blueprint for what young people think climate change education should look like.

There is much written on CCE (*e.g.* what it is; what it should be; how it should be taught; where it should be taught) but there is little exploring young people's views on learning about climate and climate crisis. This paper asks that question: What has been young people's experiences of CCE? Further to this: How would young people suggest CCE be adapted/changed?

This paper considers data collected as part of 21 focus groups for the CCC-CATAPULT project, engaging more than 100 young people in four case study sites - Bristol (UK), Galway (Ireland), Genoa (Italy) and Tampere (Finland).

The paper outlines key themes transecting young people's experiences of CCE.

The paper then considers how prominent themes inform guiding principles and recommendations for future climate change education according to young people participating in the CCC-CATAPULT European project.

Keywords: climate change education (CCE); recommendations for future CCE; co-productive and creative methodologies; young people

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Exploring the Challenges, Key Factors of Success, and Suggestions for Change to Implement Sustainable Education in UAE Primary and Secondary Schools

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Sustainability and education have been priorities in the UAE and globally for the last decade. Many programs and policies have been developed to help make the UAE school system more sustainable in its curriculum, management, and operations. However, not all schools have successfully implemented sustainable education. The objectives of this study are to identify the challenges and key factors of success (KFS), and then provide suggestions for change to implement sustainable education in both UAE primary and secondary schools. To do this, self-administrated online surveys with quantitative and open-ended questions were collected from 56 school teachers and staff from 39 schools. To analyze our data set, we then used descriptive quantitative analysis and thematic content analysis.

First, we identified 5 key challenges to implementing sustainable education in the UAE:

a) limited staff knowledge on sustainability topics,
b) negative/unfavorable community, teacher, and student attitudes towards sustainability,
c) lack of financial, material, and time resources in sustainability related projects, activities, and operations,
d) various types of COVID restrictions and limitations affecting activities and initiatives, and
e) inconsistency in policy and planning practices.

Second, the top KFS identified were:

a) student and parental awareness, support, and involvement,
b) schoolwide awareness campaigns that includes families,
c) collaboration with external institutions at the industry and government levels,
d) staff training, teacher willingness, and passion,
e) strong leadership from administration, and
f) integrating sustainability within curriculum and extracurricular activities.

Third, we explored the respondents' main suggestions for change to enhance sustainability both within their school and schools throughout the UAE. The top responses were:

a) the need for government mandated policy for sustainability as a core subject in the curriculum with examples and guidelines to provide the time needed,
b) increased opportunities to make operations sustainable as an example to the community, especially more Emirate-level sustainability infrastructure for waste management like recycling, food segregation, and composting,
c) UAE and school level competitions and award systems for incentives,
d) provide opportunities for teacher and staff training, and
e) develop campaigns, workshops, and drives for schools and the public to enhance sustainability awareness.

Theoretical and practical implications of these results are discussed.

Keywords: sustainable education, sustainability, primary education, secondary education

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The ESD Free Semester "Sustainable Me and world"

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Sustainability education can be integrated into schools even if students experience significant pressure from standardized testing. In South Korea since 2016, the 'Free Semester' policy has been implemented to alleviate the substantial academic stress that school students commonly face due to standardized testing. During 'free semesters,' national standardized tests are suspended, and educators assess students' progress and participation without overwhelming testing. The evaluations conducted within the framework of the free semester do not contribute to students' formal academic grades. In 2019, the Gyeongsang Province introduced an Enhanced Sustainability Education(ESD) program intended to provide students with comprehensive educational content during the 17th semester. This program was developed in collaboration with RCE Tongyeong, a regional center of expertise for ESD in Korea. Structured across 17 thematic classes with its own textbook, this program delves into subjects such as responsible and sustainable consumption, energy dynamics, food systems, employment landscapes, localized research endeavors, and more. This curriculum emphasizes not only fostering knowledge acquisition but also cultivating pro-environmental attitudes and functions. The program is designed to help students contextualize their acquired knowledge within their local communities. The program facilitates engagement in problem-solving while building on opportunities and assets of their local communities. For instance, in a 'Sustainable Food Choices module,' students are creating vegan recipes to replace regular school meals, which encourages them to advocate for and propose the adoption of this eco-friendly meal option in their schools. This approach aligns with the broader objectives of ESD and nurtures a generation of learners who possess a nuanced understanding of sustainability while making tangible positive changes in their communities.

In South Korea, although environmental topics are included in the curriculum, the proportion of these subjects being offered as elective courses is very low, resulting in limited practical implementation of environmental education. Further, due to a shortage of environmental educators, teachers from other disciplines are often tasked with delivering environmental education, which hinders the provision of specialized instruction. Addressing these challenges, RCE Tongyeong seizes an opportunity: empowering women on career breaks to rejoin as ESD instructors. This not only aids their reentry into the workforce but also fosters sustainability knowledge and attitudes, benefiting the community and youth. These women play a key role in building sustainable communities by spreading environmental consciousness and nurturing vital skills.

Keywords: youth, community engagement, education policy, regional centre of expertise

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Integration of Participatory Environmental Education into the 'Quality School Framework' of Primary Schools under the Ministry of Education and Sports in Laos

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To raise environmental awareness of the primary school children in Laos, hands-on environmental education is integrated into a larger programme goal "improved quality education for primary schoolchildren in the target districts".

The programme addresses the root causes of poor quality education of primary schoolchildren in rural areas. Main problems are: (1) schools lack of safe and peaceful environment in the form of green and clean school models according to the environmental criteria of the quality school framework of the Ministry of Education and Sports (MoES); (2) Teachers limited knowledge and pedagogical skills in hands-on environmental education, teaching math and Lao; (3) low competencies of school principals; (4) limited capacity of District Education and Sport Bureau (DESB) to address their challenges in supporting teachers; and (5) limited community participation in education development.

Participatory Learning and Action is applied, where teachers, community members and primary schoolchildren are supported to identify problems, brainstorm for solutions, take decisions and actions for school environment and education development. The coordination system among DESB, schools and communities are strengthened.

The community engagement in education development has an outstanding achievement. School buildings and playgrounds are constructed by communities, using locally available, materials. School grounds are surrounded by native hedges, planted by communities with children's support, to promote biodiversity. Children have learnt about the environment through their engagement in establishing community environmental code of conduct, school development plans, school gardens, tree nurseries and waste management.

Although the success is high, there are some challenges. Some green and clean school criteria, taken from the MoES' quality school framework, cannot be fully complied with in the local context, the limited capacity of teachers and education administrators. Teachers should be supported to contextualise criteria and link activities with relevant contents and subjects of the curriculum.

In conclusion, the programme has a great achievement in community ownership in green and clean school development, playgrounds and school gardens which have become more attractive to the children to come to school. The children have been engaged in and learnt from all processes of green and clean school development. In addition to improved learning performance and quality, children have benefited from produces (fruits, vegetables, seedlings), which are either cooked for food/snacks or sold for school income which are converted into rewards for their active participation and school material for needy children.

Collaboration among the communities, teachers/school managers and DESB is key and must be strengthened to ensure the integration of Participatory Environmental Education into the Quality School Framework of Primary Schools.

Keywords: participatory learning and action, hands-on environmental education, community environmental code of conduct, capacity building

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Determination of the Relationship between High School Students' Knowledge, Awareness and Attitude Levels towards Sustainable Development

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"Sustainable development", a development model that can meet the needs of present generations without compromising the ability of future generations to meet their needs, entered the world agenda towards the end of the 20th century and became a global implementation plan with international agreements signed in the 1990s. The sustainable development approach sets "sustainability" as the common denominator in the economic and social development goals of countries. This common goal, which also embraces the future, aims to enable everyone to meet their basic needs and expectations for a better life. Implementation of a development strategy that does not link the environment and socio-economic development may meet current needs, but it may jeopardize the fulfilment of people's basic needs in the future. This is because there is no certain limit beyond which growth can lead to environmental disasters, and environmental degradation is often irreversible. Therefore, a holistic assessment of the interaction between the economic and social structure and the environment, ensuring that present and future generations benefit equitably from the opportunities that development brings, constitutes the basic philosophy of sustainable development. Past experiences better emphasize the importance of this approach. In this context, the current study investigated the relationship between secondary school students' knowledge, awareness and attitude levels towards sustainable development. The study is quantitative research and designed with the relational scanning model. The sample of the study consists of 650 students studying in high schools in a province in the Western Black Sea region of Turkey. "Sustainable Development Knowledge Scale", "Sustainable Development Awareness Determination Scale" and "Attitude Towards Sustainable Development Scale" were used as data collection tools. In the analysis phase, the analysis process of the study was completed by analyses according to the status of variables included in the sub-problems. According to the data obtained, it was determined that high school students' sustainable development knowledge scores were at a good level. In addition, it was determined that the level of Sustainable Development Awareness of high school students was at a medium level. In addition, it was determined that students' Attitude towards Sustainable Development was at a good level. When the correlations between all three scales were examined, it was determined that they had a moderate level of relationship with each other. According to the results of the research, suggestions were made for sustainable development education.

Keywords: sustainable development, knowledge about sustainable development, attitude towards sustainable development, awareness towards sustainable development, high school

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574 Compulsory Environmental Education in the Undergraduate College Level

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The United Arab Emirates University decided to add the Environmental Education (EE) as compulsory course to all undergraduate students, starting from batch 2019. The EE course is called "Sustainability" and provides the students with the principles of sustainability, in terms of science, economy and sociology. This course was added to enrich the students with the necessary knowledge regarding the environment, the country's short- and long-term strategies, and Sustainability Development Goals (SDGs). The work I present is the result of my experience as a member of the Sustainability Course development committee and as an instructor on the course for four years. The students have been exposed to sustainable buildings and projects in the country through physical visits. In the first version of the course, the instructors focused on theoretical concepts of biology, geography, chemistry and statistics, whereas the following versions were developed, and they look more towards inducing innovative solutions from the students for the most recent environmental challenges in this arid part of the world. The course turned out to depend on independent learning with continuous guidance and supervision from the instructors. Only 25% of the course was settled as a formal exam, and the rest of the evaluation was attributed to innovative activities, reading, reporting, discussions and visits to sustainability projects. It was observed that students who are taking the sustainability course in their first year are more likely to participate in the SDGs specialized research projects in the following years and were contributing more effectively to the research statistical and analytical work.

Keywords: environmental education, university, UAE, arid region, SDGs

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Climate Change Education for Primary School Children in Kenya

Emmanuel Gichuru Muchora[1]

Climate change is a serious threat to Kenya, and its impacts are already being felt by children. Increased flooding, drought, and heat waves are disrupting education, making it difficult for children to learn and grow. Climate change is also causing food insecurity and water shortages, which are putting children's health and well-being at risk.

Climate change education is essential to help children understand the causes and impacts of climate change, and to develop the skills and knowledge they need to act. Climate change education should be integrated into the primary school curriculum and should be age-appropriate and engaging. It should focus on the following key areas:

- The science of climate change
- The impacts of climate change on Kenya
- What children can do to reduce their carbon footprint
- How children can adapt to the impacts of climate change

Climate change education can empower children to be agents of change. By learning about climate change, children can develop the skills and knowledge they need to make informed decisions about their own lives and the future of their planet. They can also take action to reduce their carbon footprint and help to mitigate the impacts of climate change.

Here are some specific examples of climate change education activities that could be implemented in primary schools in Kenya:

- **Storytelling:** Teachers can use stories to introduce children to the concepts of climate change and its impacts. For example, they could read stories about animals that are being displaced by climate change, or about children who are taking action to reduce their carbon footprint.
- **Games and activities:** There are many games and activities that can be used to teach children about climate change. For example, children could play a game about conserving water, or they could create a model of a solar panel.
- **Field trips:** Field trips to local parks, forests, or rivers can help children to learn about the natural world and the impacts of climate change. For example, children could visit a river that has been polluted by runoff from farms, or they could observe the effects of deforestation.
- **Community projects:** Children can get involved in community projects that help to address climate change. For example, they could plant trees, help to clean up a polluted river, or advocate for policies that reduce greenhouse gas emissions.

Climate change education is an important part of preparing children for the challenges of the future. By teaching children about climate change, we can help them to become informed citizens who are ready to take action to protect their planet.

Keywords: climate change, adaptation, impacts, risks, benefits, challenges, measures, resilience, ecosystems, biodiversity, early warning systems, water management, seawalls, drought-resistant crops, relocating communities, natural systems, comprehensive approach, stakeholders, urgent priority, green economy, political will, lack of understanding

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Evaluating Environmental Learning

David Zandvliet[(1)]

Learning environment research can provide an effective format for assessing formal education programmes that are interdisciplinary and experiential by structure and design. Several experiential, programmes in BC were selected to participate in this study. Learning Environment surveys were used to explore possible trends in student perceptions of learning experiences. Trends that were discovered through the questionnaires were further investigated through small group interviews with students from each of the programmes. Environmental learning is by nature interdisciplinary. Unlike disciplinary studies, environmental programmes draw from a variety of theoretical backgrounds and pedagogies. For this reason it is very difficulty to develop one consistent research framework. In the same way that environmental education gains strength from each of the disciplines it incorporates, so to should the research field gain strength from the drawing together of various research foundations from all the disciplines. Often confounding the interdisciplinary aspect of environmental education is the grass-roots nature of environmental programmes, with curriculum being developed for specific local audiences. Due to the generally small size, many environmental education programmes are never formally evaluated or if they are, publication of the results may be difficult to find. It is often difficult to isolate specific outcomes to measure how effective a programme is.

Experiences in environmental education may not demonstrate their effects until long after the educational experience is completed. Further, environmental education programmes are often process-based not outcome-based. For these reasons much of the past research in the field has been reliant on qualitative methodology. This study recounts the development and validation of a number of new learning environment instruments which will in future allow a combination of mixed-methods approaches in the grass-roots and/or action-research based evaluation of EE programming.

Keywords: learning environments, sustainability, environmental learning

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Assessment of Gold Miners' Awareness of Environmental Risks in Rwanda: Re-thinking the Contribution of Environmental Education in Formal and Informal Settings

Florien Nsanganwimana[1]

Mining is considered as one of the important economic activities worldwide with a high potential of socio-economic transformation of countries. At the same time, the environmental and health impacts of mining on surrounding communities have been major concerns to governments, the general public and stakeholder organizations and individuals. The present research explored two objectives: assessing the perceptions of gold miners and local community of the environmental and health impacts of gold mining, and examining whether schools' curricula provide opportunities for raising awareness on environmental and health risks associated with Gold mining.

The research questions are:

- Do miners and community demonstrate awareness about environmental and health impacts associated with gold mining?
- Do the curriculum design and implementation consider environmental issues for sustainable mining, safety and protection of living environments?

The study adopted a descriptive research design where primary data and secondary data of various sources were used for analysis and interpretation. Based on purposive sampling techniques, key informants and focus group discussions were used to assess the awareness of mining risks and the status of environmental education in schools located in the vicinity of gold mining sites.

Miners and the local community demonstrate awareness of environmental harms due to gold mining as well as perceived physical impacts mainly loss of suitable agricultural land, soil erosion, landslides and accidents, and spoilage of water. They also pointed out that the combined effects of environmental problems have culminated into health problems with high prevalence of diseases such as respiratory tract infections and skin diseases. On the other side it was revealed that the government of Rwanda has included environment issues including mining in the subjects of science and technology of the curriculum primary school topics about. Teachers are aware of environmental risks associated with gold mining and they emphasise that the environmental education is a crosscutting issue in the curriculum. However, as part of extra-curricular activities to raise awareness of environmental issues, schools' environmental clubs only focus on protection of environment like valleys, forest and other important biodiversity, and tend to ignore soil and mountains which are the most affected by mining activity.

For more protection of the environment as well as preventing health risks associated with gold mining, the findings emphasize the need to rethink the new strategies to teach environmental education in schools at early age instead of relying on extra-curricular activities and informal learning. Also, considering the economic benefits of gold mining activities in the studied area, safe mining require that miners be trained on safety and self-protection to prevent some harmful health risks.

Keywords: environmental education, mining risks, environmental awareness

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Effective Citizen Science: Playing a Role in Marine Life Restoration

Ahmed Nabil Abdel Kader[1]

The current situation is that the Florida / Caribbean barrier reef has already been lost.

Great barrier reef of Australia lost around 65% of its corals, there are immense efforts exerted by Scientists and marine biologists to protect and maintain the remaining 35%.

Red Sea/ Eastern Africa and Arabian Gulf are highly threatened as well.

The philosophy of "protection is always preferred over restoration" is a luxury that no longer applies to most regions.

NOW Restoration is necessary to preserve the biodiversity and functionality of reefs and ensure the sustainability of their resources

The proposed "Effective citizen science program" consists of 2 directions:

a) Raising awareness

b) Practical efforts.

The Program is designed to give students/ volunteers an introduction to Coral Reef Ecology & Awareness.

How to view the reef scientifically by assessing key biotic and abiotic reef components.

Teaches the volunteers how to use real world scientific sampling, conduct reef survey techniques and create new artificial reef. (Creating new life, NEW Reef)

By end of the program:

- Students / Volunteers should have full knowledge about climate change and its impact on marine life.
- Conservation strategies and how to contribute in restoration efforts.
- The volunteers should leave a positive impact by creating a new marine life. (artificial and/or natural habitat)
- To present an effective Citizen science.

The program structure is as follows:

a) Raising Awareness

Over four sessions / workshops., It includes four theory presentations:

i. Introduction and Reef Check Method, Fish, Invertebrates
ii. Human Impact, Substrates including Coral, Algae, Reef Rock and Sands.
iii. Informative talks about sharks, dolphins and dugongs in Arab Gulf.
iv. Explain about the flora and fauna around Arab Gulf coast.

b) Practical efforts

i. Identifying corals to their taxonomic levels
ii. Identifying Biodiversity of corals in an area
iii. Monitoring threats such as predation, bleaching, or diseases;
iv. Monitoring corals for health condition and status
v. Conducting advanced research and / or restoration projects
vi. Identifying rare or endangered species of coral
vii. Create new habitat for corals –artificial and / or natural
viii. Growing corals as initiative to create new habitat for marine animals

We take an ecosystem learning / educating holistic approach, focusing on the long-term sustainability and adaptability of the ecosystem rather than just trying to add more corals into areas where they will not survive.

Finally, we also adhere to the code of ethics outlined by the Coral Restoration Consortium.

Keywords: effective citizen science program, coral reef ecology & awareness, climate change, marine life impact

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Comparative Study of Environmental Moral Judgement with Specific Teaching on Sustainable Development or not

Amélie Lesenecal[1]

In recent years, many researchers have focused on the development of environmental values in children (Hansla & al.; 2008; Perssonaa, & al. 2015). The pioneer, Kahn (2002, 2003, 2008) identified three types of environmental moral reasoning: homocentric, biocentric, and isomorphic. The first suggests that the environment is at the service of humans. The second states that the environment has an ethical status, it has rights comparable to human rights. The third makes the connection between the two preceding arguments, since the two have essential similarities. The national plan Santé-Environnement (2021-2025) proposes a specific education for sustainable development. The present study questions the influence of this teaching on moral development in children of CP and CE1. For this we chose a school with a specific teaching and a school without this teaching. We assume that students from school with sustainable development education will have a more biocentric and/or isomorphic reasoning as opposed to students without this teaching.

A total of 116 children participated in the study. We proposed "moral dilemmas" that included different components. The interviews were conducted individually after parental authorization. First, we conducted a qualitative analysis. The inter-judge method was used (Kappa coefficient is 0.85) to classify responses according to the reasoning identified by Kahn.

The results show that children justify their answers mainly through two types of reasoning: biocentric and homocentric. Biocentric reasoning is most commonly used in both grades and independently of the teaching delivered. However we have been able to identify the influence of the teaching of sustainable development: CP students without specific teaching, use biocentric reasoning in 35.98%, students with specific teaching give biocentric responses in 51,61% of cases. For CE1 students without teaching, they use this reasoning for 45.32% of their responses compared to 55.57% for students with a specific education.

Our findings, along with preliminary analyses, show, as in Kahn's studies, that environmental moral reasoning is primarily biocentric in children. However, our results indicate that teaching sustainable development can strengthen children's environmental morality towards a more biocentric and therefore more ecological reasoning. The objective for future studies is to pass moral dilemmas on to more subjects in different communes.

Keywords: sustainable development, dilemmas, teaching, moral judgment, reasoning

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Learning to Run a Sustainable Business – Use of a Green Business Simulation Game in an Undergraduate Business Communication Course

Simon Burfoot[1]

Business communication courses can teach undergraduates about the theory and practice of environmentally sustainable businesses communications, but students lack practical experience of running a sustainable business and hitting CO_2 emissions reduction targets. To address this gap and examine the potential of computer simulation as a pedagogical approach, an environmentally themed business simulation game was incorporated into an undergraduate business communication course to be played in class.

The research questions:

- Is a green business simulation game feasible as a classroom activity to give students experience of real-time communication in a sustainable business?
- Can a green business simulation game increase students' engagement and motivation to improve their business communication skills?
- Can a green business simulation game help students acquire terminology and knowledge of sustainable business processes?

After evaluation, a game called GoGreen Inc. was selected. Students play in teams of 5+, taking roles of CEO/Sales/Marketing/Finance/Production. The game is played in compressed real time in 26-minute rounds representing 26 weeks of business, a complete game has three rounds. Players cooperate to run a company aiming to to make a profit and reduce CO_2 emissions.

The game was incorporated into an existing undergraduate Business Communication Course. One section of 26 female Business students played one 26-minute round of the game during normal class time, once a week for three weeks until a complete game was played. Two teams of 13 competed, each with 1 CEO and 3 students each in the other 4 roles.

After the game, holistic feedback was gathered by reflective discussion and email. Business terminology and knowledge acquisition was tested by a 25-question multiple choice quiz featuring words and phrases appearing in both the game and course textbook. End of course, students completed a motivation and engagement questionnaire. Test and questionnaire results were compared with a control group of 26 students who had not played the game.

Students were highly engaged and holistic feedback was highly positive. Motivation questionnaire scale scores were significantly higher in the test group vs the control group. There was no significant difference in terminology and knowledge quiz scores between groups.

Serious simulation games have great potential as an engaging pedagogical approach to prepare students for a future workplace where environmental sustainability is a key issue. To be fully effective, it is recommended that a course in sustainable business communication is custom built around the simulation. This will offer enhanced opportunities to pre-teach the language and processes involved and deeper reflection between game sessions. Output from the game could be used as a basis for other practical activities such as presentations, business reports and digital communications.

Keywords: sustainability, business communication, simulation, student engagement

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School as Sustainable Enterprise: Building Climate Resilient Communities Through Investment in the Girl Child

Rebecca Keogh[(1)], *Jeremy Williams*[(2)]

Scholars working in the field of the economics of education have long documented how investment in girls' education delivers the greatest return in terms of societal wellbeing (see, for example, Dollar and Gatti, 1999; Forbes, 2000; Klasen, 2002). Unfortunately, mainstream economists have quite a narrow interpretation of wellbeing, the rate of growth in gross domestic product (GDP) usually serving as the main barometer. The problem here is that higher rates of economic growth do not necessarily imply improved outcomes in terms of gender equality. Getting girls in school certainly represents progress. There are 129 million girls around the world who are not in school (UNESCO, 2022), and there are numerous obstacles to overcome if this problem is to be seriously addressed. The good news is that far more attention is being devoted to girls' education and the empowerment of women today than in the past, as countless NGOs and charities have sprung up in recent years that focus on these issues. A key question, however, is whether it is sufficient just to get girls to attend school. Less attention seems to be paid to what they actually do when they get there. Admittedly, some education is better than none at all, but what if girls attended schools where the measure of success was less focused on exam results, getting a good job and growing GDP? In this paper, we present the case for school education that aligns with the Sustainable Development Goals (SDGs). Green School for Girls (GS4G) – a pilot program – seeks to implement a curriculum and pedagogy that will produce strong, independently minded, entrepreneurial young women, capable of earning a good living for them and their families in a fashion that is in harmony with the interests of the community and the natural environment.

Keywords: sustainable enterprise, sustainable development goals, girls' education, women empowerment, social entrepreneurship

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Research about Students' and Teachers' Views on Sustainability - to Support Evidence-based Sustainability Education Development

Katalin Czippan[(1)], *Daniel Sziva*[(2)]

In Hungary, ESD is increasingly being integrated into different levels of the education system through the Green Planet Pedagogical Program, which aims to highlight the connections between different areas of life, based on the everyday experiences of the students, and to encourage young people to choose a sustainable lifestyle, make conscious decisions and take actions.

In order to develop a method for international comparison research and establish further educational cooperation between the current and future collaborating countries, a representative sample survey was conducted within the framework of the Teachers and Students on Sustainability Research Programme in October 2022 among 11th-grade secondary school students in Hungary, Slovakia and Czech Republic.

The main aim of the research was to reveal students' views on sustainability issues and examine the differences between and within participating countries. The most relevant scales were on students' attitudes toward the environment and climate change, pro-environmental behaviour, action competencies, eco-anxiety and eco-guilt.

In Hungary and the Czech Republic, a two-stage random sampling procedure was used, in Slovakia, the data for the sampling were unavailable. The participating class within each school was also randomly selected. The deviation of the samples from the distribution of the population was corrected by multivariate weighting (criteria: region, school type, school owner).

The total sample consists of 6477 respondents, 3434 from Hungary, 1656 from the Czech Republic and 1387 from Slovakia. The joint survey contained 118 items (plus additional country-specific questions). The scales used (*e.g.* New Environmental Paradigm, Environmental values, Inclusion of Nature in Self Scale, Environmental Hope, *etc.*) were selected jointly by the cooperating partners.

Overall, participants in all countries have very similar views and attitudes on sustainability. The average NEP environmental attitudes scale score indicates a markedly positive environmental attitude. In general, young people in the three countries show a high level of environmental awareness at the verbal level, however, only a very small proportion are actively informed about environmental issues in any form, and the average of the inclusion of nature in self conscience was around 2,58 out of 7.

In the session we would like to share with the participants the results and challenges of the research, to learn about similar initiatives conducted elsewhere and to discuss the possible extension and further development of the research, and how it can be used in regions outside Europe for international comparability. How research collaborations, and the IUCN Commission on Education and Communication Nature Education for Sustainability network, can contribute to science-based ESD development.

More info:
https://www.fenntarthatosagikutatas.hu/en/

Keywords: education for sustainable development, students on sustainability, representative survey, environmental attitudes, Visegrad Countries

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The Gaia (Earth) Education Philosophy - A Journey Back to the Future

Darius Singh (1)

In the context of Early Education, we navigate through teaching and learning approaches from a range of ancient cultures to more recent 100 year old theories that have influenced the world of early education. We then introduce a complementary element that we believe formally adds to the richness and value of each philosophy. We call this the "Gaia Education Philosophy". Gaia means Mother Earth in Ancient Greek, and we take its principle to be simply, to discover a connection of all we do with the oldest living and breathing entity that we know - Earth.

Adopting Gaia principles to education acknowledges and models the innovative trials and errors, necessary changes and evolutions, and resilient growth and sustainability principles that our Earth has repeatedly demonstrated and proven for over 4 billion years.

Examples of Gaia principles are already evident in the global medical industry with the shift in recent decades to incorporate nature-based and ancient eastern practices with the science-based methodology adopted in western practices. Gaia principles can also be seen in modern day engineering through the practice of biomimicry – the study of nature's 4 billion years of experience in successes and failures for solving problems of today's technical issues. However, recognising Gaia principles in education philosophies and curricula is currently more implicit and embedded rather than explicitly identified as a source of knowledge or guiding principle for teaching and learning.

For the first time in the history of planet Earth, one of its species is able to not only identify and quantify the impact of its presence on a planetary scale, but can also create models to forecast and extrapolate the effects of its continued and growing presence – all of which currently lead into an accelerated pathway that could lead to the destruction of life itself for our species (not the planet).

In a rapidly evolving era from the information age into:

a) a "real-time consumer age" where our rates of consumption of Earth's resources are unstable and unbalanced, and

b) a "hybrid age", where technology is ubiquitous, embedded, and even controlling elements of daily life, a return or reminder of basic values and principles for life itself must be highlighted for our young learners who are entering this era that we have created for them.

We present compelling connections between existing teaching and learning philosophies with Gaia principles and reveal that lessons learnt from the story of Earth itself, can be the strongest foundation for educating our young into a stable and balanced future of survival for humanity itself!

Keywords: Earth, nature, earth science, biomimicry, biophilic design

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714 A Worldwide Community for Sustainability

Mary-Virginia (Ginger) Potter[1], *Judy Braus*[2]

As the climate crisis escalates, Environmental Education (EE) has found broad local and global support as a much-needed tool for addressing the environmental, economic, and social justice issues arising from the impacts of a changing climate. The range of education supporters, including environmental and education agencies/ministries, multilateral organizations, the United Nations, regional-level organizations, NGOs, and the private sector are striving to infuse, integrate, and mainstream EE and the perspective of sustainability into their work as a way to address the impact of climate change on people, the planet, and social issues. While these supporters of environmental education may have varied motivations—individual action for sustainability, behavior change, organizational change, social learning and/or workforce development, educating every citizen around the world about the need to live and work sustainably is the objective. In short, the climate crisis will not and cannot be solved without education. Robust economies and environmental justice will not and cannot be achieved without education.

While many questions arise from conversations on what is the best way, the best course of action to stop our headlong rush to global environmental Armageddon, the focus here is firmly with the idea that education is the tool that is fundamental to achieving all of the Sustainable Development Goals So, how can we as educators, and activists, and entrepreneurs further the call for sustainable living? How do youth and elders work together to further the call for sustainable living? One answer is to work in partnership to develop networks that can work together to exchange ideas, build capacity, identify resources, and find creative people with creative solutions to further the use of environmental education to solve the climate crisis. We are building a world-wide community for sustainability!

The Global Environmental Education Partnership or GEEP is one such partnership that has worked since 2014 to build a network of environmental educators around the world who champion the use of environmental education in their countries. One GEEP activity identifies the people and organizations in country who are currently working in the environment, climate, and sustainability education space and encourages them to network to increase their capacity to deliver high-quality education to all.

GEEP would like to expand its reach to deliberately include youth who represent the very loud and growing voice of the future that is demanding a clean environment, a robust global economy, and an in-depth and critical look at social justice issues. The youth energy and commitment to sustainability and sustainable living is vital to highlighting the fundamental need for education to solve the climate crisis. This session is about identifying opportunities to partner with youth in meaningful ways.

Keywords: partnerships, networks, sustainability, youth

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Climate Change Education in Latin America: the ALEC Project, a Large-scale Initiative for Primary and Secondary Schools

David Wilgenbus [1]

The ALEC (América Latina para la Educación Climática) project aims to promote climate change education for primary and secondary school students in Latin America, to induce the behavioral changes necessary for the ecological transition. This is a pilot project, launched in 2020 for a period of 5 years, in Mexico and Colombia and ultimately aiming for expansion in other Latin American countries.

- The project is structured around 4 components:
- Production and dissemination of educational resources (free, interdisciplinary, based on IPCC reports, supporting active pedagogies, and adapted to local contexts) for teachers, students, and teacher trainers.
- Professional development of teachers and teacher trainers: face-to-face and online trainings allowing educators to enhance their climate literacy, become more familiar with inquiry-based and project-based pedagogies, and learn how to use educational resources. These trainings are complemented by field visits and support to local projects, dealing with adaptation or mitigation, and implemented in the schools.
- Creation and animation of communities of practice, to promote peer-to-peer learning and exchanges between educators, scientists, decision-makers, NGOs
- Monitoring and evaluation, to define a strategy for extending the project in other Latin American countries.

The project is coordinated by the Office for Climate Education (OCE), a Center under the auspices of UNESCO and an Observer of the IPCC, based in Paris, France (***www.oce.global***). It involves a dozen of local partners in Mexico and Colombia: NGOs, ministries of education, Academies of science, universities.

Three years after the launch of the project, an intermediate evaluation shows very positive results. About 15,000 teachers are involved in the two countries and implement climate change-oriented education projects in their classes, reaching more than 500,000 students from diverse areas (rural / urban, privileged / disadvantaged, coastal / inland...) and involving local communities. Teachers received substantial professional development (more than 50 hours/person) and demonstrate an increase in their climate literacy as well as in their professional teaching skills (use of active pedagogies, interdisciplinary approach, use of digital

resources in the class...). Students improve their climate change literacy as well as critical thinking and initiative skills. They are encouraged to find concrete solutions for adapting to and/or mitigating climate change locally.

The project acts as a pilot for national institutions, especially ministries of education and academies of science. They are planning to extend the initiative by transformative actions, especially adaptation of the school curricula. In addition to the two initially targeted countries, new ones are joining the project (Panama, Chile, Peru).

Keywords: climate change, formal education, curriculum, teacher training, communities

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Air Quality at New York University Abu Dhabi: Measuring the Effects of Information Provision on Knowledge, Behavior and Policy Preferences

Hilina Bayew[1]

Research has shown that while environmental disease burden in the United Arab Emirates is lower than global average, outdoor air quality remains the leading factor for premature death.

In the past, environmental literacy has been found to have significantly positive impacts on students' environmentally responsible behavior. By providing air quality information in the form of bi-weekly email summaries and critical level (AQI 200) email alerts, this study examines whether providing information about local air quality affects community members' knowledge, behaviors and policy preferences related to the local environment.

Participants were randomly assigned into one of three groups: critical level messaging, bi-weekly summaries, control. Randomization was blocked by respondent type, *i.e.*, faculty, contracted workers, and students. The study found that overall levels of concern regarding air quality were high among all participants, and messaging had no significant impact on these levels.

Furthermore, the bi-weekly summaries did not result in significant changes in participants' knowledge, behavior, or policy preferences regarding air quality. However, the critical alerts treatment did lead to increased knowledge among participants on several dimensions, as well as a higher frequency of air quality checks before going outdoors, indicating a positive impact on behavior. While neither treatment had a notable effect on policy preferences, a large percentage of participants expressed interest in receiving timely messaging about air quality.

Overall, the study suggests that the critical alerts approach is a more effective intervention strategy for providing air quality messaging to the New York University Abu Dhabi community compared to the bi-weekly summaries.

Keywords: air quality

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Bridging Theory and Practice through Transdisciplinary Learning Labs to Build Sustainability Leadership and Competence in Higher Education: Insights from the TRANSECTS Programme

Eureta Ronsenberg [1]

Addressing the global socio-environmental crisis requires new educational approaches and new ways of doing research. One such approach is a transdisciplinary approach to teaching and research in higher education.

In this paper I build a bridge between the theory of transdisciplinarity, and its practice in a programme called TRANSECTS, the focus of which is Transdisciplinary Education Collaborations for Transforming Sustainability.

TRANSECTS is a six-year long collaboration between universities and UNESCO Biosphere Reserves (or Regions) in Canada, South Africa and Germany. Its goals are to advance transdisciplinary research, teaching and learning, both in universities and in the landscapes of practice in which the Biosphere Reserves are situated.

I share our experience in and early evaluation of the first two learning labs that formed part of TRANSECTS, and which took place in Germany in 2022-2023. These labs represent innovations in environment and sustainability education in higher education, because they are solutions-oriented, field-based, collaborative and cut across disciplines and knowledge fields.

Our findings include that the curriculum for these learning labs is not that easy to conceptualise and deliver with multiple partners involved, and that it is important to differentiate them from other field-based experiential learning opportunities. Inter-cultural diversity also require specific planning and implementation considerations. These and other insights are important, because international learning labs are likely to become important methods for building sustainability competencies and leadership as outlined in a 2018 paper titled "The green economy learning assessment South Africa: Lessons for higher education, skills and work-based learning" (Rosenberg, E., Lotz-Sisitka, H.B. and Ramsarup, P., Higher Education, Skills and Work-Based Learning, 8(3), pp. 243-258.

The paper further sheds light on the research trend of transdisciplinarity, which welcomes and enables diversity through knowledge co-creation between researchers from different disciplines, and between researchers and a wide range of practitioners.

Keywords: transdisciplinarity, higher education, learning labs

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Showcasing a Case Study from India on Integrating, Scaling Up, and Converging Efforts on Sustaining Environmental Education to Ensure that All Learners Acquire Knowledge to Act Sustainably and Become Leaders of Change

Taru Mehta[1], *Livleen K Kahlon*[2]

With an increase in population worldwide and increase in demand for resources, growth supersedes development at a faster pace. The rapid urbanization is not only playing havoc with the environment but also changing the aspirations of human beings, which are largely unsustainable. Changing patterns of conspicuous consumption have led to redundancy and generation of waste, management of which depends on an individuals' know how and vagaries of infrastructure. The environment is being taken over by the 'desires' of mankind which is far from being green. Set against this glooming scenario, hope still resides in the power of education to offset unsustainable actions by promoting Environmentally Responsible Behaviour (ERB) amongst our younger citizenry. An empowering education can put knowledge into practice, thereby ensuring sustainable environments, healthy communities and social cohesion. ERB is a manifestation of an individuals' environmental awareness, their inclination to act in a manner that supports the environment, and their perceived understanding of ecological issues. The Energy and Resources Institute (TERI), an independent, multi-dimensional organization, with capabilities in research, policy, consultancy and implementation, has a dedicated Environment Education and Awareness division that is committed to engaging with students in the age bracket of 9 – 25 years through its various programmes. GREEN Olympiad (www.teriin.org/olympiad) is a leading school-based initiative of TERI. This programme was initiated on the occasion of World Earth Day in 1999, as India's premier environment quiz and since then it has incorporated within itself several stages of transformation to match the aspirations of the academic community to establish itself as an outstanding Environmental Education brand. The overall objective of this initiative is to sensitize and build capacity of students on issues related to environment, sustainability, and green skills. In its 25 years of journey, the programme has been instrumental in bringing together important stakeholders in India to promote the essence of sustainability in schools. The programme is currently endorsed by the Ministry of Environment, Forest and Climate Change and the Ministry of Education, Government of India. The importance of organizing Olympiads is articulated in the National Education Policy (NEP) 2020, as a medium to minimize rote learning and instead encourage holistic development and enhance 21st century skills. In addition, this Olympiad draws its linkages towards 'Goal 4 - Target 7' (SDG 4.7) which states, 'ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development' by 2030. Reaching out to nearly 2000 schools annually in India and abroad, this Olympiad is designed for students of Std. 4–12 and has so far touched lives of over 2 million students. The message of GREEN Olympiad resonates clear and strong of 'not leaving anyone behind'. Students from across the country including remotest parts register and participate in this project that demonstrates the power of Environment Education as an enabler for a Sustainable Future.

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CLUSTER

03

The Dimensions

Theme 01:
A Matter of Values and Cultural Diversity - Indigenous Knowledge and Culture

Theme 02:
Aesthetics Ethics and Emotional Dimensions - The Role of Art and Design in EE

THE DIMENSIONS THEME 01

A Matter of Values and Cultural Diversity - Indigenous Knowledge and Culture

Theme Background:

The late Sheikh Zayed bin Sultan Al Nahyan, the father of the United Arab Emirates, eloquently stated, "On land and in the sea, our forefathers lived and survived in this environment. They could do so because they recognized the need to conserve it, take from it only what they needed to live, and preserve it for succeeding generations."

His wisdom underscores the profound importance of indigenous knowledge and traditional practices in the survival of both people and their environment. This is especially evident in the delicate desert ecosystem of the UAE, where sustainable practices have been vital for generations. Notably, a quarter of the world's land area is owned, managed, used, or occupied by indigenous peoples and local communities.

Indigenous knowledge is deeply rooted in cultures and traditions, offering invaluable insights into sustainable living, resource management, and ecosystem preservation. The contributions of indigenous peoples are crucial in designing and implementing solutions to sustainability and ecosystem restoration issues on a global scale.

Theme Objectives:

The theme, "A Matter of Values and Cultural Diversity: Indigenous Knowledge and Culture," aims to:

- Examine the connection between local wisdom and cultural practices with international agendas, particularly within the framework of the Sustainable Development Goals (SDGs). How can indigenous knowledge contribute to the achievement of global sustainability objectives?.

Theme Focus:

- Initiatives that incorporate indigenous knowledge into environmental education.
- The role of storytelling, oral traditions, and indigenous arts in environmental education.
- Indigenous perspectives on sustainability and their relevance to SDGs.
- Curricular designs that incorporate indigenous perspectives and teachings.

Theme Outcomes:

A discussion on how environmental education communities learn from indigenous cultures and traditional practices, emphasizing the significance of values, indigenous knowledge, and culture in connecting people and creating a better tomorrow.

Theme Conclusions:

The thematic track on "A Matter of Values and Cultural Diversity: Indigenous Knowledge and Culture" aligns with the overarching goal of WEEC 2024, which is to "Connect People, Create Tomorrow." It underscores the critical importance of recognizing and respecting indigenous knowledge, cultural diversity, and traditional practices in the context of environmental education and sustainability.

Together, we can celebrate the richness of indigenous cultures, honour their contributions to sustainable living, and forge meaningful connections that will shape a better tomorrow for all.

THE DIMENSIONS THEME 01

A Matter of Values and Cultural Diversity - Indigenous Knowledge and Culture

Presentations

ID	TITLE	PRESENTER	FORMAT
020	Indigenous knowledge and climate education - Synergies and challenges	David Zandvliet, Shannon Leddy	Oral communication
042	الاستدامة وجهود دولة الامارات العربية المتحدة لتحقيقها	Tareefa Alsumaiti	Oral communication
049	Indigenous Land Rights as Climate Change Resiliency	Ranjan Datta	Oral communication
169	التربية على الثقافة المحلية المبدعة من اجل التنمية المستدامة : الثقافة الحسانية نموذجا	Faaras Abdelaziz	Oral communication
224	Eco-civilization and Environmental Education in China - A Case Study of Tongji University	Bin Xu	Oral communication
276	Repositioning Environmental Education Organizations' Approach to Environmental Disaster	Anthonette Quayee	Oral communication
353	Development of Educational Methods for Intergenerational Transfer of Indigenous Knowledge: A Case Study of Indigenous Environmental Education in the Amami Islands, Japan	Yuko Oguri	Round table
384	Day of the Native Wallunka and the Mast'aku Festival of Life and Death Educational Activity To Know, Feel and Live our Biocultural Traditions and Conserve the Carob Forest	Huascar Camacho Mojica	Oral communication
447	Naming Our Forest: Cultural Preservation in Environmental Communication	Yun-Hsuan Chiu	Oral communication
522	Les négociations et ententes foncières locales pour la gestion des forêts sacrées en Côte d'Ivoire: l'expérience de la forêt sacrée «Koulai a wo» de Guibobli dans le département de Bloléquin	Kouayé Olivier Dien	Oral communication

ID	TITLE	PRESENTER	FORMAT
527	Education for Aloha ʻĀina, Sustainability & Indigenous Resurgence in the Era of Climate Change	Kainoa Kaulukukui-Narikawa	Oral communication
608	An Introduction to the unique curriculum at the Mohamed bin Zayed Falconry & Desert Physiognomy School. Educating the next generation of sustainable falconers through practical and theoretical lessons	Nicola Dixon	Oral communication
629	ممارسات التربية البيئية في التراث العربي والإسلامي: تحول حضاري نموذجي	Mahmoud Mohamed Ali	Oral communication
670	Knowledge from below. Traditional Indigenous Knowledge on Watery Environments as Innovative Sustainable Solution to the Challenges of Modernity	Rita Vianello	Oral communication
676	Cultural heritage and traditional knowledge to create belonging and understanding of our place in time	Maria Hofman-Bergholm	Oral communication
687	Learning from the Best: Indigenous Knowledge and Culture Guiding Conservation of the African Manatee in Guinea	Lucy Keith-Diagne	Poster
746	Working for the Present and Future Wellbeing of all Life	Anne Poelina	Oral communication
750	The role of Indigenous Knowledge and Traditional Practices in Promoting Community Resilience and Ecological Sustainability in the Face of Climate Change: The Case of Women	Mphemelang J. Ketlhoilwe	Oral communication

THE DIMENSIONS THEME 01

A Matter of Values and Cultural Diversity - Indigenous Knowledge and Culture

Abstracts

020 Indigenous Knowledge and Climate Education: Synergies and Challenges

David Zandvliet[(1)], *Shannon Leddy*[(2)]

This paper highlights results from an action research project into decolonizing practices for environmental learning in the Canadian context of the British Columbia (BC) curriculum through case study and focus groups with Indigenous educators. These vignettes focus on how educational policy can be infused with Indigenous knowledges and pedagogical perspectives and respectively, how these policy changes might inform instruction on climate change education and a variety of other environmental topics. The revised framework we will produce hopes to guide teachers in educational planning and supports the implementation of environmental learning in diverse subjects using the dual lenses of bio-cultural diversity and inquiry & teaching about the environment and Indigenous knowledges together as an organizing theme for all teaching and learning. Our work highlights key aspects of our research involving practicing teachers, academics, provincial Ministries of Education and Environment as well as the Canadian Commission for UNESCO. Our research articulates several important bridging activities: one of research and policy, that of theory with practice, and most importantly, that of inherent synergies among Indigenous and environmental knowledges.

Keywords: indigenous knowledge, climate change, environmental education, teacher education

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042

الاستدامة وجهود دولة الامارات العربية المتحدة لتحقيقها

Tareefa Alsumaiti[1]

يهدف هذا العرض إلى التعريف بالتنمية المستدامة وركائزها وأهدافها، وتسليط الضوء على انجازات دولة الامارات العربية المتحدة في مجال الممارسات البيئية المستدامة منذ عهد المؤسس المغفور له الشيخ زايد بن سلطان آل نهيان، حيث لعبت جهود الراحل الكبير دوراً بارزاً في توجيه بوصلة العمل الحكومي نحو تعزيز مكانة الدولة كأحد أهم اللاعبين الدوليين في مجال التصدي للتحديات البيئية التي تواجه العالم ، فمن انجازاته انشاء العديد من المحميات الطبيعية، وحظر صيد الحيوانات النادرة، والاهتمام بالزراعة واستصلاح الاراضي، وزراعة اشجار القرم لحماية المناطق الساحلية، وايجاد حلول لمشاكل ندرة المياه العذبة؛ كما حرص المغفور له الشيخ زايد بن سلطان آل نهيان منذ تأسيس الدولة على غرس مفهوم الاستدامة وثقافة حماية البيئة ومواردها الطبيعية في نفوس وعقول أبناء الدولة. كما يتناول العرض جهود الدولة الحالية والمستقبلية في تعزيز العمل الجماعي الدولي لمعالجة تحديات الاستدامة، ودورها في البحث عن حلول مبتكرة، يستفيد منها الجميع على الساحة الدولية، خاصة في مجالات الطاقة والتغير المناخي أضافة إلى نشر الوعي والتربية البيئية حول قضايا الاستدامة البيئية، وتشجيع المشاركة المجتمعية في تحقيق استدامة التنمية، ودعم الاستراتيجيات الوطنية في هذا المجال، وابراز انجازات دولة الامارات في تحقيق أهداف التنمية المستدامة.

الكلمات الرئيسية: التنمية المستدامة، جهود دولة الامارات، الشيخ زايد، التربية البيئية، الاستراتيجيات الوطنية

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049 Indigenous Land Rights as Climate Change Resiliency

Ranjan Datta[(1)], *William Marion*

Indigenous land rights are vital for achieving climate change solutions. Climate change poses significant risks to Indigenous peoples, their traditional and contemporary economies, communities, and the natural environment. Indigenous communities are more likely to experience the adverse effects of climate change in several ways: food insecurity as a result of changing ecosystems; mental and physical traumas because of extreme displacement; their cultural ways of life; and their abilities to access essential resources and services such as clean drinking water. Thus, Indigenous land rights also mean fighting for climate change action and vice versa, as these two causes are intimately related and mutually inclusive.

How recent climate change (and interpretation) is challenging Indigenous food, water sources; and what is at stake in processes such as consultation, impact assessment, regulatory hearings, approvals (including negotiation of benefits), and monitoring? and what reformed processes can build Indigenous community capacity and supports robust decisions?

Following anti-racist and decolonial research frameworks, we (*i.e.*, Indigenous Elders-Knowledge-keepers, youths, and academic scholars) collaboratively used five research methods, including traditional story sharing, Indigenous cultural camps, deep listening, reflective learning, and individual stories. We tried to use all these methods for our reflective learning according to Indigenous Elders and Knowledge-keepers guidelines and community protocols. We see our reflective learning research is a lifelong learning, unlearning, and relearning journey.

Our decolonial and antiracist reflective research findings suggest that Indigenous land rights and climate justice are deeply interconnected. Our findings suggest that both western research and climate change policy can benefit from Indigenous ways of climate solutions.

Our collaborative research provides Indigenous communities provides valuable guidelines that can help them make strategic choices about climate change crises to enhance their SDGs resiliency to sustainabilities. This research may assist policymakers and Indigenous communities in sustainable climate change policy development and provide a structured, transparent, and participatory decision support tool to government and communities to guide future climate change planning initiatives.

Keywords: indigenous land-rights, decolonization, climate change, environmental justice

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التربية على الثقافة المحلية المبدعة من اجل التنمية المستدامة : الثقافة الحسانية نموذجا

فعراس عبد العزيز[1]

تقتضي التنمية المستدامة تغييرا في السلوك وفي عادات الاستهلاك وكذا في أنماط الإنتاج، مما يطرح إشكالية مطابقتها لمقتضيات احترام التنوع الثقافي. وقد أصبحت الثقافة والتربية منذ قمة جوهانسبورغ المنعقدة سنة 2002 ، الركيزة الرابعة للتنمية المستدامة، الى جانب الركائز الثلاثة للتنمية المستدامة) الركن الاجتماعي، والاقتصادي والبيئي(، مما جعل البرامج المستدامة توفق بين حماية البيئة، والتنمية الاقتصادية، والانسجام الاجتماعي والتنوع الثقافي. وبمقدور هذه الركيزة مد جسور متينة مع الركائز الثلاث الاخرى للتنمية المستدامة .

وتعتبر التربية على الثقافة المحلية المبدعة عاملا أساسيا في معادلة التنمية الترابية المستدامة لكونها تعتبر عامل جذب وإشعاع وهوية ترابية، وعنصر بناء مجتمع مواطن، كما أنه لا يمكن تصور التنمية المستدامة لمجتمعاتنا دون إدراك أهمية المعارف التقليدية المبدعة والممارسات الفضلى المميزة لهذه الثقافة المحلية المحمولة عبر اللسان، ودون فهم الإشكاليات المتعلقة بتدريسها

فاللهجة الحسانية تحمل تراثا معرفيا قيماً في عدة مجالات، حيث تحمل تصنيفا تفصيليا لجميع المظاهر البيئية والتضاريسية الصحراوية، وهذا راجع الى الإدراك المجالي الكبير عند انسان الصحراء، الذي وجه سلوكاته للتناغم مع منظومته البيئية

تساؤلات وأهداف البحث:

1. سنبرز أهمية الثقافة البيئية المبدعة عند الإنسان الصحراوي من خلال اللسان الحساني، وذلك بهدف صيانتها وتثمينها
2. سنجيب عن سؤال: لماذا تعتبر الثقافة الحسانية المبدعة أداة رئيسية لبلوغ أهداف التنمية المستدامة بجهة العيون الساقية الحمراء (الهدفين 6 و13)؟
3. سنقيس مستوى معارف عينة من المتمدرسين بجهة العيون الساقية الحمراء حول القضايا والمفاهيم التراثية ذات الصلة بالبيئية والتنمية المستدامة
4. سنحاول الإجابة عن سؤال: كيف السبيل للمحافظة على هذه الثقافة المحلية المبدعة ونقلها للأجيال القادمة عبر أداة التربية والتعليم؟ بمعنى سنقترح استراتيجيات في التربية على الثقافة الحسانية المبدعة من أجل التنمية المستدامة

منهجية البحث: طبيعة أسئلة واهداف البحث تجعلنا نعتمد على المنهج والوصفي التحليلي، بحيث سنعتمد على الأدوات العلمية التالي :

- المقابلات جمع المادة المعجمية))
- الاختبار لقياس مستوى هذه المعارف التقليدية المبدعة عند المتعلمين
- شبكة تحليل المضمون

نتائج البحث وأهم التوصيات :

تبين لنا من خلال نتائج هذه الدراسة، أن نظم المعرفة التقليدية وطرق التعامل مع المحيط التي كانت تتبعها الساكنة المحلية والتي استخلصناها من المعجم الحساني المتداول، تُشكّل مصدرا لأفكار مبدعة لمواجهة التحديات البيئية ومكافحة مخلّفات التغيّرات المناخية مع ضمان تحقيق اهداف التنمية المستدامة.

واعتبارا لكون الحسانية ثقافة وطنية تحمل حضارة وثقافة عريقتين، ونظرا لكونها متداولة على نطاق واسع في الإبداع الثقافي والمعاملات اليومية بالمناطق الجنوبية، واعتبارا للدور الذي ينبغي أن تقوم به في عملية التنمية الشاملة والمستدامة، ونظرا لكون معارفها المبدعة لا تستثمر كما يجب، مع أنها مهددة بالانقراض، فانه بات من الضروري إدماجها في المنظومة التعليمية، والعمل على تطويرها وتأهيلها، مع العمل على إدراج مضامينها الثقافية في المناهج التربوية للمواد الدراسية عبر استراتيجيات تربوية. وذلك في إطار تفعيل جهوية البرامج المنصوص عليها في الميثاق الوطني للتربية والتكوين.

المراجع المحتملة: فعراس عبد العزيز 2016): دليل العيون للتغيرات المناخية" مفاهيم و قضايا"، مجموعة البحث و الدراسات حول ساحل الصحراء

الكلمات الرئيسية: التربية على الثقافة، الثقافة الحسانية، التنمية المستدامة

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Eco-civilization and Environmental Education in China -A Case Study of Tongji University

Bin Xu [1]

The concept of ecological civilization was frequently raised since 2017 by China, which is consistent to the traditional Chinese value and culture, as man and nature form a community of life, which aims to build a shared future for all life on Earth.

Tongji University, guided by eco-civilization, has developed a new teaching system to cultivate global environmental management talents. With an A+ top ranking in the discipline of Environment among Chinese universities, Tongji offers international degree programmes in environment since 2002, focused on producing high-end interdisciplinary professionals. These programs, attracted more than 700 students from 114 countries, aim to educate talent for various applied fields of government, trade, foreign affairs, agriculture, technology, education, culture and health.

Tongji cooperates with the United Nations and world-class universities, and establishes a syllabus and teaching method aligned with international talent training model based-on on global environmental management. Breaking away from a traditional single-mode training, Tongji adopts an innovative "4 in 1" teaching concept oriented by ecological civilization. The construction of environmental professional knowledge system and teaching content is coordinated from a four-dimension of sustainability: Environment, Economy, Society and Culture, to provide "immersive" teaching activities in the whole chain, whole process and all-round way, which forms a "closed-loop" teaching evaluation and quality assurance system, lead the reform of the training mode of international students in China through forward-looking thinking, strategic planning, overall promotion and other means, and form a benchmark global environmental management talent training system.

The approach is a plus to traditional ways, which focuses on the fundamental task of cultivating virtue and cultivating people and faces the requirements for talent training in the Chinese-style modernization construction of harmonious coexistence between man and nature. The application of this immersive environmental education focuses more on the major polluted problems and needs locally and regionally, such as "rural revitalization", "toilet revolution" and "Yangtze River protection" in China, organically integrated with major national research projects undertaken, so as to cultivate students' practical ability and quality from reality to practice.

The experience could equip other similar universities and institutions with integrated vision and thoughts. Immersion of the spiritual concept would affect several generations and their behaviors. Combined with the local wisdom and real facts, diverse policies are expected to be emerged to promote SDGs. The environmental education in all kinds remain committed to integrated protection and systematic restoration of all natural resources. Together, we will make a beautiful world of harmony among all living things on this planet.

Keywords: eco-civilization, environmental education, China, Tongji

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276 Repositioning Environmental Education Organizations' Approach to Environmental Disaster

Anthonette Quayee[1]

Promoting cultural values and diversity can support sustainable solutions that help societies mitigate and adapt to environmental challenges. Traditional knowledge is not only limited to addressing today's catastrophes but also provides a context-informed approach to conserving resources. Indigenous Knowledge (IK) is a collection of skills, beliefs, and practices passed down from generation to generation within a community through storytelling, dance, and cultural practices. Utilization of IK is sustainable because it facilitates intergenerational links informed by the lived conditions of a community.

Organizations working on environmental education should create an avenue for communities to identify and share the IK they have acquired through direct contact with the environment. Compared to what they are recognized for, the rural communities have more power, networks, and knowledge systems, including adaptive skills, as they have relied on traditional ecological knowledge to adapt and prepare for environmental changes for centuries. Environmental education organizations must recognize that the current pace of environmental and social change necessitates diverse and innovative thought processes.

The preservation and passing down of indigenous values and knowledge have undergone challenges, ranging from colonialism to exploitation. One of colonialism's targets was education; through expansionist policies, colonists destroyed the validity of indigenous cultures and values and replaced them with modernity, undermining traditional ways of knowing and understanding the environment. Non-western knowledge was labelled as unscientific and superstitious information devoid of logic and technicality. This viewpoint, supported in part by the writings of anthropologists, led to the devaluation of traditional knowledge.

Appreciating diverse cultural values is critical for understanding and addressing our complex 21st-century planetary challenges, as no one solution will address all challenges. Indigenous knowledge is not a new approach to dealing with environmental disasters; instead, it offers a wealth of naturally sustainable traditional practices, techniques, and wisdom. Tapping into IK can contribute to providing a comprehensive understanding of current challenges and opportunities by encompassing social, cultural, and spiritual aspects.

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Keywords: indigenous knowledge, environmental disasters, cultures, values

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Development of Educational Methods for Intergenerational Transfer of Indigenous Knowledge: A Case Study of Indigenous Environmental Education in the Amami Islands, Japan

Yuko Oguri[1]

The "indigenous knowledge" addressed in this study includes tacit knowledge and bodily knowledge that cannot be communicated in language, and it covers the knowledge of how people interact with the natural environment (mountains, fields, rivers, and oceans) and how they acquire such knowledge. The core question of this study is to clarify the content and acquisition process of "indigenous knowledge" formed through direct physical contact with the natural environment (land). Such interact with the land was part of daily life in the days when the means of production and living were procured directly from the immediate natural environment. Therefore, subjective, physical knowledge was acquired and passed on unconsciously. Now, however, that foundation is crumbling. The second question, therefore, is to clarify how we can intentionally create the conditions for the formation and transmission of "indigenous knowledge" to the next generation, given that the foundation for its formation and transmission is disappearing.

In the Amami Islands, Japan, after the return to the mainland from U.S. military rule in 1953, social infrastructure was developed over a period of about 15 years, eliminating the need to depend on the immediate natural environment for production and means of living. However, even after that time, the generation that had physically acquired the wisdom and skills to deal with nature through daily labor (hereafter referred to as "indigenous knowledge holders") unconsciously passed on "indigenous knowledge" by performing traditional village events, communal labor, and playwork together with the generation with little experience in this area. The village was unconsciously passing on "indigenous knowledge". Through such cooperative experiences, a sense of awe toward nature and respect for ancestors have also been passed on to the next generation. In recent years, however, the traditional inheritance base has been rapidly thinning out due to multiple reasons.

Therefore, this study aims to visualize the "indigenous knowledge" that has been physically acquired by the elderly who have lived in the Amami Islands during and after World War II, and to develop an educational method that enables the transmission of this knowledge from generation to generation.

This research is a three-year project funded by a national research grant, and is currently in its second year of preparation with local people on Yoron Island, the southernmost island of the Amami archipelago, to reproduce the learning space experienced by the elderly. In addition, she plans to conduct a trial practice of multi-generational learning together using the recreated learning space.

In this presentation, She hopes to introduce our research to date, compare it with the situation in the participants' countries, and exchange ideas on educational methods that enable intergenerational transmission.

Keywords: Japan, indigenous knowledge, intergenerational transfer, Amami islands

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Day of the Native Wallunka and the Mast'aku Festival of Life and Death Educational Activity To Know, Feel and Live Our Biocultural Traditions and Conserve the Carob Forest

Huascar Camacho Mojica[1]

In an increasingly globalized world, maintaining and valuing our biocultural traditions is essential for the preservation of identity and the environment.

How to motivate and involve young people in knowing, recovering their biocultural identity and committing themselves to the conservation of the carob forest?

In order to achieve the participation of the new generations in the strengthening and preservation of customs, rites and traditions, the active and dynamic co-participation of young people is essential in the planning, organization and execution of programs that encourage the celebration and participation of social activities. cultural events of the Socio-Cultural and Pedagogical Day "FESTIVAL OF LIFE AND DEATH: THE MASTAKU AND THE NATIVE WALLUNK'A" John Dewey's proposal, in the LEARNING BY DOING methodology, children and young people from the Tiataco community and children from the city of Cochabamba, interested and committed to activities to maintain and value our biocultural traditions, as an essential dynamic for the preservation of identity and the environment, will participate in the entire process of the socio-cultural and pedagogical Day as a real and continuous authentic experience, in such a way that the commitment to revalue, strengthen and practice the Quechua language, music, dance, gastronomy , games, rituals, customs and traditions, respect and care for the environment or Pachamama, as a legacy of the knowledge of the Andean worldview, be part of their daily lives and their friendly and sustainable relationship with the community of life. The dynamic participation will be coordinated mainly by the grandmothers and grandfathers and will take place in three moments:

Know: Specifically in knowledge dialogues, they will know the times and spaces of the Andean agricultural calendar in regards to chores regarding agriculture, food, music, dance, ritualism, customs and traditions from the worldview andean.

Feel: Considering the influence of emotions during the teaching-learning process, all activities will be fostered based on deep human relationships of respect, solidarity, reciprocity, tolerance, justice, truth, and gender and generational equity.

Live: Experience in the planning, organization and development of concrete and real responsible co-participation activities such as:

- Organization of commissions before, during and after the event, in the responsibilities of logistics, control, supervision and execution of tasks such as cleaning, signaling and care of the forest, preparation of masitas and t'anta wawas and assembly of the mastak'us or tables for the dead, preparation and assembly of wallunkas, preparation of traditional food and drinks from the time of Aya markay Killa and wallunka.
- to the Design of the Activity: An interactive educational activity will be developed that involves the participation of the community.

Keywords: biocultural, outdoor activities, traditions, conservation, forests

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Naming Our Forest: Cultural Preservation in Environmental Communication

Yun-Hsuan Chiu[(1)], *Chih-Min Chang*[(2)], *Bo-Yuan Lin*[(3)]

"Our forest has more than one name," said an elder from the Saviki tribe, a part of the indigenous Tsou people residing in the central mountainous region of Taiwan. Their traditional way of life is closely intertwined with the forest.

The authority for forest management in Taiwan lies under the Forestry and Nature Conservation Agency, entities classify forest types based on their functions and establish laws for management. However, management still faces challenges. One of the main issues is that the public doesn't fully grasp the importance of protection forests. People, driven by development needs, often request management relaxation through their representatives.

To address this, the Chiayi Branch of FNC. Agency collaborated with B Cop. FriendlySeed to reach the public through environmental education and communication, helping them understand and acknowledge the significance of protected forests. Naming the forests is one way to communicate the importance of protection forests and bridge the gap between the public and the forest.

In the past, the mindset of "one forest having multiple names" was not encountered when naming protection forests in urban areas. Typically, a single name is chosen through a majority vote in these areas. The idea that a forest could have such diverse appellations was never considered. Therefore, the FS. team went to the Saviki tribe, invited elders and youth to participate in discussions, aiming to understand the Tsou people's perspectives on forests. Through their narratives, it was discovered that the forest originally known as Protection Forest No. 1915 had over 30 different names, such as "natural spring pool" and "place with many fireflies." These names and details represented cultural stories unknown to the tribe's younger generation. The elders of the Saviki tribe expressed that their lives are closely connected to the forest, and they think like the forest.

Furthermore, the Saviki elders stated that they could only name forests that are relevant to their own culture living areas. Protection Forest No. 1915 also encompasses the area of Lijia tribe, but the Saviki people couldn't name it.

For the government, the conventional approach is to have a single collective name for a forest. Thus, the practice of having two names for a single protection forest was met with surprise and concern. However, after communication by the FS. team and coordination through co-management meeting between the Chiayi Division and the tribe, both tribe's different appellations for the forest were retained. Furthermore, important oral stories were recorded, enabling the younger tribe members to carry forward their cultural heritage. This collaborative effort highlights the necessity of considering local perspectives in forest management and provides compelling lessons for the government and other stakeholders. Indigenous wisdom underscores the value of embracing diversity and complexity in our understanding of the natural world.

Keywords: name the forest, environmental communication, Taiwan indigenous tribe

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Les Négociations Et Ententes Foncières Locales Pour la Gestion Des Forêts Sacrées En Côte d'Ivoire: l'expérience De la Forêt Sacrée « Koulai a Wo » De Guibobli Dans Le Département De Bloléquin

Kouayé Olivier Dien [1]

Dans la région Ouest de la Côte d'Ivoire, la plupart des forêts considérées comme «sacrées» et renfermant plusieurs espèces végétales et animales sont régies par des pratiques séculaires qui ont du mal à assurer leur conservation. Sur le terrain, les problèmes de sécurisation de ces forêts ne sont pas réglés et, connaissant un fort taux de dégradation et une utilisation abusive, elles sont souvent au cœur de nombreux conflits opposant les communautés locales à différents groupes sociaux. Face à ces défis qui se posent en milieu rural, le présent article s'intéresse à un modèle d'expérience positive provenant des initiatives de négociations et ententes foncières locales relatives à la gestion de la forêt sacrée « Koulai a wo » de Guibobli dans le département de Bloléquin. L'objectif est d'évaluer la pertinence desdites initiatives par rapport aux systèmes de protection traditionnels et aux pressions subies par cette forêt sacrée. A partir des entretiens semi-directifs menés auprès des acteurs locaux, un diagnostic en lien avec les pratiques traditionnelles, l'état de conservation, la typologie et les acteurs des conflits autour de ce site a été réalisé. En outre, les accords légitimes négociés entre plusieurs parties prenantes dans une perspective de régulation de ses ressources naturelles ont fait l'objet d'analyse critique. Il ressort de l'étude que les négociations et ententes foncières locales sont la réponse la plus appropriée pour renforcer la gouvernance locale et le dialogue social autour de la forêt sacrée «Koulai a wo». Ces initiatives garantissent le rôle primordial des autorités traditionnelles et favorisent, grâce à l'engagement réciproque des populations à respecter les règles établies, la définition d'une vision commune de gestion des ressources naturelles de cette forêt. Elles peuvent servir d'alternative crédible à une gestion durable des forêts sacrées en Côte d'Ivoire.

Mots clés: ressources naturelles, pratiques traditionnelles, sites naturels sacrés, communautés locales, gestion durable

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527 Education for Aloha ʻĀina, Sustainability & Indigenous Resurgence in the Era of Climate Change

Kainoa Kaulukukui-Narikawa[1]

Climate change is a complex global phenomenon that affects all aspects of human and other-than-human life, from the places we inhabit, to the water we drink, and the air we breathe. In Hawai'i, Kanaka ʻŌiwi are contending with climate change along with the overlapping forces of imperialism, settler colonialism, white supremacy, and extractive capitalism. These forces have worked to marginalize and silence Indigenous perspectives on climate change. The purpose of this study is to describe the ways Indigenous people in Hawai'i are experiencing and adapting to climate change here in Hawai'i. It will specifically seek to describe the recovery, regeneration, and/or reimagination of Kanaka ʻŌiwi traditional values, knowledges, practices, and ways of life in this current huliau (turning point) of climate change.

This study will ask the questions:

a) How are the people of Hawai'i (specifically Kanaka ʻŌiwi) experiencing and adapting to climate change?

b) In the era of climate change, how are ʻike ʻāina, pilina ʻāina and pilina akua being recovered, revitalized, and reimagined?

c) How is climate change impacting expressions of aloha ʻāina (love of land, patriotism), kuleana (rights, responsibility), and mālama ʻāina (land stewardship)?

d) In what ways can education meaningfully address climate change in Hawai'i? An Indigenous conversational inquiry will allow the participants' experiences and stories to be highlighted and elevated in ways that contextualize, localize, humanize, moralize, and complicate the discourse of climate change in Hawai'i.

Keywords: Hawai'i, Kanaka ʻŌiwi, indigenous, climate change, adaptation

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An Introduction to the Unique Curriculum at the Mohamed Bin Zayed Falconry & Desert Physiognomy School. Educating the next Generation of Sustainable Falconers through Practical and Theoretical Lessons

Nicola Dixon [1]

The Mohamed bin Zayed Falconry and Desert Physiognomy School (MBZFDP) opened its doors for students in December 2016 providing heritage and environmental education to almost 4000 students over the past seven "falconry seasons".

This initiative forms part of the efforts made to preserve the heritage of the United Arab Emirates, deepen communication between the present and the past, commemorate the achievements of the pioneering falconer Sheikh Zayed bin Sultan Al Nahyan (RIP) and his original approach to preserve and pass down falconry to the coming generations.

Falconry has been practiced by Emiratis for centuries, firmly rooted in the rich cultural heritage of the UAE. MBZFDP is the first school worldwide dedicated to the teaching of traditional Arabian falconry and desert knowledge with a vision to promote and sustain Arabian falconry locally and internationally.

The MBZFDP school provides a unique opportunity for students of all ages and nationalities to experience traditional Arabian falconry in the desert environment, learning the skills and knowledge passed down through the generations.

The curriculum has been developed and written by Emirati and international falconers, teachers and educators, research and conservation biologists and falcon veterinarians, creating unique schemes of work and workshops appropriate to age and previous experience. The falconry curriculum includes thirteen subjects, each containing several topics leading to specific units of work. All subjects are delivered practically using captive bred falcons and traditional techniques and skills. Theory lessons are taught in the school's purpose-built classrooms and online.

The school aims to impart the principles and practice of Arabian falconry to future generations, demonstrating its unique nature and skills needed to practice falconry in the UAE, ensuring sustainable use of falcons, quarry and habitat.

The school offers several courses and workshops including a foundation course, where students learn the basics of traditional Arabian falconry, membership course, and apprentice scheme which delivers all subjects in depth, enabling students to become sustainable falconers in the 21st century. Schools visit the MBZFDP school throughout the falconry season, flying falcons in the desert and learning the traditional falconry skills practiced by their forefathers.

Keywords: cultural heritage, Arabian falconry, indigenous knowledge

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ممارسات التربية البيئية في التراث العربي والإسلامي: تحول حضاري نموذجي

محمود محمد علي[1]

تقتضي التنمية المستدامة تغييرا في السلوك وفي عادات الاستهلاك وكذا في أنماط الإنتاج، مما يطرح إشكالية مطابقتها لمقتضيات احترام التنوع الثقافي. وقد أصبحت الثقافة والتربية منذ قمة جوهانسبورغ المنعقدة سنة 2002 ، الركيزة الرابعة للتنمية المستدامة، الى جانب الركائز الثلاثة للتنمية المستدامة) الركن الاجتماعي، والاقتصادي والبيئي(، مما جعل البرامج المستدامة توفق بين حماية البيئة، والتنمية الاقتصادية، والانسجام الاجتماعي والتنوع الثقافي. وبمقدور هذه الركيزة مد جسور متينة مع الركائز الثلاث الاخرى للتنمية المستدامة .

وتعتبر التربية على الثقافة المحلية المبدعة عاملا أساسيا في معادلة التنمية الترابية المستدامة لكونها تعتبر عامل جذب وإشعاع وهوية ترابية، وعنصر بناء مجتمع مواطن، كما أنه لا يمكن تصور التنمية المستدامة لمجتمعاتنا دون إدراك أهمية المعارف التقليدية المبدعة والممارسات الفضلى المميزة لهذه الثقافة المحلية المحمولة عبر اللسان، ودون فهم الإشكاليات المتعلقة بتدريسها

فاللهجة الحسانية تحمل تراثا معرفيا قيماً في عدة مجالات، حيث تحمل تصنيفا تفصيليا لجميع المظاهر البيئية والتضاريسية الصحراوية، وهذا راجع الى الإدراك المجالي الكبير عند انسان الصحراء، الذي وجه سلوكاته للتناغم مع منظومته البيئية

تساؤلات وأهداف البحث:

1. سنبرز أهمية الثقافة البيئية المبدعة عند الإنسان الصحراوي من خلال اللسان الحساني، وذلك بهدف صيانتها وتثمينها
2. سنجيب عن سؤال: لماذا تعتبر الثقافة الحسانية المبدعة أداة رئيسية لبلوغ أهداف التنمية المستدامة بجهة العيون الساقية الحمراء (الهدفين 6 و13)؟
3. سنقيس مستوى معارف عينة من المتمدرسين بجهة العيون الساقية الحمراء حول القضايا والمفاهيم التراثية ذات الصلة بالبيئية والتنمية المستدامة
4. سنحاول الإجابة عن سؤال: كيف السبيل للمحافظة على هذه الثقافة المحلية المبدعة ونقلها للأجيال القادمة عبر أداة التربية والتعليم؟ بمعنى سنقترح استراتيجيات في التربية على الثقافة الحسانية المبدعة من أجل التنمية المستدامة

منهجية البحث: طبيعة أسئلة واهداف البحث تجعلنا نعتمد على المنهج والوصفي التحليلي، بحيث سنعتمد على الأدوات العلمية التالي :

- المقابلات جمع المادة المعجمية))
- الاختبار لقياس مستوى هذه المعارف التقليدية المبدعة عند المتعلمين
- شبكة تحليل المضمون

نتائج البحث وأهم التوصيات :

تبين لنا من خلال نتائج هذه الدراسة، أن نظم المعرفة التقليدية وطرق التعامل مع المحيط التي كانت تتبعها الساكنة المحلية والتي استخلصناها من المعجم الحساني المتداول، تُشكّل مصدرا لأفكار مبدعة لمواجهة التحديات البيئية ومكافحة مخلّفات التغيّرات المناخية مع ضمان تحقيق اهداف التنمية المستدامة.

واعتبارا لكون الحسانية ثقافة وطنية تحمل حضارة وثقافة عريقتين، ونظرا لكونها متداولة على نطاق واسع في الإبداع الثقافي والمعاملات اليومية بالمناطق الجنوبية، واعتبارا للدور الذي ينبغي أن تقوم به في عملية التنمية الشاملة والمستدامة، ونظرا لكون معارفها المبدعة لا تستثمر كما يجب، مع أنها مهددة بالانقراض، فانه بات من الضروري إدماجها في المنظومة التعليمية، والعمل على تطويرها وتأهيلها، مع العمل على إدراج مضامينها الثقافية في المناهج التربوية للمواد الدراسية عبر استراتيجيات تربوية. وذلك في إطار تفعيل جهوية البرامج المنصوص عليها في الميثاق الوطني للتربية والتكوين.

المراجع المحتملة: فعراس عبد العزيز 2016): دليل العيون للتغيرات المناخية" مفاهيم و قضايا"، مجموعة البحث و الدراسات حول ساحل الصحراء

الكلمات الرئيسية: حضارة، تمكين التربية البيئية، التراث العربي والاسلامي، ممارسات، في ضوء القرآن والسنة، قيم

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Knowledge from Below. Traditional Indigenous Knowledge on Watery Environments as Innovative Sustainable Solution to the Challenges of Modernity

Rita Vianello [1]

Watery environments are special spaces necessitating peculiar knowledge to be profitably habitable by humans. In aquatic territories, inhabitants have always needed to develop the adaptive knowledge for the constant modifications of human settlements; consequently knowledge, environment and infrastructures development have long been entangled.

Among the many complex human-environment-nature entanglement, in watery places local people developed a great variety of types of fishing techniques. Fishing can be defined as a form of domestication that allows communities to prove their own special skill, which are productive, cultural, and social. These special skills are very refined as the watery environment is not visually perceptible. Most recent scientific literature ignores locals' relationship and knowledge about water. In European Western vision, aquatic space is generally perceived as flat and homogeneous surface extraneous to humans and mostly dangerous. On the contrary, during my researches on small scale fishing in upper Adriatic Sea, in Venetian Lagoon, and in North France Atlantic Sea, I focused on knowledge "from below", *i.e.* bringing attention to the traditional indigenous knowledge on waters and seabed. I discover that local people and primarily fishers contest the mainstream approach to reefs. Fishers perceive watery spaces like an extension of their inhabited mainland and a bridge between dry lands. They know special liquid spaces through detailed three-dimensional mental maps which include in-depth knowledge of what lies beneath the surface. The acquisition of knowledge takes place thanks to a network of interactions built with the watery environment: the human components and the non-human ones that coexist in/under the water. This complexity of human/non-human relationship entangled together generates sustainable patterns - a concept that should be understood as including socio-cultural, economic and natural dimensions - environmentally friendly knowledge, and foster good practices.

As stated by the SDGs agenda, and as I was able to observe during my fieldworks, water traditional indigenous knowledge can teach new strategies to maintain a good ecological and environmental balance. Its valorization can contribute to actively involving local communities to protect and value the cultural and natural heritage. How to strengthen and promote the value of indigenous knowledge? What strategies can we adopt to improve the dialog between different forms of knowledge? This paper based on my anthropological research with Venetian fishing communities will present some relevant case studies to underline the value of "knowledge from below" as possible solution to sustainable management of delicate watery ecosystems, one of the great challenges of modernity. By bringing the voices to local communities and fishers, I will present my interdisciplinary research experiences with hard sciences to improve constructive dialogs between different knowledge.

Keywords: watery environment, fishing traditional knowledge, human-environment-nature entanglement

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676 Cultural Heritage and Traditional Knowledge to Create Belonging and Understanding of Our place in Time

Maria Hofman-Bergholm [1]

Neither sustainability nor the importance of traditional knowledge is anything new under the stars. Already in the early 1990s, traditional knowledge was recognized internationally as a valuable factor in the striving for sustainable development and for the protection of biodiversity but it is not before now that we have started to understand the importance of traditional knowledge systems. Aboriginal cultures around the world preserve and guard about 80% of global biodiversity but aboriginal cultures manage only about a quarter of the world's land surface and yet they manage to guard almost all of the plant and animal species in the world, a biodiversity that all humans are dependent on in the form of, *e.g.*, food systems and the medicines it supplies us with. Today, the contribution of intangible cultural heritage to environmental sustainability is recognized in many fields such as biodiversity conservation, sustainable natural resource management and natural disaster preparedness and response. It is the cultural traditions, values, beliefs, and worldviews of local people and their knowhow that are unique to a given society and that need to be transformed as traditional knowledge. Cultural heritage also contributes to creating belonging and understanding of our place in time. It is expressed through cultural heritage, saying something about who we are and what we have been, where we are and where we are heading. In a changing world, to achieve this understanding could constitute a safe anchor.

The theoretical paper builds on a multidisciplinary framework which is structured to acknowledge the need to combine different research disciplines to understand the problems our society face today. Through theoretical discussion, the paper identifies some of the deep underlying root causes and fundamental reasons as to why the urgent needed change is going so slow. The goal in the paper is to open up the discussion on, and find new pathways towards the implementation of sustainability and traditional knowledge in education today.

This study is based on a non-structured qualitative analysis performed through a traditional literature review. The flexibility in traditional literature reviews allows the method to be useful in synthesizing knowledge beyond research findings, such as theories, practices, and policies.

The paper emphasize the capacity of storytelling to make sustainability more easily accessible. Storytelling as a pedagogical tool for learning sustainability is still a bit overshadowed, but the idea of sustainability can be traced far back in aboriginal cultures, where storytelling has been used to transfer traditional knowledge from one generation to the next.

Keywords: sustainability, traditional knowledge, cultural heritage, education

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Learning from the Best: Indigenous Knowledge and Culture Guiding Conservation of the African Manatee in Guinea

Lucy Keith-Diagne[1]

The African manatee is the least studied large mammal in Africa and it faces many anthropogenic threats across its 21-country range. It lives mostly in very remote locations in murky and dark waterways, and the species is very shy due to illegal hunting and accidental capture in fisheries, making it exceptionally difficult to study. In Guinea, African manatees exist along the coast and in inland rivers, but its distribution, abundance and the impact of threats have been mostly unknown prior to this program, due to few people studying it. For the first time, a team of 13 Guinean biologists are working together to conserve this vulnerable species.

What indigenous knowledge do people in Guinea have that can teach us how to effectively protect African manatees? How can local knowledge and cultural practices guide conservation actions by Guinean researchers and wildlife management agencies?

Focus group interview surveys using a standardized questionnaire and led by 13 Guinean researchers were conducted through coastal and riverine villages throughout Guinea to determine African manatee presence, habitat use, diet and threats. Interview questions focused on traditional knowledge and cultural beliefs about manatees. Results were compiled from interviews to create a map of manatee distribution and threats in Guinea for the first time. Local knowledge and participation were then integrated into environmental education programs for children and communities in order to represent traditional knowledge guiding conservation messages.

Since May 2021, more than 300 people have participated in interviews/focus groups throughout Guinea. We also led more than 50 environmental education programs reaching 4000 people. Through these exchanges, local and indigenous people have shared information about where manatees occur, seasonal/migratory patterns, their diet and threats, all of which will lead to more effective conservation strategies for the species. For us as Guinean researchers, we have learned from them and integrated indigenous wisdom and culture into our environmental education programs to raise awareness of the need to conserve the species. We have also built relationships in communities with local people to become ambassadors for manatee protection.

Communities throughout Guinea provide crucial information about manatees, their ecology and threats that increases the ability of Guinean biologists to protect them. Environmental education programs throughout Guinea are now being scaled up for the long-term by trained researchers who are also able to join international networks to collaborate, share and exchange knowledge with a global audience. This approach, led by nationals and indigenous people working together, can be replicated in other countries to preserve other endangered species.

Keywords: Trichechus senegalensis, Africa, traditional knowledge, communities, conservation

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746 Working for the Present and Future Wellbeing of all Life

Anne Poelina[1]

The WEEC Conference (2024) provides an opportunity to listen to the voices of Indigenous leaders, scientists, investors and with governments. The future of humanity is at stake. Indigenous people across the globe, are encouraging all of us to feel and hear the land, in order to build a relationship with the land, in developing an ethics of care, Download this publication, 'Feeling and Hearing Country as Research Method' ***https://lnkd.in/gE-bZyqq*** In order to shift from extractive to regenerative economies we are building the 'Forever Industries' by incorporating ancient wisdom, incorporating all forms of capital into the modern concepts; see, ***https://stories.acf.org.au/forging-the-forever-industries***.

This call for action on the environment and climate change is essential, if we are to meet the targets of the 2030 Global Biodiversity Framework – there is no other viable way. In 2021, scientists around the world called for the recognition and support of Indigenous Peoples and local communities and their knowledge system and identified 15 recommendations to achieve this Framework .

As First Australians we are the oldest living culture on the planet, we have not walked away from nature and the 'garden of Eden'. We have remained good ancestors, custodians, and stewards, creating and sustaining our lifeways and livelihoods. The Martuwarra Fitzroy River and all people in the Watershed face great uncertainty ***https://www.globalwaterforum.org/2023/04/23/western-australia-be-the-change-for-water/*** Today we extend our values and ethics of care to our fellow Australians and outwardly to the world. We understand we are dealing with complexity particularly with climate change spiraling into climate chaos. Our Indigenous people agree this is a 'Sustainability crises are crises of relationship', see ***https://doi.org/10.1002/pan3.10149***.

The future wellbeing of all people is dependent on how we treat biodiversity and the right of our non-human kin to multi-species justice. This requires a deep relational, reciprocal collective ethics of care and love. We must listen to the wisdom of Indigenous people, in order work together for the planetary solutions towards the wellbeing of everyone and everything around us, see ***www.martuwarra.org***.

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The role of Indigenous Knowledge and Traditional Practices in Promoting Community Resilience and Ecological Sustainability in the Face of Climate Change: The Case of Women

Mphemelang J. Ketlhoilwe[1]

Commercialization of the use of natural resources has led to over harvesting of medicinal plants and wild edible fruits. To sustain harvesting of wild plants in the face of climate change, Indigenous Knowledge (IK) and traditional practices has been recognized as a viable tool by veld products harvesters especially women in Palapye District, in Botswana. IK's recognition was due to its conservation role that is historical among rural communities. It is claimed that a quarter of the world's land area is owned, managed, used or occupied by indigenous peoples and local communities. Indigenous peoples and local communities' livelihoods depends on natural resources that are obtained free of charge and managed through IK and traditional practices.

The presentation would critically examine how indigenous knowledge and culture acquired through social learning help connect people and the environment to create a better tomorrow. The connection of local wisdom is contributing to international agendas and framework such as the Sustainable Development Goals (SDGs).

The focus of the IK and cultural practices would be on common medicinal plants, herbal plants and edible wild fruits usually sustainably gathered by women for subsistence and commercial uses.

The discussion would highlight the learnings and why we need to give attention to informal environmental education. The discussion would further demonstrate the significance of the renewal for a call for the protection and integration of indigenous knowledge systems and culture into environmental education.

Keywords: indigenous knowledge, medicinal plants, wild edible fruits, sustainable development goals and environmental education

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THE DIMENSIONS THEME 02

Aesthetics Ethics and Emotional Dimensions - The Role of Art and Design in EE

Theme Background:

Art has a unique ability to help us visualize and connect with the intricate patterns inherent in living systems and the natural world. Children, in particular, possess a natural inclination to recognize and express the essence of nature through artistic expression. Beyond conventional learning about plants and animals, art offers a means of experiential engagement, fostering a deeper, emotional connection to the environment. The integration of EE and ESD into art challenges students to see and relate to the natural world in profound ways. Similarly, design thinking emerges as an innovative tool for addressing complex systemic sustainability challenges, providing a creative approach to problem-solving and fostering ethical and empathetic responses to environmental issues.

Theme Objectives:

"Aesthetics, Ethics, and Emotional Dimensions: The Role of Art and Design in EE," aims to:

- Highlight growing knowledge and sensitivity to the environment and environmental challenges through the lens of art and design.
- Showcase innovative proposals that incorporate art and design activities as critical elements of the EE and ESD experience, demonstrating the potential for creative expression to foster environmental understanding and action.

Theme Focus:

- Personal journeys of artists and educators in integrating environmental themes into their work.
- The role of art in fostering a sense of environmental responsibility and stewardship.
- Creative approaches to using art and design to communicate complex environmental concepts.
- Curriculum designs that incorporate art and design as essential components of environmental education.
- The role of artistic expression in fostering problem-solving and critical thinking skills.
- Art and design activities that promote empathy and ethical responses to environmental issues.

Theme Outcomes:

Learn how art and design contribute in developing essential skills for identifying and addressing environmental challenges, including problem-solving, critical thinking, and empathy.

Theme Conclusions:

The thematic track on "Aesthetics, Ethics, and Emotional Dimensions: The Role of Art and Design in EE" aligns with the overarching goal of WEEC 2024, which is to "Connect People, Create Tomorrow."

It underscores the transformative potential of art and design in enhancing environmental education, fostering emotional connections to nature, and promoting ethical and empathetic responses to environmental challenges.

THE DIMENSIONS THEME 02

Aesthetics Ethics and Emotional Dimensions - The Role of Art and Design in EE

Presentations

ID	TITLE	PRESENTER	FORMAT
146	Art as a Catalyst for Sustainable Community Transformation: A case study of an Art-Based project developed in four Spanish regions	Javier Fernandez Ramos	Oral communication
191	The Fresh Press Enterprise: A sustainable action project for paper production at Zayed University using locally sourced agricultural waste	Tina Sleiman, Eric Benson, Fatme Al Anouti	Pecha kucha
279	The story asking of ocean plastic: A journey across the curriculum	Erin Roxanne Philip Eaton	Workshop
381	Raising green awareness thanks to children's literature: an artistic workshop of creative writing for students in French as a foreign language	Karine Germoni	Oral communication
423	River Tales: participatory videomaking and civic engagement to foster freshwater ecosystems in the project "CIAK! Sì, parteciPO".	Laura Dominici	Oral communication
440	Environmental ethics: An analytical heuristic for theory and practice	Bob Jickling	Workshop
493	Integrating Traditional Puppetry Art for Effective Wildlife Conservation Education: A Case Study from South India	Brawin Kumar	Oral communication
497	Speaking 4 the Planet: Advocates 4 the Earth speaking at the Edge of Tomorrow	Phil Smith	Oral communication
549	SDG inclusive DREAMS Cultural Caregiving via Techno-arts Interdisciplinary Intergenerational Interfaith Strategy Popularizing Science to stop Violence Against Mankind and Mother Earth to fight poverty	Cecilia Guidote-Alvarez	Oral communication
733	Creating your own Environmental Comic Strip from Scratch	Rohan Chakrawvarty	Workshop

THE DIMENSIONS THEME 02

Aesthetics Ethics and Emotional Dimensions - The Role of Art and Design in EE

Abstracts

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Art as a Catalyst for Sustainable Community Transformation: A case Study of an Art-Based Project Developed in Four Spanish Regions

Javier Fernandez Ramos [1]

Art, culture and creativity are becoming increasingly important in addressing environmental issues, promoting sustainable practices and fostering community development. Art has the potential to stimulate critical reflection, reframe problems and needs, foster dialogue and collaboration and promote creative solutions to complex environmental and social problems (Olsen, 2013). Arts can specifically help to acquire sustainability competences to a broad public (Molderez and Ceulemans, 2018).

This research paper presents a case study of an art-based projects developed in four different regions in Spain aimed to promote sustainable and ecological transition in communities. The projects were a transdisciplinary collaboration between artists, cultural mediators and community members. The four projects share the shame methodology and approach. The case study used a qualitative approach based on individual and group interviews with project participants, cultural mediators and artist to explore the relationship between art practices and social communities in the context of ecological transition. The main research questions of the case study were: what were the key processes and factors that contributed to the success of the art-based project in promoting sustainable community transformation?; what were the main impacts on community members' attitudes and behaviours towards sustainability?; what were the main challenges and limitations?

The data were analysed using socio-hermeneutical and thematic analysis to identify patterns, themes and trends. Preliminary findings show that the art-based programs had a significant positive effect on community's environmental awareness and engagement. The projects increased participants' knowledge of sustainability issues, their attitudes and behaviour towards sustainability and their willingness to engage in pro-environmental actions. Projects helped also to create a sense of shared ownership and pride in the community. However, the projects also faced challenges and limitations, including issues of representation, participation and impact assessment.

The study make some recommendations regarding with the importance of interdisciplinary collaborations, the development of new evaluation methods that capture the diverse impacts of art-based projects on sustainability and community development and the need for more attention to issues of social justice, equity and diversity in these projects. Art can contribute to empowering communities by providing a platform for expression, advocacy and community mobilization. Art helps to develop new skills, to host a meaningful dialogue processes and to foster a sense of belonging. However, the composition of knowledge of different stakeholders is an issue to be further explored with methodological improvements in participatory processes.

Keywords: art-based project, community empowerment, cultural mediation, ecological transition

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The Fresh Press Enterprise: A Sustainable Action Project for Paper Production at Zayed University Using Locally Sourced Agricultural Waste

Tina Sleiman[1], *Eric Benson*[2], *Fatme Al Anouti*[3]

Brian Dougherty and Celery Design Collaborative suggest that because "the paper industry is responsible for 40 percent of all industrial deforestation worldwide [...] agricultural residue, or agri-pulp, is perhaps the most promising fiber source because it [...] makes the most of a waste material and doesn't require dedicated agricultural land" (2008). At the University of Illinois, Eric Benson has embedded responsible environmental practices in his innovative approaches to art and design education. Benson and a team of papermakers, farmers, artists, designers, students, architects, and material science engineers collaborate at Fresh Press Paper, a studio running in parallel to a sustainable student farm to make paper out of agri-pulp. The UAE consumes large quantities of paper (Khaleej Times, 2011), and this consumption was paralleled with the establishment of numerous paper mills (Paper Arabia, 2022). However, most mills utilize bleached, coated, wood-based paper from virgin pulp, severely impacting the environment. In response, this study explores the potential of building a small-scale model of sustainable paper production at Zayed University, utilizing local agricultural waste material like palm leaves or corn stalks as fibers to make paper that would serve art and design students and practitioners.

This research revolves around the themes of ecological restoration, sustainable material engineering, and an interdisciplinary environmental education for art and design students. From a social aspect, it incorporates technology (in the use of specialized equipment to turn agri-pulp fibers into paper), social change (because it requires collaboration from the fields of art and design with the natural sciences, as well as with community farms and environmental organizations), and health (because it aims to replace mainstream paper production– which is highly toxic, using bleach and other toxic compounds– with safer material made out of agricultural residue). In terms of methodology, an active practice-based approach is utilized to test materials for handmade papermaking.

The slides will showcase the involvement of cross-disciplinary college students in environmental education by: a) researching about existing paper production facilities in the UAE, b) learning about regenerative paper production techniques, and c) examining the potential of utilizing agricultural residue from native plants in papermaking. We anticipate that this project will facilitate the development of a sustainable approach for producing paper in the UAE and hope that the presentation would stir a discussion on responsible paper production, locally, and internationally.

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Keywords: regenerative graphic design, papermaking, agricultural residue, native plants, cross-disciplinary education

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The Story Asking of Ocean Plastic: A Journey across the Curriculum

Erin Roxanne Philip Eaton [1]

A novel method of using ocean plastic has been developed as a catalyst for student-centered learning experiences at Yas SeaWorld Research and Rescue (YSWRR). Based on contemporary art-making practice, educational psychology theories, and design-thinking methodologies, plastic-asking is easily replicable, low-cost, and can be implemented according to the unique needs of learners. Considering the strengths of human-centered designers as assets for sustainable development, (*i.e.*, empathy, tolerance for ambiguity) this method gently guides learners to connect with others through a variety of creative means.

Plastic-asking begins with learners clearing plastic from a marine habitat. The plastic is washed, dried, and displayed. Note that this trash can now be displayed as an abstract composition according to the cohort's collective aesthetic decision making. The plastic need not be transformed into anything else; it will communicate a message as the youth continue through plastic-asking. Learners will be given creative constraints to both guide and challenge them through the journey. In essence, learners will ask the of plastic: Where has it been? Why was it made? Who used it? What happened? From there, concepts in marine biology and materials science will be explored and scaffolded as necessary.

As this is an experience designed to involve any component of the 'traditional curriculum', learners might choose to investigate their plastic using the lens of any subject or combination thereof. Perhaps the learner would lean on language an develop a short play about the journey of a plastic dinner plate making its way across the Indian Ocean basin. Maybe a group of youths explore what would happen if math, zoology, and the spoken word were combined to create a piece about a bottle cap lost in a school of krill.

As educators, of the myriad responsibilities we hold, protecting our learners from eco-apathy might just be the most salient. Asking ourselves, "What would happen if..." plastic-asking is at once ambiguous, investigative, creative, and at times, downright silly. This method can add a bit of light-hearted fun, time for connection, and open an opportunity for empathy while we all work towards caring for our ocean.

Attendees to this workshop will engage in an abbreviated plastic asking with various plastic artifacts found on beaches in Abu Dhabi, and will view the work YSWRR's intentional cohort of multi-aged youth. Attendees will also leave with actionable inspiration on how to implement this method according to their own context.

Keywords: ambiguity, storytelling, plastic, inquiry, student-centered

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Raising Green Awareness Thanks to Children's Literature: an Artistic Workshop of Creative Writing for Students in French as a Foreign Language

Karine Germoni[1]

In a world that is facing more and more climate emergencies, can literature, and especially children's literature, efficiently raise the younger generations' awareness of the need to protect the environment? In order to measure this power, an artistic workshop of creative writing "Raising green awareness thanks to children's literature" will be held from September 2023 to January 2024 on a weekly basis at Sorbonne University Abu Dhabi for students who are studying French language at an intermediate level (B1-B2).

This four-steps workshop will allow students:

a) To consolidate their environmental knowledge by meeting two Belgian artists Benoît+Bo who will share their reflexive artistic experience by means of the short movie (The animals are disappearing on our Earth) and the paradoxically colorful paintings they have created to wake people's green awareness up.

b) To read and then analyze a children's book, Tchoupèpè , whose main protagonist is an endangered sea turtle found in the Caribbean Sea; with the help of its author, Matcha, students will discover how to build a story and protagonists; they will also be pushed to try and understand how "green stories" give birth to non-cathartic emotions that prick readers' critical environmental thinking and urges them to concrete actions.

c) To create and design an illustrated children's book that tells the story of an endangered animal that is close to their hearts. Students will be guided by their teacher not only to enhance the writing process of their story, but also to ask and answer relevant questions such as: how to write a "green story" in French as a foreign language? how to find the convenient drawings?

d) To be trained to read one's story aloud, to be well prepared to read it in order to move others, whether they are other young adults, children – and their parents'.

The aim of this workshop that will help students to enhance their level in French is thus mainly to develop through reading, writing green short stories for children their sensitivity for nature and especially for endangered animal species (that may live in the Middle East countries). At the end of the sessions, students will complete a survey whose results will show if the workshop has reached its goals efficiently and if yes, how it has done so.

My practice-oriented presentation will try to answer as precisely as possible the introductory question of this abstract through the results of the workshop "Raising green awareness thanks to children's literature" conceived as an experimental work in progress. My presentation is an individual submission that mainly fits into the framework of theme 7 (and, to a lesser extent, of theme 10) of the 12th World Environmental Education Congress.

Keywords: green awareness, children's literature, reading, creative writing, emotions

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River Tales: Participatory Videomaking and Civic Engagement to Foster Freshwater Ecosystems in the Project "CIAK! Sì, parteciPO"

Laura Dominici[(1)], *Silvia Pesce*[(2)], *Elena Comino*[(3)]

Freshwater ecosystems provides many ecosystems services in urban areas contributing to improve the quality of life with cultural and physical benefits. Citizens uses services provided by urban rivers that often are important landmark contributing to define unique riverscapes such as in the case of the city of Turin (Piedmont Region, Italy). However, in recent years climate change increasingly stresses freshwater ecosystems leading to more frequent extreme events such as serious droughts and floodings that negatively affect cultural and recreational services (*e.g.* water-sports like rowing). In this scenario, citizens are invited to cooperate with local government, universities, environmental agencies and third sector entities in order to preserve rivers and their ecosystems.

Therefore, this contribute presents the experience of the project "CIAK! Sì, parteciPO", proposed by the Environmental Ecology research group of the Politecnico di Torino and financially supported by the Fondazione Compagnia di San Paolo. The project focuses on the creation of a participatory video (PV) (a short documentary) thanks to the engagement of about 20 young citizens (18 – 35 years old) of the city of Turin who worked together to explore the importance of physical and socio-cultural environment of the Po River. These young citizens of varied cultural backgrounds (*e.g.* engineering studies, environmental science, human and social studies) were selected using a public "call for participants" and no specific skills about filmmaking were required to be member of the group. The group was supported by a professional filmmaker who provided to participants basic knowledge concerning scriptwriting, filming and audio recording techniques. They were also supported during the creative process of videomaking in order to answer to the question "what does it mean to live with the Po River?" by listening the voice of some local stakeholders. The project was structured in workshops and review meetings managed by project proponents with the support of the professional filmmaker, while shooting and recording stages often were self-organised by participants. The whole creative process was performed by adopting the Participatory Learning and Action to foster peer-to-peer learning, collective imagination, civic engagement and community empowerment. Indeed, participants were prompted to share their personal skills and abilities (*e.g.* songwriting or acting) in order to enrich the PV outcome.

The project used the PV as a ground-breaking tool that uses the emotional power of sounds and images to immediate communicate with local policymakers and other citizens with the aim to highlight perceptions, threats and reflections concerning the civic use of the Po River as community property. Moreover, the project strengthened the network of partners which are involved in the management of Po River ecosystems and supported the project itself.

Keywords: socio-ecological awareness; art for urban ecology; urban rivers; environmental communication; citizens empowerment

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Environmental Ethics: An Analytical Heuristic for Theory and Practice

Bob Jickling[1]

Meaningful change does not come from continuously doing the same thing. More information about science and social justice issues will be helpful in keeping issues like climate change and social injustice current. It will set up a context for meaningful change. Still, something more radical may be essential. In times of change, uncertainty, and stress, interest in values and ethics increases. Unfortunately, ethics are messy and uncomfortable. This presentation introduces an analytical and practical tool that I call a heuristic. I have chosen this term because it suggests that this tool is designed to help educators reflect on their own conceptions of ethics and education, to help them make decisions about content worthy of inclusion in their lessons and examine the ways that this content might be educationally presented. The basis for this heuristic is framed around the questions: Why don't people care enough to act on the seemingly moral imperatives of our times? Where does the moral impulse—the urge to act-come from? Must ethics rely on duties? Can ethics be joyful? Can effective ethics be grounded in abstract principles? Or do they have to arise out of lived experience? The methodological basis for this presentation will be exegetical analysis and philosophical discourse.

Keywords: environmental ethics, ethics, heuristic, change

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Integrating Traditional Puppetry Art for Effective Wildlife Conservation Education: A Case Study from South India

Brawin Kumar[1]

This abstract introduces an innovative approach to wildlife conservation education, incorporating traditional evanescent puppetry from South India. The program's primary objectives are to educate and engage audiences on wildlife conservation, biodiversity, and ecological balance while reviving a fading art form. Tholpaavaikoothu, a traditional shadow puppetry art, takes center stage in this initiative. Historically used for storytelling, it now conveys educational messages on wildlife conservation. Accomplished puppeteers employ various techniques to create captivating performances about wildlife, accompanied by informative narratives promoting biodiversity preservation, endangered species protection, and ecosystem balance.

The abstract also highlights the significance of pangolins in India's ecosystem. Pangolins are unique creatures characterized by Keratin scales, with the Chinese and Indian pangolins being native to India. These nocturnal animals inhabit burrows and play a vital role in maintaining ecological balance by feeding on termites, ants, and other insects.

The impact of illicit wildlife trade on pangolins in India is profound, with over 1,200 pangolins detected in such trade from 2018 to 2022. Loss of habitat and poaching exacerbate their vulnerability. Thus, the program aims to raise pangolin awareness, particularly among rural and tribal communities in Shevaroy Hills, Salem, Tamil Nadu, India, to prevent illegal pangolin trade at the grassroots level.

The program engages with 27 primary and middle schools in Shevaroy hills, Tamil Nadu chosen based on past pangolin sightings reported by local tribes and forest department officials. Interactive activities such as puppet shows, games, posters, puzzles, quizzes, story-telling, assessments, and sketching are employed to engage children. Pre-assessments and post-assessments measure the program's effectiveness.

Preliminary results indicate success, with 1,176 students participating in assessments, showing significant knowledge gains post-awareness sessions. Comparing pre-assessment scores (3,731) with post-assessment scores (6,983) underscores the impact of active learning methods.

The program's execution offers visual enchantment and intellectual stimulation, transporting audiences into the world of puppetry, where they connect with nature and wildlife challenges. Evaluation includes assessing knowledge and attitudinal shifts before and after wildlife conservation awareness sessions. Post-performance discussions and interactive sessions ensure precise data collection from the targeted community, ensuring effective engagement.

The integration of traditional puppetry into wildlife awareness programs is a unique approach to promoting environmental consciousness. This fusion of art and education fosters a powerful emotional connection and emphasizes the importance of community engagement and education in preventing illegal wildlife trade, ensuring wildlife and ecosystem preservation.

Keywords: traditional puppetry art, wildlife conservation education, environmental consciousness, biodiversity preservation, pangolins, Eastern Ghats, South India

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497 Speaking 4 the Planet: Advocates 4 the Earth Speaking at the Edge of Tomorrow

Phil Smith[1]

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 an Arts-based approach to building advocacy for sustainability. Participants speak or write or draw or perform their views and concerns, their ideas and their passions for healthy communities on a healthy planet.

Around the world, youth voice is rising. On every continent, students are rallying together to express their concerns about the fate of the planet. They are meeting and speaking up for their very own futures. Two key messages emerge from the global student strikes and their specific focus on climate change:

- The demand that governments use evidence in their decision-making processes and use that evidence to create good policies that protect the future and achieve sustainability.
- Schooling and education have failed everyone and the planet: education systems put sustainability at the periphery of education rather than as the core purpose; increased levels of education and understanding have not served to protect the planet and its resources (environmental and human) - indeed, they have quickened the exhaustion of those resources.

Speaking 4 the Planet is one of many youth initiatives that seek to create space for youth voice, youth connections, youth advocacy. It uses the Arts as the competition vehicle and the SDGs as the content.

The Arts can change the world. Do change the world. A great deal of work in sustainability education is science or geography focused. Information. Research. Data. Yes, important stuff. The Arts are the drivers for action. Words and performance weave the present with the possibilities of a better world. They critique extant cultures and imagine new ones. They motivate changes in thinking and feeling and doing. A sustainable planet won't be achieved with information alone. Deliberate, focused human actions - at home, in businesses, communities and governments - are required. The Arts play a major role in inspiring people to create and take up the necessary actions. Speaking 4 the Planet competitions make an Arts-based contribution to bringing about a more sustainable world. They mobilise students and link them to their local communities in conversation and action. Speaking 4 the Planet events should only be run where there is an interest in change.

This presentation will review a decade of S4P in Australia, New Zealand, Thailand and Vietnam. And consider the next steps in helping youth around the world to step up and speak up for a healthy and safe world.

Keywords: arts, sustainability, speaking, advocacy, healthy planet

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SDG Inclusive DREAMS Cultural Caregiving via Techno-arts Interdisciplinary Intergenerational Interfaith Strategy Popularizing Science to Stop Violence Against Mankind and Mother Earth to Fight Poverty

Cecilia Guidote-Alvarez [1]

Culture is the catalyst in actualizing Education for All.

The Earthsavers story of free arts education for Social Change to the vulnerable a mobilizing creative army of artists-teachers to win the war against Poverty & Pollution, Drugs & Despair, Crime & Corruption, Terrorism & Tyranny, ignorance & injustice not by compulsion thru the force of arms BUT BY Persuasion thru POWER OF ART. Politics is divisive. Arts can heal, bond a nation & unite peoples as a global family by recharging memory. Without memory, we can't learn from past mistakes nor draw strength to realize a peaceful sustainable future.

CrossCultural artistic participation seeding pride of habitat, heritage, history generating jobs new routes of arts expression from ancestral roots focused on bio-cultural diversity, Ocean & Forest Care, Climate Change response through clean energy, gender equity & health.

People must be informed through cultural symbols & language they can relate to, emphatize not alienated, involved not disinterested, to understand the complex existential crisis of climate, conflict & Covid inspired with confidence in solving their problems. More than speeches – a painting, a poem, a song, a play, a dance piece, a film, animated legends broadcast stories of love, heroism and courage of commitment to human rights, must carry the cries of orphaned children and widows to prevent armed conflict through dialogue while defusing the ecological timebomb of a Hot-house Earth through intercultural interfaith diplomacy.

The transformation of PWDs & other vulnerable groups into handicapable, responsible citizens through free arts education as a bridge for rapprochement, social cohesion & harmony has been honored with a UNESCO Artist for Peace.

Our synergized techno-theatre DREAMS program enriches curriculum and alternative learning for human resource thru DEVELOPMENT REHABILITATION, EDUCATION Through ARTS, MEDIA, SCIENCE & SPORTS. Leaves no one behind. Every person has a gold mine of talents that can be nourished with equal opportunity. Our human rights journey was intensely difficult faced with initial indifference at home. Breaking the barriers of bias and prejudice, we travelled on fly now-pay later plan to banner the triumph of spirit over adversity at the UN.

The physically and economically handicapped, the indigenous, the prisoners, youth in difficult circumstances, senior citizens, they deserve high caliber program of training & research with a platform for artistic expressions manifested in a successful SDG ResiliArt Events hosted by Manila supported by Senate under UNESCO patronage.

After Typhoon Haiyan & earthquake devastation, we joined with psychologists and social workers to address the trauma of victims to restore the mental health of victims.

Many beneficiaries from excluded groups have graduated, now well employed as teachers, using performance & media arts for non-violent lifelong learning, as we underscore that the seemingly powerless can be POWER MESSENGERS.

Keywords: peace, eco-arts, SDG education

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733 Creating Your Own Environmental Comic Strip from Scratch

Rohan Chakrawvarty[1]

'Environmental Communication the Toonie Way': A 2.5 hour long cartoon workshop

Synopsis: Workshop theme: Creating your own environmental comic strip from scratch

Steps:

A. The writing of a gag:

Analysis of a current environmental issue: a. The need and scope for humour? b. Sensitive use of humour c. Writing a gag based on a situation.

B. The drawing of a gag:

a) Warming up like an artist
b) Creating your own cartoon characters from simple shapes
c) Making your characters emote: facial expressions
d) Making your characters emote: body language and gestures
e) Drawing backgrounds and props
f) Framing and perspective
g) Creating your own comic strip

Keywords: creating your own environmental comic strip from scratch

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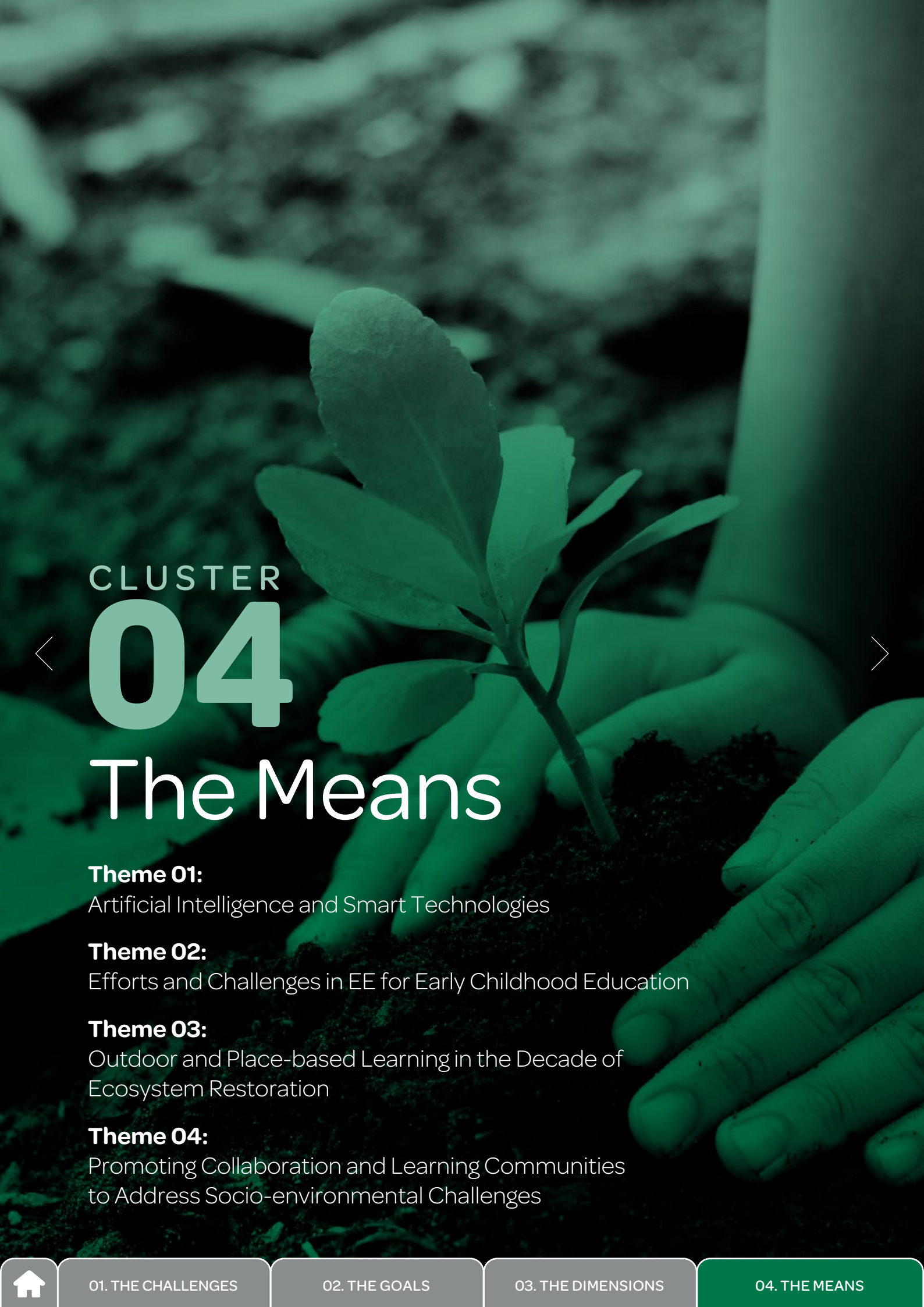

CLUSTER

04

The Means

Theme 01:
Artificial Intelligence and Smart Technologies

Theme 02:
Efforts and Challenges in EE for Early Childhood Education

Theme 03:
Outdoor and Place-based Learning in the Decade of Ecosystem Restoration

Theme 04:
Promoting Collaboration and Learning Communities to Address Socio-environmental Challenges

THE MEANS THEME 01

Artificial Intelligence and Smart Technologies

Theme Background:

In the digital age, smart technologies and Artificial Intelligence (AI) have become integral tools in education, revolutionizing the learning process for students of all ages. These technologies offer a wide range of transformative possibilities, supporting learners and educators alike in acquiring knowledge and fostering engagement. In the field of EE and ESD, smart technologies hold tremendous potential for raising environmental awareness, promoting sustainable development, and enhancing ecological understanding.

Smart technologies, including AI and virtual reality, enable interactive and immersive learning experiences, making environmental activities more engaging and impactful.

Theme Objectives:

The theme, "Artificial Intelligence and Smart Technologies in Environmental Education," aims to:

- Examine the opportunities and challenges presented by AI, virtual reality, and smart technologies in the context of environmental education. What are the advantages, and how can obstacles be overcome?
- The need to leverage Geospatial Technologies in EE and ESD and their role in enhancing environmental understanding and engagement.
- Smart technologies in citizen science initiatives and their contribution to EE and ESD.
- Role of smart technology in providing inclusive access to EE and ESD for students with special needs.

Theme Focus:

- Innovative uses of AI and smart technologies in environmental education.
- Strategies for harnessing smart technologies to enhance learning outcomes.
- Geospatial tools and their impact on environmental understanding.
- Engaging citizens in environmental research using smart technologies.
- Environmental and ethical considerations related to the production and disposal of smart devices.
- The potential for personalized and adaptive learning experiences through AI.
- The role of AI in data-driven decision-making for environmental sustainability.
- Assistive technologies and tools for special needs students in EE and ESD.

Theme Outcomes:

The pivotal role that Artificial Intelligence and Smart Technologies in connecting people to the environment, natural resources, and ecological issues, paving the way for informed decision-making and environmentally responsible behaviours.

Theme Conclusions:

The thematic track on "Artificial Intelligence and Smart Technologies in Environmental Education" aligns with the overarching goal of WEEC 2024, which is to "Connect People, Create Tomorrow."

Together, we can explore innovative approaches, share best practices, and address the opportunities and challenges presented by AI and smart technologies in the pursuit of a sustainable and resilient future.

THE MEANS THEME 01

Artificial Intelligence and Smart Technologies

Presentations

ID	TITLE	PRESENTER	FORMAT
106	Conceptualización de un Sistema de Información Geográfica (SIG) para la Educación Ambiental en Bogotá D.C. (2002-2021)	Carolina Infante Osorio	Oral communication
116	Fostering Sustainability in Education Using ChatGPT	Mohanad Halaweh	Oral communication
151	Factors influencing Artificial intelligence (AI) products adoption for developing environmental sustainability: A literature review	Rania Mostafa	Oral communication
153	What is the role of artificial intelligence in environmental education?	Gerard Cunningham	Round table
160	Can AI promote environmental sustainability in Africa?	Gerard Cunningham	Round table
160a	The need for International & national policy for AI applications	Anuja Punj Prashar	Round table
160b	Enhancing Environmental Education through AI for Sustainable Development in Africa	Esther Gacicio	Round table
160c	Harnessing Artificial Intelligence for Environmental Education in Africa: A Path Towards Sustainable Development	Chinasa T. Okolo	Round table
203	Evolution of the 'Future Mayor Workshop' during COVID-19 - Development and Implementation of Hybrid/Online Workshops that Utilise ICT	Hideaki Kurishima	Poster
222	Enhancing Environmental Education By Utilizing Immersive Virtual Reality to Visualize And Portray Future Environmental Impacts	Shirin Alimour	Oral communication
228	التربية البيئية من أجل التنمية المستدامة في منهاج الجغرافيا: أي دور للدليل الرقمي؟	Faaras Abdelaziz	Oral communication
233	Social media, moral norm and waste behaviour – based on experimental economics	Aiqin Wang	Oral communication

ID	TITLE	PRESENTER	FORMAT
329	Promises, Perils and Pitfalls of 'alternative realities' in EE Pedagogy: A provocative exploration	Lisa Ryan	Oral communication
412	Mobilizing Youth for Environmental Conservation: Navigating AI & Smart Technologies Frontier	Asish Singh	Workshop
578	Hold That Drop - Water Conservation Initiative	Janya Bhatt	Workshop
625	Connecting Citizen Science Data with AI to Create Meaningful Outcomes Including Education, Communications and Community Outreach	David James Vaughan Wallace	Oral communication
664	Creating Socially Just Physical Environments: How Geospatial Technologies can Foster Community Engagement in Sustainability Projects	Xin Hong	Oral communication
735	GIS-based Problem-based Learning for Climate and Sustainability Education	Michael Gould	Oral communication
737	Workshop on ArcGIS for Climate and Sustainability Applications	Michael Gould	Round table

THE MEANS THEME 01

Artificial Intelligence and Smart Technologies

Abstracts

106

Conceptualización De Un Sistema De Información Geográfica (SIG) Para la Educación Ambiental En Bogotá D.C. (2002-2021)

Carolina Infante Osorio[1], *Jennifer Lizeth Romero Pérez*[2], *Claudia Shirley Ramírez Cuetia*[3]

Bogotá ha sido escenario de diversos proyectos de Educación Ambiental (EA), sin embargo, el avance en esta área se ha visto obstruido por pérdida de resultados y la no visualización de los mismos. Por ejemplo, sin un registro de información pertinente que permita realizar seguimiento y control a las evidencias en EA, se genera una desarticulación entre actores que resulta en investigaciones con el mismo objetivo o áreas de estudio, duplicando esfuerzos y costos sin avances prácticos reales en las zonas ambientales de Bogotá.

El propósito de esta investigación fue elaborar la etapa de conceptualización de un Sistema de Información Geográfica (SIG), basado en la metodología propuesta por Guevara (1992) y aplicado a la EA en Bogotá, con el fin de integrar y relacionar la información sobre los tipos de EA ejecutados en la ciudad entre el año 2002 y 2021, facilitando la visualización y conocimiento de los proyectos y agentes involucrados. La pregunta de investigación se enfocó en los atributos requeridos para la entrada pertinente de datos en el SIG, siguiendo el modelo propuesto, siendo esta: ¿Cuáles son los atributos pertinentes necesarios en el diseño de un Sistema de Información Geográfica para la Educación Ambiental en Bogotá D.C. en el periodo comprendido entre el 2002 y 2021?

La investigación se basó en un método hermenéutico y se dividió en tres fases. La primera relacionada con la evaluación de necesidades en donde se identificaron necesidades y expectativas de potenciales usuarios por medio de encuestas, teniendo como resultado que el fin principal de la herramienta se espera sea informativo para ciudadanos y académicos; en la segunda fase se analizan los requerimientos tecnológicos en donde se realizó un listado detallado de hardware y software necesarios para la etapa de ejecución; finalmente, la tercera fase es el diseño conceptual, en donde se propuso un modelo conceptual basado en los 6 componentes de la EA según Zamudio (2015) para la implementación de atributos que permitan el ingreso de una información integral a la herramienta. Se destacaron como características que generan información esencial y que requieren de mayor participación en los atributos del SIG, las políticas ambientales, situaciones ambientales e interacción con otros agentes.

Se concluye que tanto los SIGs como la EA en Bogotá son temas poco conocidos por los ciudadanos, por lo tanto, se requiere de una herramienta de fácil acceso y sin restricción de uso que permita un acercamiento de los usuarios a una información que tenga integración de actores, políticas, procesos y tecnología en el campo de la EA con un enfoque interinstitucional, intersectorial e interdisciplinario.

Guevara, J. 1992. Esquema metodológico para el diseño e implementación de un Sistema de Información Geográfico. Geographicalia, (29), 21-30. ***http://doi.org/10.26754/ojs_geoph/geoph.1992291832***

Zamudio, C. 2015. Educación ambiental en la educación superior: Consideraciones teóricas y metodológicas

Palabras clave: SIG, educación ambiental, componentes, conceptualización

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116 Fostering Sustainability in Education Using ChatGPT

Mohanad Halaweh[1]

Previous studies have highlighted the potential of Information Communication Technology (ICT) in achieving sustainable environmental development, as well as its applications in education. These studies cover a range of technologies and practices, including green computing, cloud computing, and web 2.0 applications. However, the world has recently witnessed a revolutionary breakthrough in the field of Artificial Intelligence (AI) with the emergence of a groundbreaking tool called ChatGPT, which is expected to revolutionize the education sector. This research aims to provide a conceptual perspective on how the ChatGPT tool can be utilized to promote sustainability in education.

This research answers the question: how ChatGPT can contribute to promoting sustainability in the field of education.

The study incorporates two key sustainability frameworks: the Sustainable Development Goals (SDGs) adopted by the United Nations and the Triple Bottom Line (TBL), also known as the Three Pillars of Sustainability. These frameworks serve as the basis to demonstrate how ChatGPT can play a constructive role in fostering sustainability within the dimensions relevant to both frameworks. The research aims to map the capabilities of ChatGPT with the sustainability goals.

The research findings offer valuable insights and examples that highlight the benefits of integrating ChatGPT into education for the promotion of sustainability in education.

This research offers valuable insight that can guide decision-makers, and policymakers in governments and the education sector to effectively support and enable the use of this tool. Furthermore, the proposed examples can serve as a foundation for future empirical research, allowing other researchers to validate the concepts presented in this research. This study is considered original, as there is no existing research on this topic due to the recent emergence of ChatGPT tool.

Keywords: sustainability, education, ChatGPT, AI

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Factors Influencing Artificial Intelligence (AI) Products Adoption for Developing Environmental Sustainability: A Literature Review

Rania Mostafa

Artificial intelligence (AI) products play an important role in developing and maintaining environmental sustainability. These products (such as robots, voice assistants, and smart homes) can achieve cost savings, protect resources (*e.g.*, energy, water), and manage waste better.

This theoretical paper provides a literature review of the major factors that foster the use of AI resulting in environmental sustainability. The sustainability development goals (SDGs) are an effective window for evaluating the implication of AI on various domains and identifying possible interactions among them (Gupta *et al.*, 2021). The 17 SDGs are composed of three domains: society, environment, and economy (UN, 2019). The role of AI is highly significant in positively influencing around 79% of the SDG objectives, with environmental sustainability objectives (93% of the objectives) being the most influential domain among the three ones (Vinuesa *et al.*, 2020).

Previous research confirmed the positive effect of going green (or green behavior) in creating environmental sustainability (Al-Sharafi *et al.*, 2023). The purpose of this paper is to review the literature to identify different factors that are crucial in adopting AI products at the firm level and customer level, which in turn enhance green behavior and environmental sustainability. Identifying these factors is important, since previous research expected AI to reduce global emissions by around 4% by 2030 (Gawel and Herweijer, 2021). This reduction is supporting the 'net zero emission' objectives proposed by the United Nations to protect the planet.

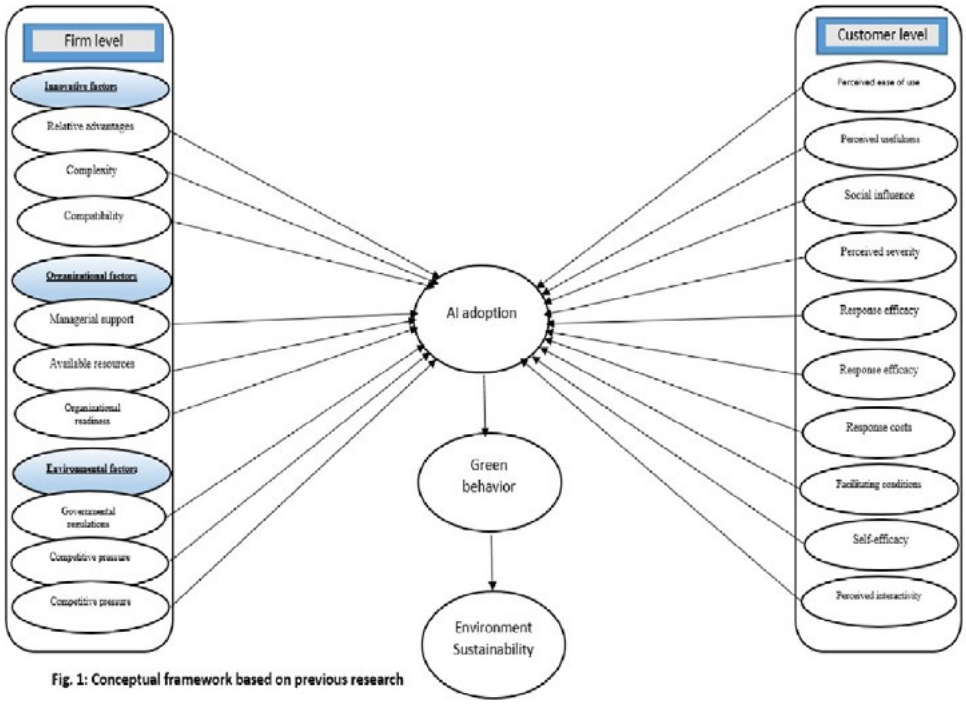

Figure 1 – Conceptual framework based on previous research

Research question: what are the factors that facilitate AI product adoption (at the firm level and customer level), which ultimately contribute to environmental sustainability?

Through an in-depth review of the literature which covers different countries including Malaysia, Turkey, China, and UAE, among others (*e.g.*, Al-Sharafi *et al.*, 2023; Arabian Business, 2023; Chen *et al.*, 2021), the following factors are deemed important when designing AI products to foster green behavior, which in turn contributes to environmental sustainability (Fig. 1). At the customer level; perceived ease of use, perceived usefulness, social influence, perceived severity, response efficacy, response costs, facilitating conditions, perceived interactivity, and self-efficacy. At the firm level, some factors are pioneering which can be grouped under three categories (Chen *et al.*, 2021; Gummadidala *et al.*, 2021); innovative factors (relative advantages, complexity, and compatibility), organizational factors (managerial support, available resources, and organizational readiness), and environmental factors (governmental regulations, competitive pressure, and market characteristics).

In conclusion, based on a thorough literature review, we provide a comprehensive list of factors that should be considered by AI designers and policymakers to achieve environmental sustainability through AI adoption.

Keywords: environmental sustainability; artificial intelligence; green behavior

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What is the Role of Artificial Intelligence in Environmental Education?

Gerard Cunningham (1)

What is role of AI in environmental education?

The ChatGPT reply to this question is as follows:

Artificial Intelligence (AI) can play a significant role in environmental education by enhancing learning experiences, providing access to data and information, enabling analysis and modeling, and promoting awareness and action. Here are some specific ways AI can contribute to environmental education:

a) Data collection and analysis: AI can assist in gathering and analyzing vast amounts of environmental data, such as satellite imagery, sensor data, and historical records. This data can be used to understand ecological patterns, assess environmental impacts, and identify trends and changes over time.

b) Personalized learning: AI-powered educational platforms can adapt to individual learners' needs, providing personalized content and recommendations. By analyzing students' preferences, knowledge gaps, and learning styles, AI can deliver tailored lessons, activities, and resources to optimize engagement and understanding.

c) Virtual simulations and models: AI can facilitate the creation of realistic simulations and models of environmental processes, ecosystems, and climate scenarios. These virtual environments enable learners to explore complex concepts, conduct experiments, and observe the consequences of different actions, fostering a deeper understanding of environmental systems.

d) Intelligent tutoring and feedback: AI can act as a virtual tutor, providing real-time feedback, explanations, and guidance to learners. Through natural language processing and machine learning algorithms, AI systems can interact with students, answer questions, and assist in problem-solving, promoting active learning and critical thinking.

e) Environmental monitoring and conservation: AI technologies like machine vision and machine learning algorithms can be employed for environmental monitoring and conservation efforts. For example, AI can analyze camera trap images to identify and track endangered species, detect illegal logging activities using satellite imagery, or predict and prevent natural disasters based on sensor data.

f) Decision support systems: AI can assist policymakers and environmental professionals in making informed decisions. By analyzing complex data sets and running scenario simulations, AI can provide insights into the potential impacts of policies, land-use changes, or conservation strategies, helping stakeholders make more effective choices.

g) Outreach and awareness: AI-powered chatbots and virtual assistants can engage with the public, disseminate information about environmental issues, and promote sustainable practices. These tools can answer questions, offer tips, and raise awareness about topics such as recycling, energy conservation, and biodiversity preservation.

The roundtable will convene 6 experts on AI and its role in EE to debate the validity of the above response.

Keywords: artificial intelligence, environmental education, environmental sustainability

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160 Can AI Promote Environmental Sustainability in Africa?

Gerard Cunningham (1)

ChatGPT claims

Yes, AI has the potential to promote environmental sustainability in Africa in various ways. Here are a few examples:

1. Conservation and Wildlife Protection: AI can assist in wildlife monitoring and conservation efforts. Through advanced image recognition and machine learning algorithms, AI can analyze satellite imagery, camera trap data, and other sources of information to identify and track endangered species, detect poaching activities, and monitor changes in habitats. This data can then be used to develop effective conservation strategies.
2. Precision Agriculture: AI-powered tools can enhance agricultural practices and help optimize resource allocation. By analyzing data from sensors, drones, and satellites, AI can provide farmers with valuable insights on soil health, crop growth, and weather patterns.
3. Renewable Energy Management: AI algorithms can improve the efficiency of renewable energy systems such as solar and wind power. AI can optimize the performance of solar panels by predicting and adjusting for factors like weather conditions, panel degradation, and shading.
4. Natural Disaster Prediction and Response: AI can help predict and mitigate the impact of natural disasters. By analyzing historical data, weather patterns, and environmental conditions, AI models can identify areas prone to disasters such as floods, droughts, or wildfires. This information can be used to develop early warning systems, evacuation plans, and resource allocation strategies for effective disaster management.
5. Waste Management and Recycling: AI can improve waste management processes by enabling efficient sorting and recycling. AI-powered robots and computer vision systems can identify and sort different types of waste, enhancing recycling efforts and reducing the amount of waste sent to landfills.
6. Environmental Monitoring and Analysis: AI can help monitor and analyze environmental data on a large scale. By processing vast amounts of data from various sources like satellites, weather stations, and ground sensors, AI can identify patterns, trends, and anomalies related to climate change, deforestation, air pollution, and other environmental issues.

It is important to note that the successful implementation of AI for environmental sustainability in Africa requires considerations of local contexts, accessibility, and inclusivity. Collaboration between educational professionals, AI experts, environmental scientists, policymakers, and local communities is crucial for developing and deploying AI solutions that address the specific needs and challenges of African countries.

Overall digital literacy, hardware and internet access as well as training in the use of AI tools are all elements that must be explicitly addressed. The authors plan to use the presentation platform with African experts and audience at the conference as a feedback loop that addresses these challenges to implementation.

The roundtable includes the following:

a) The need for International & national policy for AI applications by Anuja Prashar
b) Enhancing Environmental Education through AI for Sustainable Development in Africa by Esther Gacicio
c) Harnessing Artificial Intelligence for Environmental Education in Africa: A Path Towards Sustainable Development by Chinasa T. Okolo

Keywords: AI, environmental sustainability, Africa, innovation

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160a The need for International & national policy for AI applications

Anuja Punj Prashar (1)

With the recent advent of CHATGPT and other AI enhancing programs, the discussion about preparedness, planning, and protection for and from AI has become urgent. A whole raft of unexpected unanswered questions for economics, culture and policy have arisen - both local and international. For instance, Cyber Security will have to take on a whole new dimension of verifying and validating for 'truth' and shifts in the job market will have to be analysed afresh. The implications for unregulated development and uneven application of AI will have worldwide implications in all arenas of society & the economy. This impact may be even greater for Africa.

With appropriate international and national policies, there can be advantages of AI applications, for dealing with various global challenges, such as the triple planetary crises of climate change, biodiversity loss and pollution. Policies that focus upon regulating & empowering Public Private Partnerships, with AI applications across borders, will have the greatest impact for these three challenges.

In Africa, where the youth population is increasing at the fastest global rate, with targeted AI applications there may be opportunities for reducing the skills gap within the global jobs market, which in turn could catapult African youth into competitive positions for future economic growth and development. The economic, social, and political cooperation and collaborations, enabled by AI applications across Africa, would have far-reaching benefits for the African continent and the whole world.

Keywords: AI, environmental sustainability, Africa, innovation

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160b Enhancing Environmental Education through AI for Sustainable Development in Africa

Esther Gacicio (1)

Environmental education in Africa serves as a cornerstone for fostering sustainable practices and conservation efforts. This presentation aims to explore the perception, status, initiatives, challenges, and impact of AI (Artificial Intelligence) on environmental education and sustainability in Africa. By examining existing strategies and highlighting the potential of AI, we aim to underscore the transformative role technology plays in advancing environmental education and fostering sustainability.

The presentation focuses on;

Perception and Status of Environmental Education in Africa: Overview of the current perception of environmental education across Africa. Examination of the status of environmental education in formal and non-formal settings, highlighting its importance in addressing environmental challenges.

Initiatives and Strategies in Environmental Education in Africa: Discussion of diverse educational approaches used in environmental education across the continent, encompassing formal curriculum integration, community-based initiatives, and awareness campaigns. Examples of successful environmental education projects, showcasing initiatives focusing on biodiversity conservation, climate change, sustainable agriculture, and water resource management.

Challenges in AI Adoption for Environmental Education: Analysis of challenges encountered in adopting AI technologies for environmental education in Africa, including infrastructure limitations, digital divides, and access to technology. Examination of ethical considerations such as data privacy, algorithm bias, and potential job displacement concerns hindering the widespread adoption of AI in education.

Impact of AI on Environmental Sustainability in Africa: Evaluation of AI's role in advancing environmental sustainability, highlighting its applications in conservation, precision agriculture, climate modelling, and natural resource management. Examination of case studies illustrating the effect of AI on environmental monitoring, biodiversity conservation, waste management, and climate change adaptation in African contexts.

Strategies and initiatives that can be enhanced in leveraging AI in Environmental Education: utilization of AI in advancing environmental education across Africa, emphasizing its transformative potential that includes AI-powered learning Platforms, Virtual Reality (VR) and Augmented Reality (AR) Experiences, Citizen Science Initiatives, Teacher Support and Professional Development, Data Analysis and Visualization

Soft Skills required in the effective use of AI in environmental education: Effective utilization of AI in environmental education necessitates not only technical expertise but also a range of soft skills that facilitate its integration into teaching and learning processes.

Conclusion

Leveraging AI in environmental education holds immense promise for transforming learning experiences, raising awareness, and nurturing a generation of environmentally conscious citizens in Africa. By embracing innovative AI-driven tools and methodologies, we can empower individuals and communities to actively contribute to sustainable environmental practices and conservation efforts, thus shaping a more environmentally resilient future for the continent.

Keywords: AI, environmental sustainability, Africa, innovation

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160c

Harnessing Artificial Intelligence for Environmental Education in Africa: A Path Towards Sustainable Development

Chinasa T. Okolo

As the effects of climate change disproportionately affect countries in the Global South, with major crises seen in Africa from floods in Nigeria, droughts across East Africa, and water crises in South Africa, it is imperative to explore innovative approaches to foster environmental education and promote sustainable practices. The continent, rich in biodiversity but vulnerable to environmental threats, presents a critical stage for the integration of AI technologies to enhance awareness, engagement, and informed decision-making.

The presentation will begin by providing an overview of the current environmental issues facing Africa, emphasizing the need for effective education as a catalyst for positive change. It will then delve into the potential of AI to revolutionize environmental education, offering adaptive and personalized learning experiences that resonate with diverse communities and cultures across the continent. The discussion will include case studies and examples of AI applications tailored to the African context, ranging from interactive virtual simulations to AI-driven data analysis for informed policy decisions.

Furthermore, the presentation will address the challenges and ethical considerations associated with implementing AI in environmental education, emphasizing the importance of inclusivity, accessibility, and cultural sensitivity. It will also explore the role of AI in empowering local communities and fostering a sense of environmental stewardship, thereby contributing to broader goals of sustainable development.

By leveraging AI technologies, Africa can not only address its environmental challenges but also foster a generation of environmentally conscious citizens equipped to contribute meaningfully to a sustainable and resilient future.

Keywords: AI, environmental sustainability, Africa, innovation

203 Evolution of the 'Future Mayor Workshop' during COVID-19 - Development and Implementation of Hybrid/Online Workshops that Utilise ICT

Hideaki Kurishima[1]

The 'Future Mayor Workshop' engages students in envisioning a sustainable region and developing policy proposals from the view of a future mayor. Through this workshop, students explore future issues using data about the future region and employ backcasting to determine actions toward their desired vision. This workshop has been held across Japan, having a demonstrated effect of increasing students' attachment to and interest in their hometowns and fostering motivation to contribute to their communities as members. However, the COVID-19 pandemic has hindered face-to-face workshops, necessitating the development of alternative approaches that minimise contact with non-school personnel.

This study has aimed to develop an approach that does not impair the effectiveness of the 'Future Mayor Workshop' whilst avoiding contact with non-school personnel. We developed and practiced a hybrid/online workshop approach that uses existing ICT equipment and software.

This workshop comprises three parts:

- Part 1 involves lectures,
- Part 2 involves group discussions using the KJ method, and
- Part 3 is a policy proposal to the mayor.

This study defines an 'online approach' where participants in any of the parts do not have face-to-face contact with others, and a 'hybrid approach' where some parts are conducted face-to-face with school staff. Part 1 utilised Zoom for lectures and distributed paper materials in both approaches. In the online approach, Part 2 utilised the participants' computers, Zoom breakout sessions, and the online whiteboard 'Miro,' while Part 3 involved screen sharing of 'Miro' via Zoom. However, a hybrid approach was also designed for many students unfamiliar with computer operations. In hybrid Part 2, schoolteachers facilitated student face-to-face discussions. A facilitation manual was prepared for the schoolteachers, who were given lectures in advance. Wide-angle web cameras and microphones were installed at the venues for the practitioners to have an overview of the face-to-face discussions, connecting them via Zoom. In hybrid Part 3, each group made face-to-face presentations to the mayor, which were then broadcast on Zoom.

The first hybrid workshop took place in August 2020, followed by several online/hybrid workshops. This workshop has been consistently held on T Island since 2019, and participating students were asked to complete questionnaires. The effects of the hybrid workshops in 2020 and 2021 were similar to the face-to-face workshops in 2019 and 2022. Additionally, the use of ICT allowed for more participants and reduced costs.

We developed and practiced a hybrid/online Future Mayor Workshop. The student questionnaire survey confirmed that this barely changed the workshops' effects. Partly due to side effects such as increased attendance and reduced costs, the 'Future Mayor Workshop' evolved during the COVID-19 pandemic.

Keywords: workshop, Future Mayor Workshop, COVID-19, hybrid approach, online approach

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Enhancing Environmental Education By Utilizing Immersive Virtual Reality to Visualize And Portray Future Environmental Impacts

Shirin Alimour[(1)], *Ibtehal Aburezeq*[(2)], *Abdellateef Al Qawasmi*[(3)], *Maryam Abualrish*[(4)]

Climate change (CC) is one of the most urgent global issues with irreversible consequences, necessitating innovative educational approaches to promote pro-environmental behaviors (PEBs) and address anthropogenic CC. This study explores the feasibility of using immersive virtual reality (VR) as an alternative educational tool to enhance climate actions within formal education, specifically through the utilization of VR mastery experiences.

The objective is to investigate the relationship between immersive VR and CC experimental education (EE) from a psychological perspective and provide recommendations to ensure engaging, accessible, and impactful virtual experiences for users. A pre-registered intervention involving 142 school students was conducted to assess the impact of VR on self-efficacy (SE) and intentions to engage in PEBs. The selection of the VR experience aligned with the Cognitive Theory of Multimedia Learning (CTML).

The results demonstrated the effectiveness of VR in enhancing students' behavioral intentions (BI) and SE. The use of VR significantly increased students' BI (2 = 0.98), indicating a positive influence on this variable. Furthermore, factor analysis on the SE Scale identified three factors associated with cognitive influence (CI), motivational influence (MI), and affective influence (AI). The CI factor exhibited an eigenvalue of 2.763 and a reliability coefficient () of 0.86. The MI factor had an eigenvalue of 2.127 and of 0.87, while the AI factor demonstrated an eigenvalue of 1.836 and of 0.89. Together, these factors accounted for 79.362% of the cumulative covariance, underscoring their significance in evaluating SE within the VR context.

These findings contribute to our understanding of the positive impact of VR in experiential educational settings. Additionally, they highlight the importance of various factors that shape experiential education, self-efficacy, and learning motivation within the realm of virtual reality.

Keywords: virtual reality, experimental education, environmental education, self-efficacy, motivation, climate change, pro-environmental behavior

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التربية البيئية من أجل التنمية المستدامة في منهاج الجغرافيا: أي دور للدليل الرقمي؟

عبد العزيز فعرس [1]، يوسف اللحياني [2]

يركز موضوع بحثنا على دور المناهج التربوية في تعزيز السلوكيات الإيجابية الصديقة للبيئة، ومنها على الخصوص منهاج الجغرافيا، الذي يظل حبيس ممارسات تعليمية تقليدية لا تعطي أهمية كبرى للتدريس بواسطة الموارد الرقمية، من هنا تأتي دراستنا لتقدم مقترحا تطويريا لتعليم وتعلم مفاهيم وقضايا التربية البيئية من خلال منهاج الجغرافيا.

اعتمدنا في هذه الدراسة على المنهج الاستكشافي الوصفي التحليلي، وعلى أدوات علمية: الاستكشاف الوثائقي، شبكة لتحليل الوثائق التربوية،استمارة لرصد آراء الأساتذة حول مقترح الدليل الرقمي.

وقد تأكدت لنا فرضية: من شأن استثمار الموارد الرقمية أن يشكل مدخلا حقيقيا لتمكين مدرسي الجغرافيا من تيسير تعليم وتعلم مفاهيم وقضايا التربية البيئية من أجل التنمية المستدامة.

وخلصنا الى ضرورة اعتماد دعامات ووسائل رقمية في الكتب المدرسية لمادة الجغرافيا خاصة بتعليم وتعلم مفاهيم وقضايا التربية البيئية من أجل التنمية المستدامة، وتخصيص ورشات تكوينية للمدرسين لصناعة المحتويات الرقمية للجغرافيا.

الكلمات الرئيسية: التربية البيئية، التنمية المستدامة، منهاج الجغرافيا، الدليل الرقمي

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Social Media, Moral Norm and Waste Behaviour – Based on Experimental Economics

Aiqin Wang[1]

China is experiencing an enormous increase in household solid waste generation. Waste separation is the first step for preventing household waste. The key question is how to encourage residents to have the willingness to separation and form the separation habit. We use an online experiment to study whether different social media and moral norms impact differently on waste behaviour. We find that in urban regions, negative moral norms have a greater impact on the intention of separation than positive norms and social media, but only negative moral norms have a significant impact on waste quantity. However, only the negative moral norm is efficient on the intention of separation in rural and urban regions.

Keywords: social media; moral norm; waste behaviour

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Promises, Perils and Pitfalls of 'alternative realities' in EE Pedagogy: A Provocative Exploration

Lisa Ryan [1], *Jo-Anne Ferreira* [2]

In response to the existential threat of rising sea levels, the Pacific nation of Tuvalu is proposing to create a digital twin version of itself in the metaverse. Through a metaverse nation, Tuvalu's spectacular islands could be 'replicated', some of its rich culture be preserved, and its function as a sovereign state be maintained, despite its citizens being forced to live elsewhere (Foth & Kelly, 2022). This proposal highlights some clear conundrums for the EE field, which has traditionally privileged place-based pedagogies that educate through building connection WITH and IN nature (Kudryavtsev *et al.*, 2012). The conundrum discussed in this presentation is how, in a world rapidly approaching an existential crisis (given we are nearly at the 1.5°C internationally agreed upon 'safe' threshold of warming), might EE pivot to develop and employ a range of 'emergency' educative approaches. How might these challenge our notions of what constitutes "Nature" and connection WITH and In Nature, and how might these shift what is often perceived to be the core work of the field, that is, developing a sense of care and concern through an emotional connection with Nature?

The Tuvalu example raises key questions for EE: How can we connect with Nature, when Nature ceases to exist, or when to do so risks further impact on already fragile ecosystems? What promises, perils and pitfalls exist in metaverses, artificial intelligences and immersive technologies for the work of environmental educators?

Through an exploration of a range of illustrative case examples from around the world, we explore ways that educators are using emerging technologies such as virtual and augmented realities, geolocative apps, and artificial intelligences to connect to Place/Nature. We draw upon these examples as springboards for a robust epistemological discussion around the promise, perils, and pitfalls of 'alternative/immersive realities' pedagogies.

Findings include the potential of these tools to provide impossible experiences (endangered/extinct species wildlife encounters; pre-colonial experiences of Place); address questions of equity and democracy of access to Place; and to create 'common' shared Place and responsibility. These all raise provocative philosophical questions.

Rapidly emerging 'alternative realities' technologies provide promise and peril, and challenge assumptions about what EE and Nature are. It is important to explore their potential as we move into an emergency education phase, to understand what they might offer so that we can ensure our work continues to be effective.

Keywords: place-based pedagogy, technology, virtual-reality

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412 Mobilizing Youth for Environmental Conservation: Navigating AI & Smart Technologies Frontier

Asish Singh[1]

As we witness the escalating Triple Planetary Crisis, the push for pioneering, tech-empowered solutions is pressing. My proposed workshop at WEEC 2024 is focused on empowering youth to navigate the frontier of AI and Smart Technologies in environmental conservation, fostering the next generation of digital environmental stewards.

In Part 1, participants will explore the intricate world of AI and Smart Technologies, experimenting with platforms like TensorFlow for deep learning, Oculus Rift for VR, and Arduino for IoT applications. Real-world case studies like "IBM's AI-powered weather prediction model" and "Stanford University's OceanOne robotic diver" will underscore the transformative potential of these technologies in environmental science.

Part 2 will delve deeper into harnessing AI for environmental analysis. We'll explore cutting-edge AI projects such as Microsoft's 'AI for Earth' and IBM's 'Green Horizon', guiding participants to interpret complex environmental data, understand AI's role in predictive analysis for climate change impacts, and formulating adaptive conservation strategies.

Part 3 will investigate VR and geospatial technologies' capabilities in environmental education. By examining the 'Guardians of the Forest' VR project and employing tools like Google Earth Engine and Esri's ArcGIS, participants will learn to create immersive environmental narratives and track real-time environmental changes.

Part 4 will analyze the role of social media and other digital technologies in environmental awareness and activism. Analyzing the global impact of the #Trashtag Challenge and the 'Greta Thunberg Effect', participants will understand the power of digital platforms in fostering global environmental consciousness and learn to utilize algorithms to maximize their outreach.

Part 5 will prompt a critical discussion about the socio-ecological implications of tech advancement. We'll dissect the ethical dilemmas linked with digital transformation, such as the Cobalt mining crisis in the Democratic Republic of Congo and the e-waste predicament arising from rapid tech obsolescence.

Finally, in Part 6, participants will utilize the knowledge and skills gained in the workshop to create AI-based solutions for local environmental issues in an 'AI for Conservation' challenge. They'll use platforms like Google's AI Hub and TensorFlow to design and test their models, fostering innovative thinking and environmental stewardship.

This workshop aims to create a new generation of environmental stewards who are fluent in AI and Smart Technologies. By understanding and harnessing these tools, they can drive innovative solutions for environmental conservation, becoming active players in a tech-powered sustainable future.

Keywords: artificial intelligence, smart technologies, environmental conservation, environmental education, youth empowerment

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578 Hold That Drop - Water Conservation Initiative

Janya Bhatt[1]

The "Hold That Drop" initiative, a remarkable endeavor by Abu Dhabi Indian School, passionately aims to revolutionize water conservation. Launched under the guidance of Principal Mr. Neeraj Bhargava on November 8, 2018, the initiative is committed to raising awareness about water consumption and wastage while inciting tangible behavior changes for a sustainable future. A pivotal moment came on November 27, 2018, with a Guinness World Record attempt. About 1000 students united to form an infinity loop, symbolizing the ceaseless water cycle and the call to safeguard it. The resonant message was clear: "Save water, respect resources." Driven by determination, the initiative ventured into the community. A human chain event on February 7 2020, spanning Al Sahil to Al Bahar Corniche, saw around 8000 participants, magnifying the urgency of conservation.

Further community involvement emerged through a unique restaurant campaign in 2021. Collaborating with 150 local restaurants, students distributed campaign stickers and faucet attachments to save water, enlightening owners and patrons alike about mindful water practices in the process. This grassroots endeavor sparked positive changes in their water consumption habits. The journey took an innovative turn this year with the advent of the Save Water App, a water-tracking marvel with multi-faceted functionality. At its heart, the app is centered around water tracking.

To this end, it offers two distinct tracking modes:

- The Manual Tracker: Estimating monthly water usage through a series of simple questions, this feature provides users with personalized consumption insights and practical conservation tips to help reduce their water consumption.
- The Scannable Tracker: Revolutionizing accuracy, this feature scans water bills, offering precise usage data and comparisons against averages. Uploading monthly water bills allows users to monitor changes, thus empowering informed decisions.

While currently tailored for the UAE, this innovation holds promise for wider application. The app is is a potent instrument for sustainable change.

Harnessing real-time data, the initiative plans to bolster future awareness campaigns, informed by insights from widespread user engagement. The app has been launched on android and will be launched on iOS within the next week. The app's significance lies in its potential to collate invaluable data, for forthcoming awareness campaigns. Leveraging real-time insights, the initiative is positioned for data-driven interventions and sustainable impact.

As the app prepares for its iOS launch and future awareness campaigns, the initiative remains steadfast in its mission to protect this vital resource for generations to come. The initiative's resounding success underscores the potential for collective action in safeguarding water resources. Future endeavors will focus on expanding the app's reach, refining engagement strategies, and nurturing collaborative partnerships to amplify the impact.

Keywords: water conservation, awareness, sustainable future, community involvement, Save Water App

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Connecting Citizen Science Data with AI to Create Meaningful Outcomes Including Education, Communications and Community Outreach

David James Vaughan Wallace[1]

In a world increasingly awash with data, the alliance between citizen science and Artificial Intelligence (AI) offers untapped potential for transformative environmental action.

This presentation explores the fusion of these two domains, focussing on a real-world case study involving river pollution awareness raised by River Action UK. This particular citizen science project aimed to engage the community in activities such as water sampling, pollution identification, and data reporting to create a comprehensive database on river health. The project sought to identify the sources and types of pollutants affecting local waterways and evaluate their impact on the aquatic ecosystem.

Findings from the citizen science project revealed the presence of E. coli and Enterococci, both of which are harmful to human health, and elevated levels of pollutants, including nitrates and phosphates. This was further corroborated by AI analytics, leading to an increase in local advocacy and targeted policy initiatives.

This study posits that coupling citizen-collected data with AI analytics can not only fill voids in traditional scientific research but also enhance public awareness and communication strategies in an impactful manner. Preliminary results indicate a substantial increase in community awareness, leading to targeted advocacy and local policy interventions.

The campaign was featured extensively in both national and international press and generated significant interest on social media. A tangible outcome has been connecting with local schools to provide education on river health and water as a precious resource.

Through this example, we examine how AI algorithms can effectively process and analyse large volumes of community-generated data, thereby providing more nuanced insights into river pollution and how Large Language Models can be used to provide a conversational interface, enabling a broader audience to engage with the results. Additionally, it showcases how AI-driven platforms can disseminate this information through personalised, targeted communication strategies, thereby elevating public understanding and advocacy.

By synergising human engagement with AI capabilities, this interdisciplinary approach serves as a catalyst for both behavioural change and policy intervention.

Keywords: citizen science, artificial intelligence, river pollution, public awareness, data communication, environmental policy

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Creating Socially Just Physical Environments: How Geospatial Technologies can Foster Community Engagement in Sustainability Projects

Xin Hong[1]

In the United Arab Emirates (UAE) and the broader Middle East, the physical environment within neighborhoods plays a crucial role in promoting physical activity and reducing the risk of disease. This study explores the feasibility of a recently proposed neighborhood concept, sidewalk-homogeneous neighborhoods, designed as a measurable unit to capture economic and behavioral characteristics of residents, with the aim of enhancing community health research. This new neighborhood concept was evaluated through the analysis of built environments in residential neighborhoods with varying economic levels. We employed unmanned aerial vehicle (UAV) imagery, deep learning techniques, and Geographic Information Systems (GIS) for this assessment. By highlighting community harmony in neighborhood environments, our study not only evaluates the concept of sidewalk-homogenous neighborhoods but also initiates educational discussions. By underscoring the technology-driven assessments to educate and inspire collective efforts, we aim at demonstrating how technology can be a powerful educational tool for fostering more inclusive and harmonious living spaces across different socioeconomic levels. Furthermore, our research carries implications for applying this neighborhood concept and technologies in the context of the UAE and the broader Middle East, with the vision of creating socially just physical environments that benefit all residents.

Keywords: geospatial technologies, community physical environments, unmanned aerial vehicles (UAVs), deep learning, sustainable projects

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735 GIS-based Problem-based Learning for Climate and Sustainability Education

Michael Goul[1]

Geographic information systems (GIS) allow us to study models of our environment and to ask "what if" questions regarding where and why people are affected by changes around us due to climatic, economic, and social factors. Today these GIS are fed by very specific and timely data collected by in situ and remote (satellite, UAVs) sensors and distributed via web portals. And today's most popular commercial GIS, ArcGIS, is now available on the cloud, making it accessible to anyone, anytime, anywhere on almost any device. This has caused many secondary schools (thousands of universities before them) to begin applying GIS technology to a variety of classroom and research settings in the natural and social sciences.

Esri's education program has been running since 1992 and today it serves more than 12000 universities and as many secondary schools worldwide. The speaker (Gould) has visited more than 300 universities and schools in the past decade, and can speak to similarities and differences, successes and challenges across regions.

Earlier practical collaboration with the Abu Dhabi Education Council curriculum designers resulted in a series of GIS exercises to be inserted into Science, Math, and Geography classrooms. This included fieldwork exercises allowing students to collaborate in groups, collect data, analyze it, and visualize the results. Similar work is being undertaken in many countries, with leadership and methodology sharing coming mainly from the USA, Canada, and UK.

GIS-based problem-based learning is helping create graduates who are more technologically and environmentally prepared. A wider, more social-science-oriented view, captured by many of the SDGs, can also be analyzed and solutions proposed by using GIS. ArcGIS technology is a large platform of tools for desktop computers, mobile devices, and access via the cloud, which supports almost any learning or research scenario: from fieldwork to the classroom to socialization of results via online storytelling.

Keywords: GIS-based problem-based learning for climate and sustainability education

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737 Workshop on ArcGIS for Climate and Sustainability Applications

Michael Gould[1]

Geographic information systems (GIS) allow us to study models of our environment and to ask "what if" questions regarding where and why people are affected by changes around us due to climatic, economic, and social factors. Today these GIS are fed by very specific and timely data collected by in situ and remote (satellite, UAVs) sensors and distributed via web portals. And today's most popular commercial GIS, ArcGIS, is now available on the cloud, making it accessible to anyone, anytime, anywhere on almost any device. This has caused many secondary schools (thousands of universities before them) to begin applying GIS technology to a variety of classroom and research settings in the natural and social sciences.

This workshop will highlight the huge collection of available geospatial data, some of the popular uses of ArcGIS in classrooms and in field research, and how this problem-based learning is helping create graduates who are more technologically and environmentally prepared.

One valuable use case is calculating urban heat resilience: where in our city do we have high heat, tree cover, and who are the people affected by lack of tree cover. This analysis combines the use of freely available satellite imagery, and the best available census or other population data.

Other scenarios might involve sea level rise, inland flooding, and other environmental issues. A wider, more social-science-oriented view, captured by many of the SDGs, can also be analyzed and solutions proposed by using GIS. ArcGIS technology is a large platform of tools for desktop computers, mobile devices, and access via the cloud, which supports almost any learning or research scenario: from fieldwork to the classroom to socialization of results via online storytelling.

The proposed 60-minute workshop can cover most of these software and usage options, based on online access: attendees need only have a computer with internet access.

Keywords: GIS, climate applications, Sustainability applications, classroom exercises

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THE MEANS THEME 02

Efforts and Challenges in EE for Early Childhood Education

Theme Background:

Early childhood is a critical phase for shaping an individual's character, behaviours, and beliefs. Extensive psychological and educational research underscores the significance of this period in a child's development.

This theme focuses on the essential pillars of Early Childhood Education, encompassing educators, curricula, the impact of technology, and tools/materials used in the learning environment. These elements collectively contribute to the educational journey of young children, nurturing their capabilities, fostering engagement in communities, and preparing them for a sustainable future.

Theme Objectives:

The theme, "Efforts and Challenges in EE for Early Childhood Education," aims to:

- Discuss educational programmes and approaches that enhance environmental education in early childhood, focusing on the need for alignment with recent studies and emerging learning methods.
- Explore the tools and materials essential for creating hands-on learning experiences and fostering outdoor education spaces that stimulate children's thoughts, expand their knowledge, and enhance their skills.

Theme Focus:

- Strategies for integrating environmental education into early childhood curriculum.
- Teacher training and professional development in environmental education.
- Innovative curricular frameworks for ECE that incorporate environmental themes.
- Experiences and best practices in engaging young children with nature and sustainability.
- Designing child-friendly learning spaces that foster creativity and environmental stewardship.
- Strategies for adapting EE and ESD curricula and activities for diverse learners.

Theme Outcomes:

Stress the critical role of educators and practitioners as role models in shaping early childhood education, emphasizing their influence on students' environmental awareness and engagement within school, family, and society.

Theme Conclusions:

The thematic track on "Efforts and Challenges in EE for Early Childhood Education" aligns with the broader mission of WEEC 2024 by highlighting the pivotal role of early childhood education in fostering environmental awareness and sustainability.

Together, we can explore effective strategies, share best practices, and address the challenges of nurturing environmentally conscious and engaged young learners, setting the foundation for a more sustainable future .

THE MEANS THEME 02

Efforts and Challenges in EE for Early Childhood Education

Presentations

ID	TITLE	PRESENTER	FORMAT
089	Una Inmersión En La Memoria: El Nacimiento De La Escuela Levino Cândido	Edilene Barbosa Pinto	Oral communication
108	Incorporating Environmental Education in the United Arab Emirates: Addressing the Primary and Secondary School Curricula.	Naeema Mohamed AlHosani	Oral communication
148	Documenting Children's 'Worlding': Towards the development of pedagogical documentation practices that account for children's common worlds experiences in early childhood education settings	Elizabeth Boileau	Round table
181	Sharing experiences and best practices of a unique Nature based Early Learning Programme in India	Archana Panicker	Oral communication
218	Preschool children's self-reported sources of knowledge of environmental, social, and economic sustainability: An interview study	Farhana Borg	Oral communication
336	Contribution of Natural and Non-Natural Materials to Understandings of the Natural World in Early Childhood Education	Claudine Habak	Pecha kucha
340	Educator Practices and Approaches for Environmental Awareness in Early Childhood Education in Abu Dhabi	Nusaibah Salem Al Ameri	Oral communication
341	The Climate Change and Early Childhood Development Nexus a Case Study of Eswatini	Novuyo Nkomo	Oral communication
342	Where We Want to Play and Learn: Children's Voices in Choices of Environments in Abu Dhabi	Nahla Alsyedibrahim	Oral communication
392	La Realidad De Las Escuelas Y La Nueva Forma De Hacer Educación En Afogados Da Ingazeira-Pe, Brasil	Edilene Barbosa Pinto	Oral communication

ID	TITLE	PRESENTER	FORMAT
460	Early Childhood Education - The First Step That Lays The Foundation for Environment and Sustainability Questions	Ingrid Samuelsson	Oral communication
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THE MEANS THEME 02

Efforts and Challenges in EE for Early Childhood Education

Abstracts

089 Una Inmersión En La Memoria: El Nacimiento De La Escuela Levino Cândido

Janirza Cavalcante da Rocha Lima (1)

Investigación realizada con el objetivo de producir una cartografía de la memoria de las instituciones escolares del semiárido nororiental y de los sujetos de esas escuelas, con foco en las dimensiones de las prácticas pedagógicas y de gestión y sus transformaciones. El municipio de Afogados da Ingazeira fue elegido para el estudio inicial y la Escuela Municipal Levino Cândido fue el foco en la producción de este análisis.

En Brasil, los proyectos de memoria institucional surgen como reacción a las acusaciones de que somos un país sin memoria, donde el olvido es la fosa común donde reposan episodios y personajes, actores y acciones. Por ello, la comunidad intelectual emprende la tarea de preservar la memoria, deteniendo el olvido (NORA, 1993).

Es en el afán de buscar sus orígenes lo que mueve a distintos actores sociales en la recuperación de memorias particulares. Así, se consagran "lugares de memoria", que conviven en tres dimensiones: material, funcional y simbólica. En ese entretejido, los "lugares de la memoria" se caracterizan como un movimiento que articula Memoria e Historia, pues busca intencionalmente conservar las huellas, impidiendo la acción del olvido.

Dentro de estas formulaciones teóricas, encaja nuestra búsqueda por comprender la memoria institucional de la educación en municipios ubicados en el semiárido brasileño, en especial el municipio de Afogados da Ingazeira-PE.

Con el impedimento de realizar la investigación etnográfica, se optó por trabajar con documentos oficiales y/o institucionales. Se realizó un exhaustivo levantamiento bibliográfico sobre el tema.

Dos niveles guiaron el análisis de datos. En un primer nivel de análisis se tomaron los acervos documentales como indicadores de la memoria de la educación en el municipio y con ello plasmamos la dimensión cuantitativa. En un segundo nivel, se intentó mapear los temas privilegiados en los documentos mencionados y las posibles conexiones que tejen su acervo teórico-investigativo allí presente. Es una investigación que aborda la memoria institucional de la educación, de forma etnográfica y documental.

La escuela es pues sus muros imaginarios, su arquitectura, sus sujetos, personajes de una historia inconclusa pero en constante construcción.

Por otro lado, la escuela almacena gran parte de la memoria social como resultado de su cotidianidad y su temporalidad. A través de las memorias de docentes y estudiantes representa el momento de todo aprendizaje, como normas, transmisión de valores, uniformes, caminos recorridos hacia el mismo, juegos y desafíos, experiencias con el grupo, material didáctico utilizado y otros hechos que cobran sentido en relación social con la vida cotidiana de estos protagonistas escolares. Esto muestra que como lugar de memoria es a la vez simbólico y material. Los lugares, los edificios, los uniformes y los objetos sólo cobran pleno significado a partir de las relaciones sociales que se dan en la vida cotidiana.

Palabras clave: memoria institucional; semiárido; educación contextualizada

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108 Incorporating Environmental Education in the United Arab Emirates: Addressing the Primary and Secondary School Curricula

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This study examines the shortcomings of integrating environmental education into the primary and secondary school curricula in the UAE to advance the agenda of sustainable development. It also uncovers the challenges confronting the application of environmental education in schools and determines the support required for its implementation. To this end, it utilises a qualitative methodology to ascertain the standard context through opinions expressed by its subjects and insights obtained from other stakeholders. Students, teachers, and school principals were engaged in discussions about discrete scientific applications. It was found that the subjects of earth system science, environmental science, and social science most integrated environmental education into their syllabi. Further, this paper addresses the responsibility of the UAE government regarding developing environmental education curriculum with clear objectives and goals, ameliorating teachers' abilities in imparting environmental education, distributing teaching & learning resources, and integrating environmental education into the school curricula.

Keywords: environmental education in primary and secondary curriculum, integrated approach to sustainable development, qualitative methods, UAE

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Documenting Children's 'Worlding': Towards the Development of Pedagogical Documentation Practices that account for Children's Common Worlds Experiences in Early Childhood Education Settings

Elizabeth Boileau (1)

Pedagogical documentation, or pedagogical narration, can be used in early childhood education to convey children's experiences to parents, other educators, children, and the community, especially in settings inspired by the Reggio Emilia pedagogical approach. It is a process that involves listening, observing, and interpreting children's learning and experiences, and may comprise a variety of mediums such as pictures of children in action, children's quotes, drawings, educator reflections, *etc*.

As suggested by Merewether (2018), pedagogical documentation can lend itself well to examining children's lived experiences outdoors and can offer new knowledge and new perspectives. Further, Boileau (2022) called for an integration of the more-than-human world in pedagogical documentation; indeed, teacher-researchers may find it engaging to listen deeply to children as well as materials and non-human beings in outdoor environments, acknowledging the intermingling of bodies and things in an relational assemblage that are in a constant state of becoming (Merewether, 2018).

Yet, in practice what might this look like? How can educators and others successfully steer away from the pervasive assumption that humans should be at the centre of stories and narration? In one example, two teachers in Australia used pedagogical documentation to "illustrate the relationships children are developing with the more-than-human as well as the children's and teachers' sense of place" (Iorio *et al.*, 2017, p. 149). They revisit, rethink, and re-write narratives in an ongoing thoughtful process that puts place at the heart of the story rather than the children and their learning and actions. Others (*e.g.*, Boileau, 2022; Hodgins, 2019) have also experimented with documentation practices that give voice and to non-humans. This requires considerable reflection time and effort, which are typically not found within an early childhood educator's day. What guidance can be collectively generated to help educators and teachers enact a "radical shift in their thinking and their pedagogies" (Iorio *et al.*, 2017, p. 167)?

This roundtable discussion will provide an opportunity for participants to come together for a meaningful discussion on an emerging topic for which there is little published literature (academic or professional) but that has the potential to be a very powerful tool in engaging educators, children, families, and communities in better understanding their relations to the land and their multispecies kin.

Keywords: early childhood education; common worlds; documentation

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181 Sharing Experiences and Best Practices of a Unique Nature Based Early Learning Programme in India

Archana Panicker[1]

In India, the New Education Policy 2020 is just getting implemented across nation post covid period. It stresses a lot on early childhood programme that is play based and activity based. The SDG 4 on Quality Education equally stresses the importance of early learning. Centre for Environment Education, India has been pioneers in setting up innovative models on education, communication and training and for furthering these goals ahead, CEE in 2018 set up a nature based early learning programme, set outdoors on a 14 acre lush green campus where toddlers of age 2-8 years learn amidst nature. The classroom without walls, the learning spaces within nature, where story telling near a pond and under the tree is a routine and where other creatures live in harmony with these toddlers, this programme connects the kids to nature in mid of a cemented city environment. The nature and enquiry-based learning through interactions and experiences in the nature builds life-long learners. The connect, compassion and love for other living organisms engages young minds and tiny hands in taking positive actions towards sustainability as we call it "Handprint" and builds future responsible citizens. The multifold benefits of Environment Education in early years leads to well-developed sensorial faculties, enhanced gross and fine motor skills, abilities of learning to learn through natural process, internalize environment values, empathy and love for nature that is much required for a sustainable future.

This session will focus on how this unique nature based early learning programme called CEE's Planet Discovery Centre focuses on setting up an "EE in Early Childhood" model, training teachers and influence policies for Early childhood education in India. The programme greatly focuses on:

- Building Environment Educators as role models to educate, influence, and nurture students' capabilities and enhance their engagement leading to positive actions
- Build a robust Curricula and educational programme for early learning through EE
- Set up inspiring nature-based Classroom, outdoor spaces and learning communities around the Child to enhance learning
- Use of natural resources (in place of paper for crafts)
- Engaging Parent community through a Parent Nature Club to meet the objective of implementing child's learnings from classroom to home.
- Increasing Handprint and Decreasing footprint by taking small positive actions towards sustainability like composting of kitchen resources, enhancing reduce-reuse-recycle in daily life, promoting sustainable consumption (eating in season) and eco-friendly celebrations.

Keywords: nature based early learning; EE in early childhood

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Preschool Children's Self-reported Sources of Knowledge of Environmental, Social, and Economic Sustainability: An Interview Study

Farhana Borg [1], *Johan Borg* [2]

Children are exposed to various sources of information as they witness pandemics, wars, climate change, natural disasters, and inequalities within and across countries. However, little is known about children's sources of knowledge of sustainability. As children are the bearers of values and norms that shape future societies, identifying these sources can be crucial to influence their learning of sustainability. The purpose of this study was therefore to contribute insights into preschool children's knowledge of sustainability and their perceived sources of such knowledge in Sweden.

The study addressed two research questions:

- What do children know about use of money, recycling, and the impact of different modes of transport on the environment?
- What are their perceived sources of such knowledge?

An integrated approach to sustainability that includes environmental, social, and economic dimensions was utilized. The study used Bruner's (1960; 1966) Iconic (image-based) mode of representation and Bandura's (1977) social learning theory.

Using a qualitative research approach, a total of 53 preschool children, aged 5-6 years, from 12 preschools in 6 municipalities in Sweden were interviewed. An interview guide was developed and pre-tested with eight children. Illustrations, toys and a cuddly puppet were used to create a child-friendly environment. A qualitative content analysis was conducted (Weber, 1990). The study was vetted by the Regional Ethical Board in Umeå, Sweden. Informed consent was obtained from both parents and children.

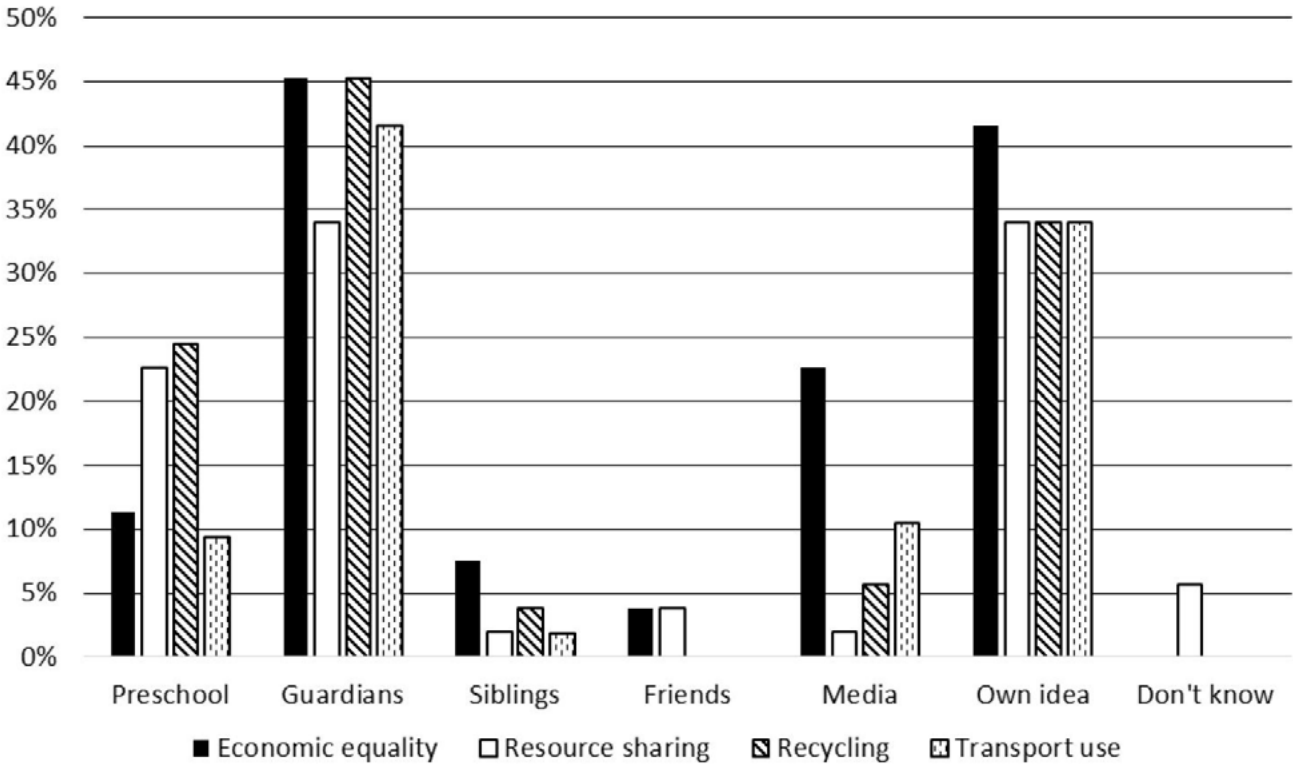

Figure 1. Children's self-reported sources of knowledge. (Borg, 2017, p. 67)

A majority of the children (85%) considered money to be used for buying goods such as toys, candies, pets and other things. Some children (13%) wanted to donate money to the poor. All children recycled at least two out of three items (banana peel, aluminum can and plastic bottle) correctly, and nearly half (41.5%) of them recycled all items correctly. About half (47%) of the children reported that traveling by car was harmful for the environment while cycling (58%) and walking (54%) were frequently mentioned as being environmentally friendly.

The children could report several knowledge sources for four different sustainability-related issues. Parents were reported to be the main source of knowledge along with children themselves while preschool (teachers and other staff) and media were less commonly reported, see Figure 1. Siblings and friends were the least common sources of knowledge.

By the time children completed preschool education, most of them acquired knowledge about use of money, the environmental impact of different modes of transportation, and how to recycle. Parents play a significant role in young children's learning along with preschool teachers and media. The findings indicate needs for further collaboration between teachers and parents to influence children's learning for sustainability.

Keywords: environmental education, sustainable development, preschool, knowledge sources, parents

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Contribution of Natural and Non-Natural Materials to Understandings of the Natural World in Early Childhood Education

Claudine Habak[(1)], *Hanadi A. Chookah, Ieda M. Santos*[(2)], *Kyongje Sung*[(3)], *Joseph Agbenyega*[(4)]

Quality materials carry numerous affordances, for children's learning through sophisticated play. Recent work comparing how young children (3-4 years of age) use and make meaning of natural materials (nature-based *e.g.*, flowers, rocks, food) and non-natural materials (*e.g.*, synthetic arts and crafts materials) in their playful learning activities, has indicated that both types of materials provide affordances for complex thinking, imagination, and creativity, but activities using natural materials lead to richer expression and multi-dimensional connections (Chookah *et al.*, 2023). The purpose here is to address the contributions of natural and non-natural materials to children's awareness and understanding of the natural world. Research Question. How do natural and non-natural materials contribute to children's connections to nature, and to their understanding of the natural world?

We looked at the affordances for connections to the natural-world, using natural and non-natural materials across three components of children's playful work: their comments, procedures (play - how they approached activities), and artifacts. Activities using each type of material were matched in theme and scope (*e.g.* Spring theme for each type of activity, Space theme for each type of activity). The study was carried out with a relatively small number of children aged 3-4 years, but for multiple activities (24 observations), providing a rich data set across the three components (comments, procedures, and artifacts). Data were analyzed qualitatively through an interpretivist cultural-historical approach. The work was carried out in accordance with the Declaration of Helsinki for work involving human participants and was approved by ECAE's Institutional Review Board.

Findings indicated affordances with both types of materials, but activities using non-natural materials remained within the immediate discussion of the theme, whereas the use of natural materials led to more numerous connections to nature and greater sophistication in the expression of concepts (understandings) of the natural world.

Quality materials provide affordances for children's connection to nature, but understanding of the natural world is deeper with natural materials. In an era of digitization, this study has profound implications for practice and policy, as it calls for increased integration of natural materials in teaching and learning for children to develop stronger connections to, and understandings of the natural world.

Reference

Chookah, HA., Agbenyega, JS., Santos, IM., Habak, C. (2023). Play Affordances of Natural and Non-natural Materials in Preschool Children's Playful Learning Tasks. International Journal of Early Childhood. ***https://doi.org/10.1007/s13158-023-00348-z***.

Keywords: play sophistication; nature; quality materials; affordances; conceptual understanding

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340 Educator Practices and Approaches for Environmental Awareness in Early Childhood Education in Abu Dhabi

Nusaibah Salem Al Ameri[1]

Early childhood education and care carry a long-term impact on the child and their societal-environmental engagement. So, looking at current early-year environmental education practices in the United Arab Emirates (UAE) allows us to identify the strengths and needs for future growth in environmental awareness and action locally. Early childhood education and care attend to areas that impact the growth and achievement of personal potential and wellbeing – the holistic person, which has lifelong implications.

Environmental education rests at the intersection of many of the United Nations' Sustainable Development Goals (SDG), which pursue an inclusive framework for economic, social, and environmental objectives to enhance human wellbeing holistically. Gaining a better understanding of environmental education in early childhood within a holistic framework of educator capacity allows for identification of strengths and needs within the local context, contributing to the global vision. The purpose is to evaluate the current approaches and practices used by early-childhood educators of children ages 8 and under in environmental education within a wider framework of such educators' holistic capacity and wellbeing.

What practices and approaches are currently used by early-childhood educators in Abu Dhabi working with children ages 8 years or less? Which practices and approaches are effective and can be scaled? What needs are there in fostering environmental education in early childhood education?

We used a mixed-methods approach with wide-sample quantitative survey scales and interviews with educators and caregivers to evaluate early-childhood educator approaches and practices for environmental education within a holistic educator framework. The study is carried out in accordance with the Declaration of Helsinki for work involving human participants and was approved by ECAE's Institutional Review Board.

Analyses are in progress to inform on the practices and approaches currently used for environmental education in early childhood in Abu Dhabi, along with educator holistic wellbeing related to their approaches and practices.

By gaining better understanding of early childhood educators' perspectives and identifying the key practices and approaches that support quality environmental education, we will make recommendations to foster innovation in training and capacity building. In addition to practice recommendations, there will be a theoretical impact for the intersectionality concept of early childhood education to promote high-quality interactions between early-childhood educators/caregivers and the holistic development of children.

Acknowledgement

This work is supported by a research grant from Abu Dhabi's Early Childhood Authority.

Keywords: early childhood, learning environment, educational practices

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The Climate Change and Early Childhood Development Nexus a Case Study of Eswatini

Novuyo Nkomo (1)

Environmental education that is grounded in real-world situations ought to start in a child's very first years. Such encounters are crucial in establishing long-term attitudes, values, and behavioral patterns toward natural surroundings that endure throughout one's life, (Bisschoff & Botha, 2015). Alive to the fact that while ECE is a critical time in the ultimate development of young people and aware that there is a dearth of research studies on the implications of climate change on the ECE, this study sought to unpack and appreciate these in the context of the low-income development country, the Kingdom of eSwatini.

The questions asked were:

a) How do climate change-induced extreme weather patterns affect access to ECE learning centers?
b) What lessons, are drawn from the best practices from the country cases that have adequately responded to support policy response in developing countries such as Eswatini?

The study used a mixed-methods participatory action research approach that appropriately combined elements of qualitative and quantitative approaches, (John, 2014). The approach centered around variations of the interview method that extracted relevant data from ECE practitioners from 5 NCs in Manzini region. Key informant interviews with Ministry of Education, EMA officials, FGDs with ECCD learners, parents, and teachers constituted the qualitative means data were collected and subsequently analyzed to generate findings. It found that there is a need for an awareness of the increased challenges caused by climate change by eSwatini ECE practitioners, particularly as the Kingdom is largely rural and dependent on agriculture. It emerged that ECE learners are vulnerable to the effects of extreme weather phenomena like flooding, heat waves, and famine due to their age-vulnerability matrix which means they cannot negotiate their way on their own. The study also found that damage to learning infrastructure because of weather extremities continues to compromise learners' access to ECE service and this does not augur well for their futures. Learners' psycho-social development is understood as under-cut with negative impacts on the Kingdom's farming heritage as it means diminished access to nutrition to the children most in need of it to have a solid basis for growth.

Achieving net zero is necessary to mitigate the worst impacts of climate change in Eswatini. The world over, there is an increase in the impacts of climate change, such as flooding, rising temperatures, and lack of food. For early childhood learners, education-based is practical experience through recycling and waste reduction programs or vegetable gardens are likely to be most impactful, nutritional gardens would be helpful.

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Keywords: early childhood care and development, climate change, accessibility, climate adaptation

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Where We Want to Play and Learn: Children's Voices in Choices of Environments in Abu Dhabi

Nahla Alsyedibrahim[1], *Nusaibah Al Ameri*[2], *Kyongje Sung*[3], *Ieda Santos*[4], *Michael Melkonian*[5], *Joseph Agbenyega*[6], *Claudine Habak*[7]

Children flourish with quality, early childhood experiences that focus on nurturing all aspects of their learning, development, and wellbeing. Part of these experiences involve children's environments, as different environments provide a variety of affordances (opportunities) for children's learning and development. Previous work has indicated that when children use natural materials (plants, flowers, ice, foods, *etc.*) compared to synthetic materials in playful learning, affordances are richer for creativity and for deep thinking about connections and relationships in the world (Chookah *et al.*, 2023). In light of environmental contributions to child learning and development, we seek to identify the characteristics of learning spaces that best foster environmental awareness in children (ages 8 and under) by understanding the environments that young children value in the current local context. As part of a wider study addressing quality interactions between children (ages 0-8 years) and early-childhood educators (and the educators' capacity and characteristics) in Abu Dhabi, the current work addresses the physical and emotional spaces important to children.

What are young children's environment preferences for learning and play in the local context? How do children's environment preferences align with environmental awareness? How do these preferences align with their current environments? How do these preferences align with the goals of environmental education and sustainability?

To evaluate children's preferred environments, we sought their voices through interviews of children aged 8 years or less. The work is carried out in accordance with the Declaration of Helsinki for work involving human participants and was approved by the Emirates College for Advanced Education's Institutional Review Board.

Analyses are in progress to inform on the environments that children prefer to learn and play, in Abu Dhabi.

By understanding the learning environments preferred by children aged 8 and below, we can identify the surroundings that foster environmental awareness and agency. In this regard, we will make recommendations on how to link these preferences to children's current environments and foster their understanding of the environment.

Acknowledgement

This work is supported by a research grant from Abu Dhabi's Early Childhood Authority.

Reference

Chookah, HA., Agbenyega, JS., Santos, IM., Habak, C. (2023). Play Affordances of Natural and Non-natural Materials in Preschool Children's Playful Learning Tasks. IJEC. ***https://doi.org/10.1007/s13158-023-00348-z.***

Keywords: early-childhood, environment, play, learning, children's voice

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La Realidad De Las Escuelas Y La Nueva Forma De Hacer Educación En Afogados Da Ingazeira-Pe, Brasil

Edilene Barbosa Pinto (1)

Hay muchas críticas con respecto a la educación pública en Brasil, pero no sabríamos

decir cómo sería una escuela de calidad, ya que el concepto de Calidad es dinámico y se reconstruye constantemente. Por lo tanto, no existe un estándar para una escuela de calidad. Por ello, a partir de una acción conjunta de varias organizaciones gubernamentales y no gubernamentales, se crearon los Indicadores de Calidad Educativa, con el objetivo de contribuir a la comunidad escolar en la evaluación y mejora de la calidad de la escuela. Se basa en estos Indicadores, la reflexión sobre la realidad de las escuelas que aquí se presenta.

Este trabajo está vinculado a la investigación La Realidad de las Escuelas y la Memoria de la Educación en los Municipios del Semiárido Brasileño, que tuvo como objetivo producir una cartografía de la memoria de las instituciones escolares en los municipios del Semiárido Brasileño y de los sujetos de estas escuelas, centrándose en las dimensiones de la práctica y evaluación pedagógica, el acceso y permanencia de los estudiantes en la escuela y el entorno físico escolar.

En la realización del proyecto se incluyó la propuesta de Educación Continuada en Educación Contextualizada para la Convivencia con el Semiárido. Este Curso se propuso, entre sus objetivos, contribuir a la construcción y difusión de una nueva cultura de convivencia con el medio semiárido. Asumiendo que la convivencia reúne un conjunto de significados, saberes y dichos, que al posibilitarse en espacios de apropiación -por ejemplo, espacios educativos-, pueden propiciar una relación armoniosa entre el ser humano y el medio ambiente, es decir, existirá una impacto en la calidad de vida, salud, vivienda, saneamiento, abastecimiento de agua, seguridad alimentaria y seguridad social y asistencia social y garantía de igualdad en las relaciones sociales para los habitantes de la Región Semiárida.

Participaron del curso educadores de las escuelas municipales de Afogados da Ingazeira-PE, que actúan en la Educación Básica en escuelas rurales de la red pública de educación.

Considerando las informaciones proporcionadas por los docentes investigados y los indicadores trabajados en esta investigación, se concluyó que las escuelas del ámbito de Afogados da Ingazeira, atienden en algunos ítems la cuestión de la calidad en la Educación. Pero en otros, se necesita inversión para mejorarlos.

La investigación se propuso indagar en la realidad de las escuelas de un municipio inserto en una región que, históricamente, sufre los efectos del clima y busca implementar una propuesta educativa que considere la convivencia con el Semiárido como paradigma central de la Educación Contextualizada.

Y Afogados da Ingazeira es un municipio prometedor en la implementación de esta propuesta educativa. Esta prueba la da el hecho de que luego de realizar nuestro trabajo, el municipio inició el proceso de elaboración de la Ley Municipal de Educación Contextualizada para la Convivencia con el Semiárido.

Palabras claves: educación contextualizada; convivencia con la región semiárida; calidad de educación; práctica pedagógica; Semiárido

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460 Early Childhood Education - The First Step That Lays The Foundation for Environment and Sustainability Questions

Ingrid Samuelsson (1)

ECE looks different in different areas of the world, but when the Commission on futures of education write about effort for future education, they point out that we need a new social contract and foundational principles, to consider the relation between past premises and an uncertain future, as well as proposals for renewing education. With the report's suggestions will a development- and research project in ECE in Sweden be presented and discussed. Environmental education will be the hub for sustainability questions, but the approach to ECE will also be a new theory called play-responsive teaching where children's agency and rights are central. In the development- and research program do 300 people participate, 200 preschool teachers and 100 head-maters or leaders of the 9 communities. The participants get input from researchers and carry out various tasks, the researchers are analysing (in different ways) and give feed-back to the participants and use the data for scientific publications. The project started 2021 and will end in December 2024.

Keywords: early childhood education, play-responsive teaching, environment & sustainability

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How Children Aged 2-8 in the Emirate of Abu Dhabi Are Supported in the Development of Their Environmental Awareness? through Educational Programs

Mariam Jasem Alzaabi[1]

Historically, children have spent a significant portion of their early years engaging with natural environments, such as parks and unmanaged areas, fostering a sense of wonder and curiosity (Chawla, 1990; Davis & Elliott, 2004; Kellert, 2005). These outdoor experiences, rich in hands-on learning opportunities, evoke emotions that can leave lasting impressions and influence lifelong behaviors. Moreover, such interactions with nature play a pivotal role in developing an understanding of interconnectedness with the environment, thereby nurturing environmental awareness and identity. This abstract explores how children aged 2-8 in the emirate of Abu Dhabi are supported in the development of their environmental awareness through educational programs. This research employs a qualitative approach, involving observations of early childhood settings catering to children aged 2-8 and interviews with educators and educational leaders. Data collection will span across the emirate of Abu Dhabi, encompassing the western region and Al Ain. Understanding the significance of nurturing environmental awareness during early childhood is crucial. Children's comfort levels in biodiverse settings increase as they engage more with natural landscapes. Prosocial behavior, shaped by various factors including individual characteristics, environmental influences, and cultural norms, develops during these formative years (Acar & Torquati, 2015). Given that children represent the future generation responsible for upholding traditions and cultural norms, instilling in them an awareness of the diversity of life and a desire to preserve their environment is imperative. Before children can grasp the concepts of environmental protection and preservation, they need the opportunity to explore and play freely in natural environments. Moreover, it is essential that children possess knowledge of their local surroundings and develop a sense of environmental identity, understanding what they are safeguarding and their connection to the land. Children learn best through exploration, and their exposure to local environments can foster a sense of connection to nature, leading to heightened environmental concern and a commitment to protect their natural surroundings. Achieving this can be realized through several approaches: Creating Natural Play Areas: Designing safe play areas that mimic the natural landscapes of the region, allowing children to interact with their local environment, field Trips to Natural Environments, stories, and positive Messaging. In conclusion, this research aims to shed light on the methods and practices employed to support children aged 2-8 in Abu Dhabi in developing their environmental awareness through educational programs. By cultivating a strong connection between children and their local environment, we can nurture environmentally conscious citizens who will play a crucial role in preserving the natural beauty and ecological balance of Abu Dhabi.

Keywords: early childhood education, environmental awareness, environment identity. local environment

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518 Eco-Écoles & Outils Pédagogiques : La Fondation Et Son Centre En Action Pour Une Éducation Préscolaire Intégrée

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Mettant en avant une approche intégrée et éco-responsable, le Centre International Hassan II de Formation à l'Environnement, bras pédagogique de la Fond ation Mohammed VI pour la Protection de l'Environnement, a développé des animations et des outils pédagogiques adaptés pour promouvoir et renforcer l'impact positif de l'éducation préscolaire.

Le Centre vise à travers le programme Eco-écoles à former une nouvelle génération consciente, créative et respectueuse de l'environnement à travers la promotion de l'éducation préscolaire intégrée, la sensibilisation environnementale, l'introduction d'animations spécifiques, l'engagement de la communauté éducative et le renforcement des valeurs éthiques et sociales.

À travers des animations et des outils pédagogiques spécialement conçus pour les tout-petits, le programme cherche à offrir une éducation préscolaire engageante, interactive et en phase avec les besoins individuels de chaque enfant. Parmi ces outils pédagogiques, le Centre a mis en place un jeu spécifique sur la permaculture pour les initier aux principes de durabilité et de respect de la nature, des coloriages géants mettant en scène la biodiversité, ainsi que des affiches explicatives du programme éco-écoles pour les sensibiliser aux enjeux environnementaux de manière ludique et accessible.

De plus, des vidéos interactives captivantes sont utilisées pour une approche multimédia immersive, suscitant l'intérêt des tout-petits et stimulant leur curiosité envers les thématiques environnementales. Les activités sensorielles sont également intégrées dans le programme, permettant aux enfants de découvrir leur environnement par le toucher, l'odorat et l'ouïe, favorisant ainsi leur compréhension globale du monde qui les entoure.

Le volet pratique du programme inclut des séances de plantation où les enfants peuvent expérimenter le processus de croissance des plantes, les sensibilisant ainsi à l'importance de la nature et de la biodiversité. Des animations d'ateliersont organisées pour guider les tout-petits dans leur apprentissage, et des explications des thématiques du programme sont fournies de manière adaptée à leur niveau de compréhension.

L'approche éco-responsable et intégrée a suscité l'engagement de la communauté éducative. Les animations et les outils pédagogiques adaptés ont rendu l'apprentissage attrayant. Ils ont favorisé la sensibilisation environnementale précoce et le développement des compétences sociales, formant ainsi une nouvelle génération consciente et engagée envers la durabilité.

Les résultats positifs ont montré que cette initiative forme une nouvelle génération consciente, créative et responsable, ancrée dans des valeurs de durabilité. Pour pérenniser ces résultats, d'impliquer davantage la communauté, de développer de nouvelles ressources et de soutenir la formation continue des enseignants.

Mots clés: programme eco-écoles, éducation préscolaire, outils et animations pédagogiques

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Development of a Tool towards Enhancing Early Childhood Education in Schools and at Homes providing Basic Environmental Knowledge Using Artificial Intelligence Technology

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The integration of artificial intelligence (AI) into educational tools has ushered in a new era of innovative learning approaches. This abstract presents Little Green Hero (LGH), an inventive mobile and web application that harnesses the power of AI to promote environmental awareness among children aged toddler to 8 years. The proposed application highlights the significance of early environmental education (EE) and introduces how LGH tactfully navigates the complex terrain of environmental topics, fostering understanding without inducing fear or anxiety.

The goals of the LGH program align seamlessly with the theme's emphasis on innovative educational approaches to environmental awareness. The use of AI technology amplifies the program's aim of providing personalized, engaging, and age-appropriate EE to young children.

Environmental consciousness is a critical facet of contemporary society, and its cultivation from an early age holds transformative potential. However, educating young minds about environmental complexities necessitates an approach that balances imparting knowledge with ensuring that children feel empowered, curious, and unburdened by ecological concerns. The central challenge lies in explaining intricate concepts like climate change, energy efficiency, and waste management in ways that are both informative and relatable. LGH addresses this challenge by employing AI to create a dynamic and interactive learning experience. Through games and educational videos, the application takes children on an engaging journey where they learn about these topics with the assistance of a friendly AI-driven character who facilitates learning by interacting, giving feedback, and providing context-sensitive information.

The experience offered by LGH is grounded in AI's adaptability. LGH tailors the learning experience to the child's age, comprehension level, and pace of learning. As the child interacts with the AI character and progresses through different levels, the AI adapts its responses and content delivery to ensure a personalized and enriching experience so that the child remains engaged, fostering a sustained interest in environmental topics. Furthermore, the program encourages outdoor exploration and engagement with the environment, complementing the AI-facilitated lessons. By instilling a love for nature, LGH aims to inspire a generation of environmentally conscious individuals who are motivated to safeguard their surroundings.

In conclusion, LGH presents a promising avenue for delivering impactful EE to young children. By employing AI-driven interactions, LGH makes learning about complex environmental topics accessible, engaging, and enjoyable. This approach not only imparts knowledge but also empowers children to understand their role in environmental preservation. As AI continues to redefine educational paradigms, LGH stands as an exemplar of how technology can foster a generation of environmentally aware individuals.

Keywords: environment, early childhood, artificial intelligence, education, games

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منهج السنة النبوية في غرس وتنمية قيم التربية البيئية وأثره على الأطفال

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لطالما حرصت السنة النبوية على غرس قيم التربية البيئية في نفوس الأطفال، ويعد ذلك نموذجا رائعا يمكننا إسقاطه على واقعنا الحالي ومدارسة سبل تفعيل ذلك في المدارس ومراكز تحفيظ القرآن

إن تعليم الأطفال على القيم والمباديء قضية كبرى لطالما شغلت المفكرين والمربين والأدباء والعقلاء، وكل أدلى فيها بدلوه، غير أن معين الهدي المحمدي يظل أعذبها موردا، حيث إنه كان ينتهج في ذلك "التعليم بالقدوة"، وهو أسلوب رائع ومنهج قويم، لأن الطفل يعتمد في تعلمه على المحاكاة والتقليد، فكل أفعاله صلى اللّه عليه وسلم كانت بمثابة مرجعية للأطفال وللشباب، أيضا كان له أسلوب فريد في رياضة الأطفال، "حديث يا عمير ما صنع النغير" نموذجا

والمتأمل في أحاديثه الشريفة يرى كيف استخدم صلى اللّه عليه وسلم مصطلحات وألفاظ بيئية تحبب الناس في بيئاتهم وتصنع علاقة قوية بين الإنسان والبيئية، فقد سبق بذلك وتفرد صلى اللّه عليه وسلم، على سبيل المثال لا الحصر بحديث النخلة:

عن عبد اللّه بن عمر أن رسول اللّه صلى اللّه عليه وسلم قال: » إن من الشجر شجرة لا يسقط ورقها، وهي مثل المسلم، حدثوني ما هي؟ « (الحديث متفق عليه)

وفي حديث شريف آخر نجده –صلى اللّه عليه وسلم – يربط الإنسان ربطا شديدا بتربة الأرض التي يعيش عليها بل ويعلمه أن يسترقي بها من المرض، فهل يقدم عاقل بعد ذلك على تلويث تربة يستشفي بها !

إن مبدأ الرقابة التي تسعى إليها التربية البيئية العالمية، يبدو جليا في أحاديثه الشريفة يقول صلى اللّه عليه وسلم:"مثل القائم على حدود اللّه والواقع فيها كمثل قوم استهموا على سفينة فأصاب بعضهم أعلاها وأصاب بعضهم أسفلها...الحديث رواه البخاري.

لأن الكل لا يسلم حتى يسلم الجزء وأن المشكلة إن حَلّت لا تميز بين الفاعل وغيره تبنت دولة الإمارات العربية المتحدة هذا الدور الرائد في نشر السلام والعلم ومحاولة التوفيق بين الشعوب فأدنت القريب من البعيد وألفت بين الميؤوس والمأمول، وقد جاء هذا نتيجة للفهم الوسطي المعتدل للنصوص الدينية وسعيا لتطبيق منهج السنة النبوية الشريفة وبخاصة من خلال غرس وتنمية القيم البيئية الإسلامية، وهي "مجموعة الأحكام المعيارية المنبثقة من الأصول الإسلامية ، التي تكون بمثابة موجهات لسلوك الإنسان تجاه البيئة وتمكنه من تحقيق وظيفة الخلافة في الأرض" ، وهي :قيم المحافظة، و قيم الاستغلال بمفهوم التوسط والاعتدال، وقيم التكيف والاعتقاد، وقيم الجمال.

حيث حثت الشريعة الإسلامية على أهمية الحفاظ على البيئة في العديد من الآيات الكريمة ومنها :"كُلوا وَاشْرَبُوا من رِّزْقِ اللَّه وَلَا تَعْثَوْا فِي الْأَرْضِ مُفْسِدِينَ" (البقرة:60) ، كما أنها نهت صراحة عن الفساد بكل أشكاله واهتمت السنة النبوية اهتماما بالغا بالتشجير والزراعة، وفي ذلك يقول الرسول صلى اللّه عليه سلم: "مَا مِنْ مُسْلِم يَغْرِسُ غَرْسًا، أَوْ يَزْرَعُ زَرْعًا، فَيَأْكُلُ مِنْهُ طَيْرٌ أَوْ إِنْسَانٌ أَوْ بَهِيمَةٌ، إِلَّا كَانَ لَهُ بِهِ صَدَقَةٌ ".

ومن جهة أخرى دعا الإسلام الحنيف إلى المحافظة على الكائنات الحية وعدم التعرض لها بالأذى، يقول صلى اللّه عليه وسلم: دَخَلَت امْرَأَةُ النَّارَ فِي هِرَّةٍ رَبَطَتْهَا، فَلَمْ تُطْعِمْهَا، وَلَمْ تَدَعْهَا تَأْكُلُ مِنْ خَشَاشِ الأَرْضِ"

إن تمام التربية أن ننشئ أطفالنا على قيم الرحمة والمحبة والإحسان لكل الخلق وبالأخص الأرض التي نحيا عليها ومنها، يقول تعالى : وَلاَ تفْسدوا فِي الأَرْضِ بَعْدَ إِصْلاحِهَا وَادْعوه خَوْفاً وَطَمَعاً إِنَّ رَحْمَةَ اللَّهِ قَرِيب مِّنَ المحْسِنِينَ"

الكلمات الرئيسية: التربية البيئية، التربية الإسلامية، الوسطية، الاعتدال، الجمال، الرحمة، غرس القيم، تربية الأطفال، الحفاظ على البيئة

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How I Teach and Play: Wellbeing, Practices, and Growth in Early Childhood Educators

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Thriving, happy children have trust in their worlds, which involves feeling connected to their environments through quality interactions with educators and caregivers. Enhancing early childhood education relies on quality experiences that promote children's holistic growth across development, learning, and wellbeing. This approach is reflected in the United Nations' Sustainable Development Goals (SDG's) for enhancing wellbeing for all – holistically. There has been extensive focus on curricula and approaches in early childhood education, and only recently, has a deeper appreciation of early-childhood educator wellbeing come into focus (Berger *et al.*, 2022). Adoption of the SDG's frame-of-reference recognizes that the quality of a person's work and interactions, arises from more than their quantifiable knowledge and skills. Early-childhood educator capacity should include elements that address the whole-person, such as their state of wellbeing, social and emotional aptitudes, and approaches to continuous learning. The purpose here, is to identify the elements that promote the highest-quality interactions between early-childhood educators/caregivers and the children entrusted in their care, along with the children's families.

The research questions are:

- What does the wellbeing of early-childhood educators in Abu Dhabi look like?
- How does their wellbeing impact their practices and approaches?
- What is the relationship between their wellbeing and their lifelong learning?

To evaluate early-childhood educator wellbeing, its effect on practices and approaches, and its relationship with lifelong learning, a questionnaire was used to survey 700 early-childhood educators and caregivers anonymously. Dimensions included scales of wellbeing, stressors, practices and approaches, including play, and attitudes towards lifelong learning. The study is carried out in accordance with the Declaration of Helsinki for work involving human participants and was approved by ECAE's Institutional Review Board.

Preliminary analyses indicate a relationship between the wellbeing of early-childhood educators and other dimensions, including stressors, societal value, and approaches.

By better understanding early childhood educators holistically, we identify fitting approaches to support their needs and wellbeing. Recommendations point not only to innovations in training and capacity building of educators, but also to their whole-person care and societal engagements. Acknowledgement. This work is supported by a research grant from Abu Dhabi's Early Childhood Authority.

Reference

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Keywords: early childhood, wellbeing, lifelong learning

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Pioneering Wildlife Conservation Education Program Reached 6,194 Students and Aimed to Build the Very First Sustainable Core Team to Protect Pu Mat Forest

Ngo Thi Thuong[1]

In mid-2018, Save Vietnam's Wildlife (SVW) established its first law enforcement unit, in collaboration with Pu Mat National Park. 1176,55 km distance patrolled by foot; 17 guns confiscated, 264 camps destroyed, 2924 traps removed; these numbers indicated that biodiversity has declined at an alarming rate. To solve this problem, we developed long-term plans in addition to forest patrols to educate young children whose families live in the buffer zone of Pu Mat and mainly rely on forests for food.

Between 2021 and 2022, we developed a pioneering educational program for 20 satellite schools in the buffer zone of Pu Mat National Park. The program has brought significant changes in children's awareness after one year of participation, in which, the recognition of wildlife species such as otter, saola, pangolin, and elephant steeply increased from 21.24% (Pre-survey) to 64.4% (Post-survey); the level of recognition of Sa Mu Dau - a heritage tree of Pu Mat National Park rose from 4.05% to 85.89%; 98% of children strongly disagree about becoming hunters when they grow up. To implement activities effectively, we follow an explicit theoretical framework with five levels of conservation education to design and implement evidence-based education and outreach programs for different types of targets. The framework has been flexibly adapted from the Tbilisi Declaration in 1977 by the United Nations Education, Scientific, and Cultural Organization in cooperation with the United Nations Environment Programme.

First, we conducted pre-survey research to build a suitable program for children. Then, a series of activities to raise awareness that provided knowledge and promoted the love for nature and wildlife in children through conservation events, and youth clubs at school. We also compiled "The Way Home" game set and disseminated it to classes and libraries in schools. At the highest level of the theoretical framework - Participation, we gave opportunities for children and encouraged them to speak up and take action to protect local pride - Pu Mat through club activities, child announcer, letter writing contest with themes of nature and wildlife protection.

The program reached 6,194 children directly and 5,335 families through media publications, the results showed how effective our activities were, however, there was not much participation from local people in building the idea and plan. To ensure sustainability, in the period 2023-2025, we aim to build a core team, including rangers, teachers, and children in the club, who are local people. The core team has roles in brainstorming ideas, planning, and implementing activities by themselves in schools and communities where they live.

Keywords: Save Vietnam

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Awareness and Sustainability: An Action-research on Early Childhood Educators and Parents in the Municipality of Rome

Chiara Minischetti (1)

Today's society is increasingly called to confront the issues of sustainability and environmental education; these would seem to be known to various groups of citizens, but not yet sufficiently rooted in the majority of people. Nevertheless, the dissemination of sustainability issues in mass culture does not always produce real habits or practices in citizens. The development of sustainable actions requires education from an early age.

The role of early childhood education and care is crucial to the achievement of the fourth sustainable development goal of the 2030 Agenda, "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". Therefore, starting from the preschool age, environmental and sustainability education practices have become indispensable in the current educational landscape since pre-school age. In order for these practices to work, families must be involved in a community education perspective.

Education for sustainability requires more than just passing on concepts; it must also involve embracing a sustainable lifestyle. This action-research is primarily focused on environmental awareness analysis of early childhood teachers and parents due to these reasons.

A good awareness of the issues related to environmental sustainability can be considered a primary starting point for changing one's behaviour and adopting a sustainable lifestyle.

The objectives of this action-research, as part of the PNRR doctoral research path, are being defined and implemented; in particular, these objectives concern:

a) the knowledge of sensitivity to the issues of sustainability and education to sustainable development, through a questionnaire addressed to teachers and parents of schools from 0 to 6 years; the focus is mainly on analysing environmental awareness and the adoption of sustainable practices;
b) the exploitation of the existing potential of the educational system of the 0-6 years old and its educational community;
c) the systematization of some actions concerning the emerging issues of sustainability; early childhood educators, pre-school teachers and families are the protagonists of these actions.

Keywords: Early childhood education – Sustainability - Environmental awareness – Sustainable lifestyle

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727 Little Green Steps WA - Sustainability in Early Childhood Settings

Jennifer Pearson (1)

We envision a world where every child – especially the most vulnerable – connects meaningfully with nature every day. One of the most accessible and effective ways for achieving that vision is through children's and youth's school-based experiences. If children are to connect with nature every day for growing, playing and learning, school grounds must be part of the solution.

There is growing momentum worldwide to scale school ground greening as a sensible and thoughtful approach to increase climate resilience, enhance biodiversity, improve health and education outcomes, and strengthen communities, especially for those most impacted by systems of inequity and environmental injustices. Mounting scientific evidence suggests that transforming school grounds into nature-rich environments is a powerful tool to achieve multiple benefits. Such school grounds improve physical and mental health, social and cognitive skills, creativity, and academic performance for students. They also contribute environmental benefits such as reduced heat in warming climates, reduced pollution and water conservation.

The Greening School Grounds & Outdoor Learning project engages global leaders and practitioners to build networks of like-minded organizations and individuals to identify and deliver scalable strategies to support the worldwide movement of school ground greening. The project provides professional development, technical support and curriculum resources to successfully design, implement, evaluate and maintain green school grounds and other nature-based and place-based outdoor learning environments for early childhood, elementary and secondary education students.

Before this project, there was no international survey of successful examples of green school grounds. For the first time, a map now exists to show where they exist, and where the gaps are present. A position statement has been created to demonstrate the need. Short films serve as case studies to inspire and demonstrate their simplicity and effectiveness. An action plan has been developed to move all of this forward.

There is a strong peer-reviewed evidence base available to support both the need and the potential for positive outcomes. However, no cohesive international effort was previously underway to bring scale to help achieve the benefits of such approaches. The partner organizations that have collaborated to create this project are uniquely prepared to succeed with dispersing this elegant and accessible solution to schools and communities throughout the world.

The objective of this workshop is to strengthen and expand the existing international greening of school grounds and outdoor learning movement. A draft Ten-Step Guide to Greening School Grounds and Outdoor Learning will be provided to participants, and there will be meaningful interactive discussion and opportunities to collaboratively generate strategies for growing the movement worldwide.

Keywords: early childhood, sustainability, environmental education, climate change initiatives, green schools

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Inclusion of People with Disabilities in Environment Education

Alba Godall Mateo (1)

Persons with disabilities, being among those at the greatest risk of being left behind in education and society, should be actively included in discussions, both in formal and informal settings, given the importance of environmental education and its potential impact on them. This inclusion is vital for integrating individuals with different needs and abilities into environmental education frameworks.

This 60-minute hands-on session is tailored for people with disabilities. We will introduce basic concepts within environmental education, with a specific focus on designing spaces that cater to the diverse needs of individuals with disabilities.

This workshop aims to showcase a method for introducing and engaging people with disabilities in environmental education settings. It is intended to serve as a blueprint for future educational activities in the UAE and other parts of the world, with specific objectives including:

- Including people with disabilities in environmental education settings.
- Creating an inclusive learning environment for people with disabilities.
- Providing guidance for educational institutions on environmental accommodations and best practices for educating people with disabilities

Keywords: inclusion, accessibility, environmental education, sustainability, equity, disabilities

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THE MEANS THEME 03

Outdoor and Place-based Learning in the Decade of Ecosystem Restoration

Theme Background: Connecting with the natural environment and its contextual significance plays a fundamental role in fostering a deep sense of connection among individuals and in creating a sustainable future. This core theme aligns with the central theme of WEEC 2024, which emphasises "Connecting People, Creating a Sustainable Tomorrow." In this context, the United Nations Decade on Ecosystem Restoration represents a global commitment to preventing, halting, and reversing the degradation of ecosystems through active participation by communities and individuals. As part of this commitment, there is a growing call for nature-based education and place-integrated experiences within the field of EE and ESD.

Theme Objectives: The theme, "Outdoor and Place-based Learning in the Decade of Ecosystem Restoration," seeks to:

- Showcase diverse examples of outdoor and place-based learning initiatives that connect individuals with nature and their surroundings.
- Explore the impact of outdoor EE and ESD on students' physical and mental well-being and examine how contact with nature contributes to holistic development.

Theme Focus:

- Innovative approaches to outdoor education and place-based learning.
- Successful programmes that engage students and communities with their local ecosystems.
- Strategies for incorporating outdoor learning into formal and non-formal education settings.
- Psychological and physical health benefits of outdoor education.

Theme Outcomes: An elaboration on nature-based or place-integrated learning experiences that have shown to yield a wide range of benefits, in the context, the United Nations Decade on Ecosystem Restoration through active participation by communities and individuals, including the development of personal and social competencies that are highly relevant in today's world.

Theme Conclusions: The thematic track on "Outdoor and Place-based Learning in the Decade of Ecosystem Restoration" aligns with the broader mission of WEEC 2024 by emphasising the critical role of outdoor and place-based education in connecting people with their environment and fostering a sustainable future. Educators, researchers, practitioners, and community leaders are encouraged to contribute their insights, experiences, and innovations to this important dialogue in Abu Dhabi.

Together, we can explore the transformative potential of outdoor and place-based learning and its capacity to empower individuals and communities to become stewards of the natural world and active participants in ecosystem restoration efforts.

THE MEANS THEME 03

Outdoor and Place-based Learning in the Decade of Ecosystem Restoration

Presentations

ID	TITLE	PRESENTER	FORMAT
028	Coastal urbanization and environmental change: Opportunities for collaborative education across a global network university	John A. Burt, Mary Killilea	Oral communication
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THE MEANS THEME 03

Outdoor and Place-based Learning in the Decade of Ecosystem Restoration

Abstracts

028 Coastal Urbanization and Environmental Change: Opportunities for Collaborative Education across a Global Network University

John A. Burt[(1)], *Mary Killilea*[(2)]

Human populations are heavily concentrated on shorelines and growing urbanization is putting increasing pressure on coastal ecosystems around the globe. Many of the environmental challenges facing individual cities are shared by cities elsewhere, and there is increasing recognition that localized solutions being developed for a particular urban setting have the capacity to be scaled up to help resolve environmental issues in other parts of the world. In the past decade there has been rapid growth of the internationalization of higher education, and this provides an opportunity to explore environmental issues that have both local relevance and global importance for the next generation of decision makers.

New York University has established itself as a "global network university" with 3 major campuses and 11 academic sites spanning 13 nations on five continents. A novel undergraduate course, "Where the City Meets the Sea", makes use of the opportunity presented by this global presence to study issues surrounding coastal urbanization and environmental change.

Using a combination of interactive online lectures, asynchronous fieldwork and computer-based data collection and analysis labs, plus cross-campus group assignments, students from multiple NYU campuses are able to collaboratively explore issues around coastal urbanization by collecting and analyzing data from their local environment, and comparing these results with those of students at sites elsewhere in the globe.

The globally relevant but local place-based approach used here allows students to deeply contextualize their understanding of global issues by fostering an understanding of the environmental challenges - and their solutions - that span local to global scales. This course has been offered at least annually since 2012, deepening the environmental education of over 400 undergraduate students from geographically divergent campuses across the globe (NYU New York, NYU London, NYU Abu Dhabi, NYU Shanghai and occasional other NYU sites). Qualitative and quantitative student feedback in course evaluations show strong support for this cross-campus comparative approach. Despite the strong positive outcomes, teaching a global class was not without challenges. These include linked-classroom IT infrastructure needs and back-end support for field-based data collection, to more subtle challenges (*e.g.* managing time-zone differences, optimal desk arrangement for interactive cross-campus classes, and balancing student collaboration across campuses).

It is expected that higher education will experience increasing levels of internationalization in the coming decade. Our approach provides a case study that exemplifies how we might leverage this opportunity to enhance place-based learning of local environmental challenges through comparative assessment of these issues at global scales.

Keywords: interactive video conference, academic technology, distance learning, internationalization, environmental education

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La Ruelle Verte: Un Patrimoine Du Commun Où Déployer Une Éducation à l'inclusion

Mamadou Bhoye, BAH, (1)

Cet article traite de la ruelle verte comme un patrimoine du commun à s'approprier et un terrain propice au déploiement d'une éducation à l'inclusion sociale. Les ruelles vertes, de plus en plus présentes sur le territoire montréalais, ont fait l'objet d'une série de webdocumentaires intitulée Vue de ruelle. À partir de l'analyse de ces documents, de visites des lieux et d'un ensemble d'entrevues avec les acteurs de divers projets de ruelle, nous avons mené une recherche descriptive, interprétative et critique visant à mieux saisir les modes d'appropriation des ruelles par les résidents. Deux principales voies d'appropriation se dégagent de l'analyse des propos d'entrevue et des notes d'observation: l'aménagement et l'utilisation. Nous avons également porté attention à la dimension inclusive des projets de ruelle à l'égard de la diversité sociale. Nous observons qu'il y a lieu de réfléchir avec les acteurs engagés afin d'examiner davantage la question du commun inclusif et d'envisager des activités éducatives à cet égard.

Keywords: théorie des communs, ruelle verte, éducation à l'inclusion

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A Curriculum of Place: Facilitating School-university Partnerships through a Place-based STEAM Semester

Kevin O'Connor[1]

The purpose of our research is to investigate how teacher candidates' experiences in STEAM field studies with community partners can inform our work as teacher educators with an integrated practicum semester based on a curriculum of place (Chambers, 2008). Many contributions to education have been made through non-Indigenous perspectives of place. Place-based education (Penetito, 2009) is an approach to teaching that is grounded in the context of community and environment (Theobald & Curtiss, 2000) and seeks to help students, educators and other interested community members in solving community problems (Denise & Harris, 1989). However, emerging research suggests that place-based education is limited because it does not critique colonial legacies in theoretical frameworks of place (Calderon, 2014). Many Indigenous scholars are replacing the term place with land and argue that land-based pedagogies promote the decolonization of education (Ballantyne, 2014) by recognizing the intimate relationship that Indigenous peoples have with the land. One challenge with land-based pedagogies is the role non-Indigenous peoples have in this approach to the decolonization of education. Our research, in a western Canadian context, explores this tension as we come to a deeper and shared understanding of our co-responsibility within Treaty 7 relationships. Learning from place emphasizes a relationship with the land (Blood & Chambers, 2006), something deeply respected in Indigenous communities yet often absent in PBE literature. Our project seeks to close this gap by considering varying perspectives of place as it informs STEAM teacher education pedagogy.

The participants in this study included the two teacher educators, a Blackfoot Elder, three student research assistants and sixty-three teacher candidates. Together, we piloted integrated 7-week intensive STEAM courses in coordination with candidates' practicum experiences and field studies and inquiry projects.

The results show that our attempts to enact a curriculum of place that recognizes the intimate relationship that Indigenous people have with the land and emphasizes relational ways of knowing were impactful. However, we were disappointed that many of our students seemed to experience a place-based curriculum that was not linked explicitly to Indigenous ways of knowing. Moving forward, we are collaborating with our Indigenous school partners in designing field studies that invite students to experience all dimensions of the place, as we look to shifts in identity needed to authentically experience a curriculum of place.

It is our hope that our research findings will prompt others to consider how teaching and learning can be enhanced (McKinney, 2004) through a curriculum of place that considers how Indigenous knowledge systems can inform and/or challenge critical, intellectual, cultural, societal, and economic investigations intended to connect students and educators with their specific place on the earth.

Keywords: place-based learning; teacher education; indigenous ways of knowing; STEAM; school-university partnerships

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186 Nurturing Innovation and Creativity for a Brighter Future

Megan Patterson (1)

Intelligence is not a one-size-fits-all concept. There are various forms of intelligence, and it's crucial to recognize and appreciate different types of thinking and problem-solving skills. Encouraging a broader definition of intelligence can help individuals with unique talents and perspectives thrive.

We currently have a narrow definitions of intelligence and a need for more inclusive approaches to education and the workplace, especially when it comes to nurturing the potential of neurodivergent individuals. It's essential to recognize and value different forms of intelligence, including creativity, innovation, and out-of-the-box thinking. This recognition is crucial for fostering a society where everyone has the opportunity to thrive.

The educational system and workplaces often prioritize conformity and standardized testing, which can hinder the development and expression of unique talents. It's essential to create environments that encourage and celebrate diversity in thinking and problem-solving.

The complex challenges our world faces, such as climate change, pandemics, and technological advancements, require innovative solutions. Thinking outside the box is essential for addressing these issues effectively, and neurodivergent individuals can contribute significantly to this process if given the right support at a young age.

By providing support, understanding, and accommodations, we can harness their creativity and innovation for the benefit of society. Nature offers valuable lessons in diversity, adaptation, and symbiotic relationships. This approach not only enhances our understanding of neurodiversity but also promotes the importance of reconnecting with the natural world for the well-being of both individuals and the planet.

Encouraging children to engage with the outdoors is essential for their mental and physical health and can inspire innovative thinking. Nature provides a rich context for learning and problem-solving, which can benefit future generations.

For the future health of our planet and all living things, it is vital that we embrace diverse forms of intelligence, supporting neurodivergent individuals, and using nature as a source of inspiration and learning. By doing so, we can create a more inclusive and innovative society that is better equipped to tackle the challenges of the future.

Keywords: outdoor-based, place-based, neurodiverse, innovation

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195 Pilot Study of a Nature-focused Field Trips Using Play-based Learning in Primary Education Degree Students

Cinthia Pereira[1], David Aguilera[2], Javier Carrillo-Rosua[3], Genina Calafell[4], Mireia Esparza[5]

Although it is well known the value of nature-focused field trips (NFFT) in education (Orion 1993), they have little presence in course's syllabus (Aguilera 2018). To prepare and motivate teachers in the use of NFFT, it is essential to include in their training the pedagogical knowledge and the appropriate experiences that enable them to organize NFFT (Tal and Morag 2009). A motivated and prepared teacher will awake curiosity and interest in learning Natural Sciences in their students. Our communication presents a NFFT program aimed at arising teacher's training and motivation.

Objectives

a) To design a NFFT program for Primary Education Degree students using play-based learning.

b) To know the students' perception about the importance of NFFT for learning Natural Sciences.

c) To assess the ability to observe and describe previously unknown natural elements.

d) To evaluate the degree of motivation and collaboration during a NFFT.

Two pilot experiences were carried out with students of the Primary Education Degree from two Spanish universities (University of Granada, UGR; University of Barcelona, UB) with the aim of improving and enriching the experimental design of the NFFT from two different points of view. Thus, 40 students from the UB participated in a NFFT in Montseny Biosphere Reserve (Pla de la Calma, Barcelona) and 42 students from the UGR went to Sierra Nevada Biosphere Reserve (Cumbres Verdes, Granada). Groups of four people were organised to solve challenges on fauna, flora, landscape and geology. In order to overcome these challenges, each group had detailed information on the area and a set of materials and instruments for measurement and observation. Each group managed and organised their work and time to overcome The Challenges with the guidance of teachers with experience in NFFT and knowledge of the environment.

The following procedure was followed:

a) Exploration and detailed study of the area.

b) Validation in situ by experts in Biology, Geology and Education of the itineraries, contents and methods to work.

c) Design of the materials: instructions, guides, field notebook, surveys, co-evaluation tables for students and evaluation rubrics for teachers.

d) Logistics organisation.

e) Data collection and analysis.

Challenge solving dynamics showed great interaction within and between groups of students. The students' answers show that working in this way increased the cohesion of the class-group. It was observed that the students intuitively posed themselves questions about the natural environment while overcoming the different challenges. Since the learning was autonomous (teachers did not immediately provide the information), the students had to be very observant, recording the details in field notebooks and with photographs. All these evidences demonstrate the importance of experiential education outside the classroom for environmental education provided by NFFT.

Keywords: outdoor education, natural sciences, environmental education, experiential education

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207 FLOW with Nature: Building Experiential and Positive Emotional Connections between Young People and Nature to Enhance Well-being

Carl Leong[1]

A growing body of research points out that reconnection with nature benefits humans' physical and mental wellness, reducing stress and promoting healing. The powerful calming effect of blue space (environments that feature open water, such as wetlands, coastal areas and the sea) is demonstrated by a study across 18 countries, which found that frequently visiting 'watery' nature decreased mental distress. As short as spending 10 minutes in urban wetlands can be enough to improve a person's mood. By merging nature's healing power and resilience, WWF-Hong Kong implemented the Flow with Nature: Youth Action Project to facilitate young people to look into their mental wellness as well as the health of the planet through reconnection with nature to improve both participants and planetary well-being in 2021-2022.

The 1.5-year Project aimed to enhance the effectiveness of delivering environmental education by promoting positive emotional connections between individuals and the natural world, thereafter fostering a sense of stewardship towards nature. It incorporated multi-sensory outdoor explorations to help participants enhance their connection with nature. They participated in fieldworks such as habitat management and research to develop a sense of purpose and achievement. They were also empowered to develop conservation ideas and action projects. Project outputs included developing a board game on promoting nature, social media challenges on sustainable lifestyle and educational exhibit on local wildlife protection, *etc*.

More than 110 young people recruited from the secondary school sector and community have successfully undergone the "flow" journey, allowing them to develop a deeper understanding and ability to articulate their personal connection to nature, thus augmenting their level of nature relatedness. Evaluation results showed there were net increases in the key factors of nature relatedness among the participants. Participants also reported feeling more acquainted with nature, exhibiting an enhanced sense of comfort and eagerness to engage in nature, and experiencing a range of positive emotions such as awe and wonder when exposed to natural beauty, as well as feelings of tranquillity, rejuvenation, and vitality upon spending time in nature.

This project has enabled WWF-Hong Kong to expand its educational activities beyond the cognitive domain by incorporating the affective domain of learning. With the positive results and lessons learned from this project, the foundation for implementing an affective learning approach in education programs has been established. The activities developed from this project have significant potential to be incorporated into other WWF education programmes targeting children, families, schools, and even multipliers. By encompassing both the cognitive and affective domains, we believe young people can recognise the value of biodiversity as being equally important to human livelihood and well-being.

Keywords: mental wellness, youth, positive education, affective learning, nature relatedness

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Meaningful Watershed Educational Experiences (MWEEs) Promote Outdoor Learning and Environmental Stewardship

Steve Kerlin [1], *Tamara Peffer* [2], *Michelle Niedermeier* [3]

ThegoalofthissessionistointroducetheMeaningful Watershed Educational Experience (MWEE) framework for designing student investigations of local environmental issues and taking action. Presenters will share the capacity building efforts in the state of Pennsylvania, U.S.A. to train formal and nonformal educators in the MWEE framework along with example MWEE units. Created by the U.S.A. National Oceanographic and Atmospheric Administration (NOAA), the MWEE has the four essential elements of environmental issue definition, outdoor field experiences, synthesis and conclusions, and environmental action (***https://www.noaa.gov/education/explainers/noaa-meaningful-watershed-educational-experience***).

Stroud Water Research Center, Pennsylvania Department of Education, Pennsylvania Sea Grant College Program, and other partners are leading the statewide effort and current NOAA-funded grant project which is now in year seven of capacity building efforts. We'll describe a series of MWEE professional development certifications, multi-level environmental literacy network building, and communications strategies. Presenters will share the evaluation methods for the professional development and biennial statewide status and needs of environmental education surveys. We'll also share online resource hubs such as ***https://www.baybackpack.com/*** and ***https://pagatewaytogreen.org/***.

Lastly we'll share recommendations for planning and implementing MWEEs and outdoor learning spaces. Examples and resources about additional grant-funded projects about the development and use of outdoor learning spaces on school properties will be shown and discussed. Stroud Water Research Center takes the approach that all outdoor spaces are learning spaces. It does not matter if the school is in an urban area or has a forested property. Schools could build outdoor classrooms and/or restore natural habitat for outdoor learning (***https://pagatewaytogreen.org/outdoor-learning-spaces/***).

Attendees of this session will leave with resources about the MWEE framework, large-scale environmental literacy capacity building strategies, and examples of how to create and use outdoor learning spaces.

Keywords: environmental literacy, outdoor learning, environmental action

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Altaura Farm: Direct Outdoor EE Experience on Beauties and Utilities of the Restored Local Ecosystem Convinces post Covid Community to Support Protection of Environment for a Sustainable Future

Maria Dalla Francesca[1]

Altaura Farm is located in the PoValley, where plant biodiversity is, almost everywhere, 1, during the production cycle and, 0, after harvesting. Since 1998, 9ha have been left free to restore the local ecosystem, the lowland forest, where now more than 600 species of plants grow and nature offers beauty, uses and utilities. It is a sort of GeniusLoci, of social capital, around which the local community can identify. The goal of our program, is that, through outdoor farm activities, people can have a real chance to see what the loss would be. Among people who share these experiences solid bonds and motivations are born to promote, as personal belief, protection of environment for a sustainable future. Our first goal is to capture personal interest through direct experience with Nature which we then scientifically analyze and connect with ethnobotany, climate change and art. For a few hours of outdoor EE we find stratagems to shorten the distance between students and nature:a mosquito-net house allows students to observe, closely, the life of bees. For longer periods, we involve students in games, science, foraging, cosmesis, art and poetry, amusing activities that must contain the environment as the fundamental element. For annual meetings we monitor, in different plots of 20 s.m. each, the reactions that characterize the restoration of the local ecosystem. For my experience, convinced defenders of Nature are trained first helping them to experiment good sensations, then answering theoretical questions and lastly implementing good practices. Outdoor EE stimulates primordial sensations of well-being, increases interests and skills in a context where comparing theory and reality is easier, improves self-esteem, maturation and various personality aspects: motor, cognitive, social and affective. COVID-19 is a time of confusion, followed by choice for the future, updating the sense of freedom. Outdoor learning leads to knowledge of good practices to adopt for well-being of a microsystem and by extension to an ecosystem. Detachment of life from contact with nature has caused us to lose the unity vision, very important in times of globalisation, that nature teaches. We must learn from nature and imitate it. Covid19 reduced important school education stimuli to almost virtual ones, impoverishing effective contents, inhibited social relationships and curiosity towards surrounding environment. In the current phase of covid-caused damage restoration, outdoor experiences, much more stimulating than indoor ones, facilitate self-awareness in terms of personal and social skills. Nature arouses amazement and spontaneous curiosity in following the cycles of life, reactivates senses and channels of perception of the surrounding world, favoring renormalization of the education process. Open-air experiences are recommended, favoring those in which, in addition to the life of individual creatures, one can follow the restoration of an ecosystem that leads to the fundamental dimension of interdependence.

Keywords: biodiversity, ecosystem restoration, knowledge, experience

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Interdependence of Salmon Forests + Cultural Restorative Practice @ Cheakamus Centre (NV Outdoor School)

Victor J Elderton[1]

For over 5 decades the Cheakamus Centre (NV Outdoor School) situated in what is presently known as Brackendale, BC, Canada, on the bank of the Cheakamus River on the unceded and unsurrendered territory of the Squamish people has been engaged in experiential place and nature-based learning. Victor Elderton, author and researcher, was the teaching Principal at this field school for over 25 years. From 1984 -2013, Victor taught and mentored over 130,000 students and 4300 teachers at Outdoor School. The researcher as well as these co-learners gained insights and understanding about themselves and the braiding of the salmon forest and cultural restorative practices through the program experiences and teaching at the school.

This research seeks to probe key intertwining stories of the Pacific Salmon that spawn at the school and ultimately nourish the forest, indigenous cultural and nature-baed learning culture at the school. Further this research explores how the restoration of the salmon streams and spacing grounds at the school within the Dave Marshall Salmon reserve synergistically about not only natural forest and bio-diversity restoration but also cultural restoration. This cultural restoration came about through both indigenous cultural restoration but progressive environmental education teaching and learning as well.

This research hopes to build examples of natural bio-diversity restoration intertwined with cultural restoration as potential model that might be applicable to other contexts and other place-based contexts.

Keywords: culture, restoration, interdependence, bio-diversity

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Exploring the Value of Zoo and Aquarium Experiences as Experiential Learning Environments in Abu Dhabi

Anupama Chaudhari (1)

Zoos and aquariums have been functional for centuries as recreational and educational facilities all around the globe. However, in the last few decades, they have undergone transformations to evolve into environmental and conservation education centers for visitors of all ages. Apart from being spaces that instill a sense of wonder and joy, zoos and aquariums can be considered tools for lifelong learning through their many experiences.

In urban settings with hot temperatures for a large part of the year, like in Abu Dhabi, forming connections with nature can be challenging. While nature-based learning opportunities are omnipresent, activities that encourage having physical contact with environmental elements, critters or fauna are not widely popular. With newer approaches and standardized practices that have enhanced focus on education, zoos, and aquariums can offer a variety of experiences, which could be explored, in reducing the gaps of nature connections.

This study is based on the experiences of introducing visitors to interactive marine animal encounters at SeaWorld Abu Dhabi and Yas SeaWorld Research and Rescue. With possibilities of interacting with animals ranging from smaller invertebrates like urchins and sea stars to large mammals like Walruses, increasing animal knowledge amongst visitors and generating curiosity are key pillars of the education programme at the park. Educators and guides aid these experiences by weaving scientific information in thought-provoking narratives at every habitat. Inquiry-based learning sessions all around the park, structured and unstructured classroom activities, dedicated spaces for invoking creativity, and gamification using interactive screens are other educational tools and opportunities that are utilized in SeaWorld Abu Dhabi and Yas SeaWorld Research and Rescue, for imparting marine conservation information.

This study will explore the above methodologies' observations in understanding their contribution to pro-environmental behaviors through scientific evaluation techniques. With a team of experienced leadership from a variety of backgrounds like in-situ and ex-situ conservation, K-12 education, science, and fine arts, the education programme at SeaWorld Abu Dhabi aims at providing platforms for generating curiosity, building skills, focusing on "how to think" instead of "what to think" for visitors.

Keywords: place-based learning, nature connections, biophilia, Abu Dhabi, Zoo

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Classroom Gardens in an Early Childhood Setting in the UAE: the Importance of Biophilic Design in Place-based Learning

Anna Dillon[1], *Moss Turner*[2]

Gardens and outdoor spaces are crucial in the holistic development of the individual. Gardens enchant as spaces of nourishment and healing, in a process we refer to as biophilia. Similarly, early childhood represents a period characterized by continuous play, development, and wonder.

The program aimed to establish an outdoor classroom garden in the UAE and evaluate its effectiveness, whilst also exploring the importance of biophilic design in the lives of young children in the context of the arid, hot desert climate of the UAE.

A laboratory nursery in the UAE, serving children aged six months to four years, collaborated with education studies and biology students to develop a small patio-based outdoor classroom area and integrate its use across the curriculum for six weeks.

Observations of children and interviews with teachers took place during and after the process. Outdoor gardening offered children opportunities to cultivate a wide range of skills in the context of multisensory learning experiences that fostered a deeper connection with nature and biophilic connection.

It yielded numerous benefits including exposure to fresh air, sunlight and soil microbes, improvement of well-being, the development of gross and fine motor skills through tasks like digging, sorting, watering, pulling, and cutting, opportunities for social and emotional learning, the acquisition of scientific skills by observing plant growth, the application of mathematical skills involving counting, recording, measuring, charting, sequencing, sorting, comparing, and classifying, and the enhancement of language development and general communication skills.

However, many teachers reported not having enough knowledge to further develop the use of the outdoor space as part of the curriculum framework. The surrounding landscape is significant in shaping children's connection to the world. School gardens provided opportunities for meaningful engagement and establishing emotional bonds with a specific place. Gardens are distinctly local environments, and so it is crucial to contextualise potential place-based gardening experiences in the challenging environment of the UAE that can harness aspects of well-established cases of outdoor education such as forest schools in Scandinavia, and gardening programs aimed at offering children the opportunity to grow, harvest and cook their own food in the United States. Outdoor education opportunities and biophilic design needs particularly careful planning in the UAE.

To further enhance place-based learning, schools can collaborate with universities or environmental agencies and designers, thereby promoting enhanced learning experiences for both children and educators.

This paper highlights the scope for the intentional development of school and nursery gardens to enhance the lives of young children by affording them the opportunity to experience a biophilic kick that can cascade into their lives for the future.

Keywords: biophilia, early childhood education, place-based gardening, holistic development, biophilic design

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Awakening and Working with Arne Næs

Bob Jickling[1]

This presentation revisits key aspects of Arne Næss's life and work. This seems timely as Post-humanist scholars are re-opening territory once the domain of eco-philosophy (Braidotti, 2019). We believe that this move can be enriched through this fresh look at Næss's work, and particularly his relationship with the place he called Tvergastein. The methodological approach takes the form of an essay with philosophical orientation. We write to figure things out (Richardson, 2001). This method of presenting evidence has a long history stretching back to the Renaissance philosopher Montaigne. For him, the essay is a gathering of experiences, senses, and the concrete realities of material life—the "mute life" of the physical body. For Montaigne, appearances matter, and experiences are to be trusted (Bontea, 2008). This approach aligns with the contemporary work of Jan Zwicky who argues that philosophy can never be complete when it is limited to logic and linguistics— and fails to recognize the "things that cannot be said" (Zwicky, 2015, 2019). In this she, too, is concerned with the sensuous world of the physical body. Thus, the conversational approach taken in this presentation riffs off Zwicky's lyric philosophy.

This this essay is built around a day-long visit to Arne Næss's hut, Tvergastein. Through reflections on Arne's life and the experience of being present in his hu,t we bring life to his thzeorizing. Through what we call a Montaigne-eques" wonder-wander," (Heggen *et al.*, 2022), we sought to understand his inspirations/awakenings and the work he did in his place.Næss's mentorship has mostly been words on flat pages; visiting Tvergastein is to touch their source. And it is to be inflated by the presence of place—to rise like sourdough. It is to glimpse into the forces, feelings, and relationships that were Arne Næss.

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Keywords: environmental philosophy, ecophilosopohy, place-based education, Næs, lyric philosophy

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Outdoor Play and Place-based Experiential Environmental Education at Every Child Outdoors Using the Rare Chain of Learning

Istafa Sufi[1]

The rare Charitable Research Reserve is an urban land trust and environmental institute in Waterloo Region, Ontario, Canada, that protects over 1,350 acres of highly sensitive lands. Our ultimate goal is to make the world a more sustainable place by stewarding a diverse network of natural landscapes for ecological integrity and for future generations through conservation, research and education. Since inception, rare has taken care of the land on behalf of the community through the use of Western tools in conservation, research and education. As rare becomes engaged in reconciliation with the Indigenous Peoples of Turtle Island (North America), these pillars now equally include and value Indigenous ways of knowing and being – becoming three strands of a strong braid. Together we steward these lands with respect for generations past, present and those yet to come, intact in perpetuity with trees more than 250 years old, 24 habitat types, over 5000 unique species and 6 of 8 pre-settlement landscapes.

Since its inception in 2003, over 21 000 students have participated in place-based youth environmental education programs at rare, called Every Child Outdoors or ECO. This name reflects our belief that every child should have the opportunity to be outdoors in a safe natural environment, guided by strong role models that promote an enthusiasm for learning and caring for the Earth. Every Child Outdoors allows youth to explore large tracts of protected natural landscapes supporting many unique and globally rare habitats that are home to a diverse array of wildlife. The program allows children to build interest and bond with nature, feel a greater sense of purpose in life and belonging to their community, in both a local and global sense. Through the Every Child Outdoors program and the rare Chain of Learning: a concept where knowledge, expertise, and ideas are directly transferred from (and to) researchers, and Indigenous Knowledge Keepers to students of all ages, families and community members, rare uses land and play based outdoor experiential learning to facilitate a reconnection with nature for youth of all ages.

Join rare Senior Educator Istafa Sufi in this workshop to learn how the ECO program teaches learners of all ages about environmental education using the rare Chain of Learning and the lands it stewards. Participate in active hands-on environmental games and activities (decomposer tag, wolfpack, camouflage, forest fire, meet a tree and more!) to learn how you too can apply the principals of place and play-based learning outdoors with your class or group. The activities can be applied to science, math, art, geography, and physical education curriculum topics at a variety of grade levels with minimal equipment needed. These activities promote teamwork, problem solving, communication, and other practical skills in your students while teaching them about the importance of decomposers, cooperation, camouflage, forest fires, tree ID and more!

Keywords: place-based, play-based, outdoor, experiential, research

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The Green Action Pathway Project: Exploring the Power of Outdoor and Place-based Learning in the Decade of Ecosystem Restoration Practice in Awka, Nigeria

Mmachukwu Loretta Obimdike(1)

The goals of the programme are to improve education, awareness raising and human capacity on climate change.

The Green Action Pathway (GAP) Project was an environmental education program that aimed to increase the participation of young people in environmental activities. The Activities of the GAP project includes:

1. Formation of Environmental Clubs in schools and development of manual and activity booklet tailored to the needs of our environment for the club members to aid their learning.
2. A Climate Bootcamp organiSed for students to increase awareness and participation in climate action.
3. Establishment of mini-tree nurseries in their schools to promote environmental stewardship.
4. A Green Hangout organiSed for Youth in the communities. This brought the youth of the communities together to learn about the importance of environmental conservation and sustainability.

Reflecting on the practices we used during the Green Action Pathway (GAP) project, we explored outdoor options to get the student intrigued and garner stewards for the environment. They include:

a) Environmental Club Formation in Secondary Schools: There were no environmental club existing in secondary schools in my region and this assertion was based on a survey our organisation did before the start of our program. We formed these clubs in ten schools but more work needs to be done by our organisation because most young people in Nigeria are yet to understand The Challenges posed on the environment.

b) The Climate Bootcamp was a transformative experience for the students and GECCI team. It was designed to raise awareness about the environment, green solutions practices, sustainability, and environmental conservation. Through the engaging sessions on Tree nursery development techniques, Environmental art, building solar energy system for homes and up-cycling, the participants learnt about innovative measures to our prevalent environmental challenges.

c) The establishment of mini nurseries in school is a new initiative our organisation introduced to foster environmental stewardship. The students are still starting out in the process.

d) The Green Hangout was an environmental education program for community youth. It was an unforgettable experience that not only broaden the knowledge of the participants but inspired participants to action.

Whether it's establishing tree nurseries in schools, developing nature corner inside the classrooms, participating in nature-based workshops and excursions, these experiences allow students and all people to develop a personal connection with the ecosystem.

My recommendation for theory is for scientific researcher to help communities find the link on the unequal distribution of environmental risk and benefits among communities.

Recommendation on practice is on transformative learning which focuses on critical thinking for innovations.

Keywords: environmental education, outdoor learning

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484 Outdoor Environment Learning Literacy & Experiential Learning in Schools/Outdoor Learning: A New Norm

Sheela kumari Jayachandran Nair(1)

OUTDOOR ENVIRONMENT LEARNING LITERACY IN SCHOOLS can be a great way to make learning fun and engaging for students of all ages and help them develop a love of nature and a respect for the environment. Outdoor learning can be a valuable tool for promoting ecosystem restoration as it can enhance academic achievement, increase motivation, and enhance social and emotional development in students.

Examples

1. **Magical Metamorphosis - Natural Habitat for the Butterflies by Eco club Green Ambassadors.**

   A project that guides students to learn about the migratory patterns of butterflies is a good way to explore science concepts.

   A butterfly garden provides a colorful array of nectar-producing plants that not only attract butterflies but offers plants to feed the caterpillar stage of their life cycle. A butterfly garden provides opportunities to educate children about the life cycle of a butterfly, allowing them to view each stage of growth and explore the intricate relationships of plants and animals.

2. **UAE Native Species Garden**

   Native species gardens help to conserve native plants, which are often threatened by climate change and development. They provide a habitat for native animals and insects and can be used to educate the public about the importance and the UAE's natural environment.

Ghaf Tree an Ecosystem - A total of 64 Ghaf trees were planted by students and staff. Students showed great enthusiasm in planting them and knew their hard work would recharge ground water, prevent sandstorms, green areas will become dense and more benefits. The aim of the campaign was to raise the profile of the tree by creating an awareness of ecological and cultural significance among the community.

Adopt a Wetland

Adopting a wetland is a great way to teach students about the importance of water quality and the need to protect our natural resources. Students can help to monitor the water quality, remove trash, and plant native plants.

Effects Of Contact With Nature During Outdoor Ee On Student's Well Being

Contact with nature during outdoor Environmental Education can have a positive impact on student well-being. Spending time in nature can help to reduce stress, improve mood, develop a love of nature, boost self-esteem, and increase feelings of connectedness to others and to nature and the students to become environmental stewards.

The Nature of Outdoor Based Learning in a World that has Contended with Crisis such as Covid 19

There are ways to incorporate outdoor learning into the curriculum, even in a virtual setting like virtual field trips, Nature-inspired activities, Nature journaling.

Outdoor based learning can be a valuable tool for helping learners cope with the challenges of the COVID-19. It can provide them with a sense of normalcy and connection to the natural world, which can be very important for their physical and mental health.

Keywords: A new normal for the 21st century, outdoor learning literacy, magical metamorphosis, natural habitat

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Nature Education for a Planetary Citizenship - the ECoNNECT Project

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The "ECoNNECT" project (European Collaboration Network for Nature Education and Citizenship Training) is supported by the EU Erasmus+ program for a period of three years, starting in September 2022. The project, which brings together partners from three European countries, France, Belgium and Greece, aims to help strengthening nature education through the creation of an innovative training course, adapted to the environmental, institutional and socio-economic context of partner countries.

Nature education forms an integral part of environmental education, however it emphasizes experiences 'along with' and 'within' the natural environment. As an educational process through a contact with nature (through observation, immersion...), it is based on first-hand experience, using multiple and complementary approaches (cognitive, sensory, emotional, *etc.*), highlightinf the need for the respect of natural balances. For us, partners in this project, nature education, just like environmental education as a whole, is an education in eco-citizenship and for social justice. The training we are developing aims to help stimulate, restore and strengthen a deep, healthy and respectful link with nature, through the study of global issues and challenges (climate, biodiversity, *etc.*) and their impact in each territory, in the form of socially vivid questions. We prioritize a complex systems thinking, which applied to nature education involves, among others: learning through a sensory and sensitive immersion; a critical and democratic learning; considering the emotions as an integral part of the learning process; ethics as a discipline to be mobilized for learning (including the notions of solidarity, social justice, responsibility).

The training course is being developed through a participatory approach, that involves the project's target group: nature educators (teachers, trainers, facilitators), professionals, or undergoing training (students in disciplines related to the environment and education) in the three countries. The participatory approach of a 'co-construction' adopted during the project constitutes, in itself, a training process for the participants, while the exchange of educational experiences a form of a peer-to-peer education process, and therefore a contribution to the professionalization of the participants, and to the setting up of a European network of educators and trainers involved in nature education.

The 'ECoNNECT' partners: 'Réseau français d'éducation à la nature et à l'environnement, le FRENE' (formerly known as 'Nature and Education' network – Project Coordinator – ***https://frene.org/***), France; 'Réseau Idée – Réseau Information et Diffusion en Education à l'Environnement', Belgium (***https://www.reseau-idee.be/***); 'écotopie - Institut d'Eco-Pédagogie en Belgique', Belgium ***(https://ecotopie.be/***); Polis – International Network for Environmental Education, Greece (***https://polis-inee.org/***).

Keywords: nature education, complex thinking, planetary citizenship, ethics, social justice

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Sensibilisation Du Grand Public En Plein Air: Concept Du Chemin Pédagogique Spécifique Au Site D'accueil

Iatimad Zair[1]

De par sa mission de promouvoir la protection de l'environnement et l'amélioration du cadre de vie, la Fondation Mohammed VI pour la Protection de l'Environnement, initie et met en œuvre un ensemble de programmes et projets pilotes pour sensibiliser et faire prendre conscience aux citoyens des nouveaux enjeux, et de contribuer à la préservation d'un patrimoine national ou d'un écosystème menacé.

Dans ce cadre, la Fondation a mis en place un concept novateur d'éducation et de sensibilisation à la protection de l'environnement étant « le chemin pédagogique».

Ce concept vise à renforcer la communication, l'information, et l'éducation, de manière ludique, et ce à travers la transformation d'un jardin ou d'un parc urbain, en un espace de sensibilisation permettant aux visiteurs, spécialement les jeunes, de se familiariser avec divers comportements favorables à notre environnement.

La démarche du chemin pédagogique consiste à l'implantation de plusieurs points d'information qui alternent de façon ludique panneaux visuels et modules interactifs, communiquant sur plusieurs thématiques environnementales (La biodiversité, les déchets, le compostage, les forêts, la gestion de l'eau, le jardinage écologique, ...).

Ces modules thématiques sont présentés sous forme d'un cheminement adapté pour chaque site. Leur succession tente de maintenir l'intérêt du visiteur tout au long de sa visite, en lui présentant un contenu scénographique interpellant, cohérent et très visuel. Pour que ce visiteur devienne un acteur de son environnement et adopte des bonnes pratiques environnementales au quotidien.

La Fondation avait réalisé, à titre pilote, un chemin pédagogique au sein des jardins exotiques de Bouknadel en 2011. Et compte tenu de l'impact positif qu'il a suscité auprès du grand public, la Fondation a reproduit et adapté ce concept pour plusieurs autres jardins selon leurs spécificités à travers le royaume du Maroc (Casablanca, Marrakech, Dakhla..).

Fidèle à sa mission d'éducation au développement durable, la Fondation a lancé des concours d'idées pour la conception de nouveaux chemins pédagogiques auprès des étudiants des Écoles Nationales d'Architecture, concours qui consistent à impliquer les jeunes dans l'ensemble de ses programmes et d'évaluer et valoriser leurs potentiels créatifs.

Le chemin pédagogique propose de transmettre aux enfants et aux plus âgés des connaissances sur l'environnement en prenant place au niveau des jardins ouverts au public. Le développement de ce concept pourrait encore avoir lieu suite aux collaborations avec les écoles d'architecture et des beaux-arts pour favoriser les expériences et faire émerger des solutions innovantes en termes de sensibilisation à l'environnement et au développement durable.

Mots clés: chemin pédagogique, bonnes pratiques environnementales

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Les Activités Outdoor Du Centre International Hassan II De Formation à l'Environnement

Farid Alaoui[1]

Eco-écoles est un programme international d'éducation au développement durable (EDD) porté par la Fondation de l'Education à l'Environnement (FEE), relayé au Maroc par la Fondation Mohammed VI pour la Protection de l'Environnement depuis 2006, en partenariat avec le ministère de l'Éducation nationale, du Préscolaire et des Sports.

Dans le cadre des activités de formation et de sensibilisation organisées au profit des communautés des programmes éducatifs le Centre International Hassan II de Formation à l'Environnement organiser des activités en plein air.

1. Activités Intramuros :

Organisation d'ateliers et événements au niveau du Centre International Hassan II de Formation à l'Environnement pour les programmes Eco-Ecoles & Jeunes Reporters pour l'Environnement.

2. Activités Extramuros :

- Visites du Navire Odyssée contre la pollution plastic
- Visites Zoo de Rabat au profit des éco-écoles de la région Rabat-Salé-Kenitra Sensibiliser à, travers des ateliers pédagogiques au niveau des parcs et jardins zoologiques locaux autour de thèmes spécifiques : les déchets, le climat, l'eau, la biodiversité notamment le lion de l'Atlas : patrimoine naturel marocain disparu.
- Visites des installations de l'Office National de l'Electricité et de l'Eau en marge de le journée mondial de l'eau.
- Visites crocoparc d'Agadir par groupes de vingt, chaque jour cinq groupes le matin et cinq l'après-midi, pour effectuer un parcours pédagogique d'une heure et demie à deux heures, constitué d'ateliers sur des thèmes environnementaux, comme le climat, la biodiversité, l'énergie, les déchets, l'eau, *etc.*
- Visites au niveau national d'installations en relation avec l'OCEAN dans le cadre de le journée mondial des océans le 8 juin.

Les Objectifs Des Visites

- Permettre aux jeunes visiteurs de comprendre l'importance de la biodiversité et de découvrir la faune et la flore de leur région.
- Sensibiliser les communautés et les jeunes sur l'importante de préservation de l'eau, ressource vitale rare mondialement.
- Sensibiliser la communauté à l'importance de l'océan en tant qu'écosystème vital pour la planète, en mettant en lumière ses contributions à la vie humaine, à l'économie et à la biodiversité.
- Inspirer les jeunes générations à s'engager pour la protection de l'océan et à devenir des ambassadeurs de l'environnement, en leur fournissant des opportunités de formation, d'éducation et d'interaction avec des experts et des professionnels du domaine.

Les différentes visites nous ont permis de voir l'engouement des jeunes écoliers pour la découverte des différents milieux de vie des animaux ainsi qu'autour différentes thématiques environnementales.

Suite à l'impact positif du programme annuel des activités extramuros, le Centre International Hassan II de Formation à l'Environnement prévoit de dupliquer ces différentes expériences et en faire bénéficier plus d'enfants et de jeunes.

Mots clés: éducation, environnement, visites, océan, biodiversité

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Enhancing Place-Based Learning through the Heritage Keepers Program

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The "ECoNNECT" project (European Collaboration Network for Nature Education and Citizenship Training) is supported by the EU Erasmus+ program for a period of three years, starting in September 2022. The project, which brings together partners from three European countries, France, Belgium and Greece, aims to help strengthening nature education through the creation of an innovative training course, adapted to the environmental, institutional and socio-economic context of partner countries.

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Keywords: agency, collective, model, support, workshops

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Opération #b7arblaplastic: Présentation Du Mode Opératoire De L'opération Et Ses Retombés Sur la Préservation Des Écosystèmes Marins

Khadija Chahidi[1]

Dans le cadre de dynamique internationale visant à atténuer l'impact de pollution marine et notamment plastique, la Fondation Mohammed VI pour la Protection de l'Environnement agit autour de l'axe stratégique relatif à « l'atténuation des pollutions (déchets, émissions) au niveau des mers et océans par des comportements responsables », et conduit annuellement depuis 2019 son opération #b7arblaplastic pour mobiliser différents acteurs et parties prenantes pour lutter contre la pollution plastique. #b7arblaplastic a été récompensée en 2020 par la Fondation pour l'Education à l'Environnement et inscrite à la Décennie des Nations unies pour les Sciences océaniques au service du développement durable.

Cette opération repose sur trois piliers :

- Une cible : les jeunes ;
- Un objectif : éliminer la pollution plastique ;
- Un vecteur de mobilisation : le digital ;

Cette opération vise à créer une dynamique de sensibilisation sur 3 niveaux :

- Volet partenarial : conduire des actions de sensibilisation au profit des estivants durant 3 mois (mi-juin à mi-septembre)
- Volet jeunesse : organiser des ateliers de sensibilisation thématique le long de l'année pour les préparer à une période estivale responsable
- Volet grand public : par l'usage des médias offline et online notamment sur les réseaux sociaux pour maintenir un discours de sensibilisation visant à faire changer les comportements.

Chaque année, pendant les trois mois de la période estivale, plus de 100 millions de visites sur les plages marocaines sont enregistrées. De ce fait, la pression sur les écosystèmes demeure considérable et se traduit souvent par des déchets plastiques abandonnés par les estivants.

La lutte contre la pollution marine passe impérativement par l'apprentissage de comportements responsables, pour lesquels la Fondation avait atteint en 2022 les résultats suivants, grâce à l'implication de 100% de ses partenaires :

- 1138.67 tonnes de plastiques en moins sur 66 plages, soit 17,25 tonnes de plastique évitées par plage.
- 83.216 de sensibilisation à la pollution plastique, de nettoyage, des activités ludiques (atelier, animation...) ont été menées.
- 2.323.554 jeunes ont été mobilisées
- 59.38 % des déchets collectés ont été recyclés

Cette campagne de sensibilisation ne cesse de démontrer son impact positif sur l'ensemble des acteurs et bénéficiaires. Cette opération est accompagnée notamment en matière de digital à travers l'application mobile Ana Boundif qui sensibilise à l'environnement grâce à des défis, des bonnes pratiques, des quizz et dans un contexte de gaming, en plus de l'utilisation des réseaux sociaux comme vecteur de sensibilisation de masse.

L'opération #b7arblaplastic a permis, depuis son lancement, d'enregistrer des chiffres conséquents en matière de sensibilisation et de réduction des déchets dans les fonds marins.

Mots clés: sensibilisation, activités outdoor, jeunesse, protection de la mer et des fonds marins

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540 Greening School Grounds and Outdoor Learning - Building an International Movement

Cheryl Charles [1]

We envision a world where every child – especially the most vulnerable – connects meaningfully with nature every day. One of the most accessible and effective ways for achieving that vision is through children's and youth's school-based experiences. If children are to connect with nature every day for growing, playing and learning, school grounds must be part of the solution.

There is growing momentum worldwide to scale school ground greening as a sensible and thoughtful approach to increase climate resilience, enhance biodiversity, improve health and education outcomes, and strengthen communities, especially for those most impacted by systems of inequity and environmental injustices. Mounting scientific evidence suggests that transforming school grounds into nature-rich environments is a powerful tool to achieve multiple benefits. Such school grounds improve physical and mental health, social and cognitive skills, creativity, and academic performance for students. They also contribute environmental benefits such as reduced heat in warming climates, reduced pollution and water conservation.

The Greening School Grounds & Outdoor Learning project engages global leaders and practitioners to build networks of like-minded organizations and individuals to identify and deliver scalable strategies to support the worldwide movement of school ground greening. The project provides professional development, technical support and curriculum resources to successfully design, implement, evaluate and maintain green school grounds and other nature-based and place-based outdoor learning environments for early childhood, elementary and secondary education students.

Before this project, there was no international survey of successful examples of green school grounds. For the first time, a map now exists to show where they exist, and where the gaps are present. A position statement has been created to demonstrate the need. Short films serve as case studies to inspire and demonstrate their simplicity and effectiveness. An action plan has been developed to move all of this forward.

There is a strong peer-reviewed evidence base available to support both the need and the potential for positive outcomes. However, no cohesive international effort was previously underway to bring scale to help achieve the benefits of such approaches. The partner organizations that have collaborated to create this project are uniquely prepared to succeed with dispersing this elegant and accessible solution to schools and communities throughout the world.

The objective of this workshop is to strengthen and expand the existing international greening of school grounds and outdoor learning movement. A draft Ten-Step Guide to Greening School Grounds and Outdoor Learning will be provided to participants, and there will be meaningful interactive discussion and opportunities to collaboratively generate strategies for growing the movement worldwide.

Keywords: schools, environmental benefits, academic and health outcomes

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564 Building Community Partnerships for Ecorestoration Projects in Greater Mumbai through CSR

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As part of Corporate Social Responsibility of DCB Bank, in the year 2021, we bagged three distinct ecorestoration projects with a strong emphasis on reforestation and ecological revitalization. These initiatives were undertaken in three degraded ecological settings: Taloja Hill Forest in Kharghar, Navi Mumbai; Ambivli Biodiversity Park in Kalyan; and Sanjay Gandhi National Park in Mulund, Mumbai. Taloja necessitated the afforestation of a desolate hill, involving the planting of 8 000 trees, herbs, and shrubs. Ambivli's focus was on establishing a biodiversity park, realized through the planting of 10 000 saplings. A noteworthy feature of this endeavor was the incorporation of six themed gardens, namely, the Astral, butterfly, bee, medicinal, bat, and bird gardens. At the Sanjay Gandhi National Park, our approach centered on assisted natural regeneration, tackling canopy gaps by reintroducing tree species and establishing designated zones for pollinators and deer browsing. In addition to these efforts, we developed educational assets including nature trails, bilingual signs, exhibits, activity field stations, and field guides to enrich visitors' comprehension of local biodiversity. Local volunteers, equipped as naturalists, played a pivotal role in conducting nature trails.

Over a span of three years, in close partnership with the state forest department, Municipal Corporation, and DCB Bank as the principal funding entity, these projects have effectively managing 17 ha of degraded habitats, planted 28 000 saplings engaged around 6 000 members of the local community volunteers and developed a range of educational resources. Volunteer activities encompassed a spectrum of tasks such as land preparation, mulching, sapling plantation, seed collection, as well as the creation of nature trails and educational materials. The engagement approach was instrumental in nurturing a sense of community ownership and goodwill, facilitating site upkeep, and serving as an effective problem-solving mechanism, particularly during fire incidents. The robust participation of enthusiastic volunteers has fostered a symbiotic relationship, substantially alleviating staffing demands, enriching expertise, and fostering a shared sense of accountability. Corporate volunteers, including those from DCB Bank, have notably augmented the overall impact.

Our hands-on experience emphatically underscores the latent potential inherent in involving local communities as vital participants and collaborators in ecorestoration initiatives. This approach not only alleviates organizational burdens but also nurtures positive relationships and garners support from funding agencies. This approach was a savior during pandemic. This inclusive strategy empowers technical organizations to disseminate their expertise, refine strategies, and engage in cost-effective experimentation through collaborative community involvement.

Keywords: ecorestoration, Greater Mumbai, community volunteers, partnerships, CSR

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609 Everglades Restoration Plan: Lessons to Learn

Hussam Alrabaiah[1]

The Everglades Restoration Plan represents a multifaceted and collaborative approach to rejuvenating South Florida's iconic Everglades ecosystem. This abstract provides an overview of the best management practices (BMPs) that are important in the rehabilitation effort. These BMPs contain a variety of strategies, each designed to address the specific environmental challenges facing the region.

First, watershed restoration seeks to mimic historic watersheds, maintaining wetland habitats and native species. Storm Water Treatment Areas (STAs) are treated water systems that play an important role in treating stormwater runoff into the Everglades, thereby improving water quality.

Nutrient reduction measures are primarily aimed at reducing agricultural and urban pollution. Controlling invasive species is critical to protecting ecosystems and therefore requires intensive management and eradication programs.

Habitat restoration focuses on eradicating invasive plants, reintroducing native species, and restoring historic wetlands. Large-scale projects such as the Kissimmee River Restoration aim to restore natural floodplain habitat.

Water storage and reuse strategies provide reservoirs for flow control, improving wet and dry conditions. Prescribed temperatures sustain fire-dependent ecosystems such as pine boulder landscapes.

Ongoing monitoring and evaluation underpins restoration efforts, providing important information on water quality, hydrology, and wildlife populations. Land acquisition is essential to protect critical habitat from new development.

Partnerships between federal, state, tribal, and local agencies, as well as engagement with stakeholders, are critical to an integrated approach. Environmental education and outreach programs raise awareness of the importance of the Everglades and encourage participation in conservation initiatives.

Finally, flexible management principles ensure adaptability to changing environmental conditions and challenges. Together, these BMPs form a comprehensive and scalable plan, poised to restore and sustain the unique ecological wonder of the Everglades for future generations

Keywords: Everglades restoration; best management practices (BMPs); hydrological restoration

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The Importance of the Al Wathba Wetland Reserve for the Natural History in Abu Dhabi Emirate

Claudia Steuber[1]

The Al Wathba Wetland Reserve is located just outside of the Mussafah industrial area of Abu Dhabi city. It is a blend of desert, sabkha and aquatic ecosystems.

The geological outcrops are offering insights to recent climate history of the region, with conglomerates deposited from river systems that transported rock material from the Oman Mountains to Abu Dhabi (Hili Formation). The overlying fossil dunes of the Ghayathi Formation display Quaternary climate change, with dune formation during cold periods when the Arabian Gulf was dry and warmer, more humid periods when rising groundwater levels caused stabilization and weak cementation of the dunes.

The inland sabkha environments can be observed in or around depressions and lakes, where the groundwater level is sufficiently close to the surface so that evaporation occurs through the capillary zone. The lake system is semi-artificial, as recycled water is supplied to maintain permanent lakes. The history behind the development of the permanent lakes is a rare example of the positive interaction of human activity and nature.

When water started ponding in the central sabkha depression of Al Wathba after heavy rainfall in late 1989 and attracted waterbirds, including the Greater Flamingo, the wish to establish a permanent wetland emerged. In 1998 when the water supply was optimized and the lake area was fenced, the first successful breeding of the Greater Flamingo was recorded and the area was formally designated as protected. The Greater Flamingo (*Phoenicopterus roseus*) is still the key species with the most important breeding colony of the region. Being protected from major human intervention, construction and overgrazing, a very diverse terrestrial flora and fauna developed. The reserve is Abu Dhabi's hotspot for birdwatching with 260 recorded bird species, including resident and migratory species. Attracted by the permanent presence of aquatic birds, the Greater Spotted Eagle (*Clanga clanga*) and the Western Marsh Harrier (*Circus aeruginosus*) became seasonal key raptors.

The plant cover consists of c. 40 species. Different adaptations and survival strategies as a response to the extreme environmental conditions can be studied. A characteristic geomorphologic feature, so-called nebkhas, are formed by the two Haloxylon species of the reserve (*Haloxylon salicornicum* and *Haloxylon persicum*).

Nebkhas are important habitats for burrowing animals (mammals, reptiles, arthropods), as they offer stabilized sand. Sixteen reptile species including the Spiny-Tailed Lizard (*Uromastyx aegyptica microelepis*), 10 mammal species, and c. 400 arthropod species (five species new to science) are living in the reserve.

Due to the large biodiversity, and with sufficient awareness, many insights into the ecology, feeding and hunting behavior of the biota present can be gained.

Keywords: Al Wathba Nature Reserve, geology, flora, fauna

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The Cayman Islands Coastal Lagoon Education Program and Mangrove Rangers - a Proven Template for Formal Tropical Education Curriculum and Capacity Building in the Community

Martin Andrew Keeley[1]

Goal In the past twenty years education systems have steadily moved away from hands-on science exploration in the field to today's virtual reality world of screens. The goal of the Mangrove Education Project (MEP) Marvellous Mangroves (MM) program and its successor the Coastal Lagoon Ecosystem Guide (CEG) is to take young students and their teachers back to practical, hands on immersive teaching which we believe is far more effective.

Program MM is based on an established hands-on, science-based interactive program first introduced to Cayman schools in 2001. In conjunction with the Department of Education it has since been taught as an integral part of the Year 5&6 science curriculum to every Year 5&6 class in Cayman. Furthermore the program has been adapted and translated into eight languages and taught in seventeen countries worldwide. As such it is a thoroughly road- tested education product which has been improved and tightened at each iteration, enhanced by in-classroom activities, demonstrations and structured field trips for both students and teachers. Beyond MM, there is a lack of holistic teaching resources associated with coastal ecosystems to complement the newly introduced UK curriculum into the Caymanian Islands. Additionally, rapid urban development is damaging those same ecosystems and their biodiversity.

In response to this deteriorating situation MEP adapted its former MM program which previously focussed only on mangroves to include seagrass and coral and linked these three main components of the tropical coastal ecosystem for the CEG. Central to the CEG program is employing and training Mangrove Rangers comprised mainly of university-aged students to implement this new curriculum and monitor the status of coastal ecosystems. With the Rangers help MEP introduced the CEG into Caymanian primary schools and monitored coastal ecosystems, conducting research with high-schools with teachers, students, and the wider Cayman community. All have come to better understand their value to help protect their coastal ecosystems.

CEG is available to any educator in the Cayman Islands through a specifically developed website ***www.coastallagoon.org*** plus supplemental resources and videos on how to run activities and demonstrations in their classrooms. Away from computer screens the Rangers run field trips throughout Cayman's coastline to mangroves, seagrass and coral reefs. The field explorations, discussions and exercises are directly linked to the curriculum.

Experience and evaluation Previous MM studies show a 58% change in attitude and behavior. Since its 2022 introduction the CEG has shown high level of acceptance in Cayman's schools and communities through teacher participation and evaluation.

Conclusion and recommendation for theory The CEG program supported and implemented by MEP and the Mangrove Rangers is an established a template which can be adapted and implemented throughout the world for the benefit of children and ecosystems.

Keywords: mangroves, hands-on, field, curriculum-linked, science-based, interactive, exploration

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Blue Flag Beaches as Place-based Climate and Sustainability Education Sites in India

Shriji Kurup[1], ***Sanskriti Menon***[2], *Madhavi Joshi*[3], *Meena*[4]

Stage 1 involved literature review and discussions with Blue Flag beach managers, and helped identify immersive, hands-on learning activities aligned with India's climate vulnerabilities and socio-economic developmental settings. Discussions with beach staff, educators, civil society, local administration officials, community members, and visitors provided insights into nurturing beaches as educational sites. The study identified target groups and learning outcomes for effective sustainability and climate education in beach settings, emphasizing scalability and relevance in coastal areas, particularly Blue Flag sites.

Stage 2 conceptualized an educational framework, key principles, and approaches. Engaging interns and college youth allowed for experimentation and observation of place-based educational processes at Kovalam Beach, Kerala. Cultural, local, and regional contexts, along with indigenous knowledge, are incorporated in cocreating and implementing educational activities with community and beach managers. Capacity-building helped beach managers play the role of educator-facilitators, gaining new perspectives on beach ecosystems' interconnectedness with climate and developmental aspects. This phase encouraged a holistic approach to beach management, advocating responsible tourism and sustainable lifestyles in Blue Flag beaches.

In Stage 3, beach managers implemented learnings, designing beach walks, activities, and engagement with visitors, students, and research institutions. The approach became more place-based, collaborative, hands-on, and action-oriented. Special groups like the National Cadet Corps and local fishing communities promote inclusivity and community collaboration, transforming beaches into spaces for exploration, learning, and addressing climate pressures and developmental challenges.

The case study reveals the potential of Blue Flag beaches as place-based learning sites, encouraging hands-on experiential learning, critical thinking, and self reflection. It identifies nature-based solutions, risks, vulnerabilities, and opportunities for climate action, instilling urgency and collective ownership of beach spaces. It acknowledges the psychosocial aspects of climate change, fostering sensitivity among participants towards coastal communities' vulnerabilities. The action-learning approach promotes environmental responsibility and community involvement, impacting beach management, conservation practices, and educational systems at various levels.

Keywords: sustainable tourism, place-based climate education, Blue Flag beaches

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From Australia to the World: An International Workshop on Advancing Nature Play and Place-Based Learning

Jason Pitman [1], *Kelsie Prabawa-Sear* [2]

In an era marked by the urgency for youth to reconnect with nature, this workshop explores the efforts of Botanic Gardens and Park Authority and Nature Play WA to foster outdoor and place-based learning within Western Australia. Kings Park and Botanic Garden, cherished for their recreational, cultural, and natural significance, serve as a unique backdrop for a pioneering approach to nature-based education. Nature Play WA is a not-for-profit organisation committed to enhancing the well-being of Western Australian children through nature-focused outdoor play. Together, they have catalysed the evolution of nature play in Australia.

At the heart of this endeavour is Naturescape Kings Park, a groundbreaking family destination, and the first of its kind in Australia. Launched in 2011, this initiative has been at the forefront of the global 'nature play' movement. Simultaneously, Nature Play WA was founded the same year as an independent entity with a mission to strengthen children's connections to nature and community, emphasising the importance of mental and physical health. The collaborative efforts of these organisations have not only kindled a movement within Western Australia but have also inspired schools and communities to establish and activate nature play parks across the state and beyond.

The concept of nature play continues to evolve, with an increasing focus on integrating it into formal education, addressing environmental challenges, and providing children with opportunities to experience and learn from the natural world in various ways. Throughout this change, families are increasingly seeking more authentic and riskbased opportunities for outdoor play. Simultaneously, the proliferation of technology and screen-based activities have reduced children's exposure to their natural environments. This evolving landscape presents a crucial juncture for re-evaluating how unstructured and active nature play can be integrated into a progressively sedentary and technology reliant world.

This workshop aims to initiate a dialogue on international perspectives regarding nature play and nature-based education. It invites participants to examine the strategies, challenges, and innovations associated with this shift in outdoor learning, emphasising the importance of fostering a connection between children, nature, and community in an era dedicated to ecosystem restoration. Participants can expect to gain practical insights and strategies applicable to their respective educational, community, or conservation efforts. Ultimately, the workshop seeks to address critical questions surrounding the promotion of outdoor and place-based learning in the context of nature play and its role in the broader framework of ecosystem restoration in the coming decade.

Keywords: advancing nature play and place-based learning

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THE MEANS THEME 04

Promoting Collaboration and Learning Communities to Address Socio-environmental Challenges

Theme Background:

EE and ESD are not new to learning communities that serve as powerful platforms for fostering meaningful learning experiences, leading to both personal and societal change. The concept is rooted in the idea that people can learn more effectively when they collaborate, exchange ideas, and support one another in their learning journeys.

Several key elements underpin the creation and sustainability of such communities—recognizing the possibilities of formal and non-formal systems for outreach, a cause, interdependency and critical discourse. These elements enable educators and learners to engage in deep and meaningful learning experiences that can drive positive environmental and social transformations. With the advent of social media and virtual engagement platforms, which proved effective during the global COVID-19 pandemic, there is a growing interest in collaborations of various types.

This theme explores the roles of various collaborations and civil society organizations in strengthening EE and ESD

Theme Objectives:

The theme, "Promoting Collaboration and Learning Communities to Address Environmental Challenges," seeks to discuss strategies for sustaining and improving learning communities to serve EE and address environmental challenges effectively.

Theme Focus:

- Examples of effective collaborations between government agencies and local communities in addressing sustainability crises and driving positive change.
- Role of citizen science in the field of EE and ESD and its contributions to environmental monitoring, research, and public engagement.
- Good practices in the transfer of knowledge from EE and ESD initiatives to society, fostering informed decision-making and behaviour change.
- Collaborative initiatives for environmental education and sustainable development.
- Examples of citizen science projects in environmental monitoring and research.

Theme Outcomes:

Underlines the need for collaboration and learning communities that take various forms and exist within different contexts and which can contribute significantly to addressing local, regional, or global environmental and sustainability challenges.

Theme Conclusions:

The thematic track on "Promoting Collaboration and Learning Communities to Address Environmental Challenges" aligns with the overarching goal of WEEC 2024, which is to "Connect People, Create Tomorrow." It underscores the critical role of collaboration, education, and community engagement in addressing environmental and sustainability challenges.

Together, we can explore innovative approaches, share best practices, and build stronger partnerships to drive positive change and promote a sustainable and resilient future for all

THE MEANS THEME 04

Promoting Collaboration and Learning Communities to Address Socio-environmental Challenges

Presentations

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085	Health and life science ecosystem of innovation vs climate change: a regional action plan for stakeholders' engagement	Nicole Ticchi	Oral communication
139	Examining the Benefits of Nature Connectedness and Mindfulness on the Mental Health and Wellbeing of University Students	Molina Walters, Cyna Schuster	Round table
180	Design and implementation of the educational program to promote environmental civic actions in Japan	Tomoko Mori	Oral communication
259	Seeds of Hope: Tree Planting as a Climatic Collective Action Lead by Young People in Iraq	Melissa Kate Reid	Round table
286	Coalitions for Environmental Vibrancy @ Cheakamus Centre (British Columbia, Canada)	Victor J Elderton	Round table
315	Science in the City: Building Participatory Urban Learning Community Hubs through Research and Activation	Constantinos Cartalis	Oral communication
358	Tracking Green Commodities, Chocolate Consumers and Sustainable Cocoa from Ghana: The Catalyst for Responsible Tourism	Edward Amankwah	Oral communication
393	Desarrollo de una propuesta participativa para la resturación ecológica urbana de un espacio público en Costa Rica	Marcela Gutiérrez Miranda	Oral communication
397	NATURE ZOO CLUB, a virtual conservation education program for families: Evaluation of the effectiveness	Antonieta Costa	Oral communication

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449	Fostering Community Stewardship Through Place-Based Learning: Insights from Burrenbeo Trust Initiatives	Aine Bird	Oral communication
453	Text, Video, or Podcast: Which is the Best Way to Conduct Environmental Education Online?	Vinicius Avelar São-Pedro	Oral communication
481	A community initiative to prevent food waste in school canteens: first results of the “GINO! Let’s play not to waste food!” project	Elena Pagliarino	Oral communication
524	DAcQUA AL PO ("Water the Po River" in local language). Cultivate educational lands, activate environmental natives, and safeguard water networks of the Po River land in northern Italy	Silvia Crema	Oral communication
525	Utilisation du digital comme moyen de sensibilisation à l’environnement: cas de l’application mobile Ana Boundif	Khadija Chahidi	Oral communication
621	Schoolgrounds as learning landscapes and green livingrooms of neighbourhoods	Ian Mostert	Round table
648	Nature-Based Education Networks	Luis Alberto Camargo	Round table
678	Investigating climate change narratives in fire and flood events in the media: Developing a research framework	Rebecca Keogh	Oral communication
708	Redesigning Educational Cities through Common Practices. Historic Garden as Intergenerational Playground	Maria Letizia Montalbano	Oral communication
715	Urban Cohousing in Search of (Eco)Sustainability. Italian Cases	Carmine Urciuoli	Oral communication
718	Role of Corporate Social Responsibility (CSR) in Greening Young Minds: How is HCLFoundation Reaching the Unreached through Environment Education	Aishwarya Balasubramanian	Oral communication
725	مبادرة مركز التعليم البيئي مؤتمر التربية البيئية	Sameera Al Braiki	Oral communication
728	Informal & Non-formal Environmental Education – Valuing Community Endeavours	Jennifer Pearson	Oral communication
730	Teaching and learning for a future we do not know – A Change Project Approach	Shepherd Urenje	Workshop
738	Inclusion of People with Disabilities in Environment Education	Alba Godall Mareo	Workshop

ID	TITLE	PRESENTER	FORMAT
755	Engaging Students to Share 'Stories from Our Environment' through Literacy and Art Skills	Hamda Al Ameri	Oral communication
757	Curating Interactive Learning Experiences to Create the Next Generation of Young Conservationists	Sarah Jizzini	Oral communication
759	Conservation and Education Professionals Working Together. How Lessons Learned During Covid Have Informed and Energised One Environmental Education Programme - Engaging the Expertise and Energy of Conservation Professionals has Connected and Involved Young People and Their Teachers in a Pan African Perspective on Biodiversity and Nature Conservation.	Penny Fraser	Oral communication
760	Nurturing Youth Leadership in Green Transition	Katre Olmez	Oral communication
761	How to Develop and Deliver Tailored Educational Content to Initiate a Sustainability Habit-change Journey?	Walaa Hirzallah, Huda Masalmeh, Toka Ahmed, Ounsi El Daif	Oral communication
765	THE EARTH PRIZE - School Teams Around the World Competing for Innovative Solutions to Sustainability Problems	Angela McCarthy	Workshop
903	Empowering the Future: Integrating Education and Behavioral Change in Abu Dhabi's DSM Strategy for Sustainable Energy Management	Amna Almheiri	

THE MEANS THEME 04

Promoting Collaboration and Learning Communities to Address Socio-environmental Challenges

Abstracts

072 Comunidades De Innovación: Una Herramienta Para la Innovación Y El Desarrollo Sostenible En la Nueva Normalidad Poscovid Y Los ODS

Adela Vélez[1]

La implementación de los ODS es cada vez más importante. En Bogotá, Colombia, se está llevando a cabo un proceso de trabajo en el que se conforman comunidades de innovación integradas por estudiantes, empresas y docentes. Estas comunidades han logrado implementar innovaciones incrementales que han dado solución a las necesidades de las organizaciones, contribuyendo así al cumplimiento de los ODS 8, 9 y 11.

Desarrollar comunidades de innovación academia – empresa que contribuyen al cumplimiento de los ODS.

Impacto en estudiantes

Han sido formados estudiantes con competencias para ser agentes transformadores de las organizaciones Y habilidades para la resolución de problemas complejos, experiencia acompañando procesos de innovación empresarial, desarrollo de competencias de investigación que les permitieron identificar factores que condicionan la innovación.

Así mismo la Universidad obtuvo una batería de herramientas de formación de sistemas innovación validadas que permiten desarrollar procesos de innovación en otras empresas.

Impacto en las organizaciones

Las empresas vinculadas al proceso se beneficiaron del mismo, ya que al final obtuvieron:

Un diagnóstico de conocimiento de la organización frente a una necesidad identificada y la solución innovadora a la necesidad

La innovación debe verse como un proceso no como un fin y en esa medida lo más importante es el cambio en la cultura organizacional de las empresas involucradas lo que supone un tiempo largo de trabajo.

La incorporación de los procesos de innovación en la empresa tiene mayor probabilidad de éxito y de incorporación a su cultura organizacional si resultado del ejercicio se obtiene un beneficio claro para la empresa

La alta dirección de las empresas debe estar involucrada en todo el proceso.

Es necesario contar con motivadores o incentivos para la participación de los estudiantes y los trabajadores de la empresa.

Las herramientas virtuales para la comunicación se convierten en un gran aliado para el desarrollo de este tipo de iniciativas.

Frente al cumplimiento de los ODS: Los principales resultados evidencias que la propuesta se articula a alcanzar las metas propuestas para los ODS 8, 9 y 11. Ya que la innovación se convierte en un motor que impulsa la competitividad y la productividad, así mismo promueve mejores prácticas de trabajo y la cualificación del empleo y la equidad.

Palabras clave: comunidades de innovación, educación superior, ODS8, ODS 9, academia - empresa

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085 Health and Life Science Ecosystem of Innovation Vs Climate Change: a Regional Action Plan for Stakeholders' Engagement

Nicole Ticchi[1]

Within the Emilia-Romagna region, the first in Italy for the efficiency of the health system and for the presence of a very advanced innovation ecosystem, the Clust-ER Health is a non-profit association that guides and promotes scientific and economic sustainable development, especially from an environmental point of view. European and regional policy makers are asking all the actors in the innovation field to tackle climate change and the circular economy, to join the race to zero carbon emissions. Healthcare sector is one of the last joining this race, because other important challenges have to be taken into consideration, but it's time to put effort in this field urgently.

This large association, together with all the local stakeholders, has produced an action plan to develop sustainability models for hospitals, companies in the medical and pharmaceutical sector and training initiatives for future professionals over the next 5 years of the health sector.

The Clust-ER Health's strategic plan started in 2022 and is built on 4 main pillars:

- GREEN and RESILIENT HOSPITAL: management of hospital and research waste, thanks to on-site hot friction sterilization and treatment technology to reduce the environmental impact associated with road transport to waste-to-energy plants by up to 70%. The projects underway on this technology will also make it possible to work on clinical laboratory research waste and to process medicines and expired substances.
- BIOMEDICAL MATERIALS: project for companies in the biomedical district of Mirandola, global excellence, for more sustainable medical device packaging materials, thanks to a circular economy approach and the use of recycled polymers or alternatives to plastics of fossil origin such as PVC and PP.
- TRAINING: master courses and seminars for healthcare professionals about how to improve sustainability in every dimension, from industries to hospitals
- GREEN LABS: promoting a sustainability culture in research centers and universities, to improve energy efficiency, waste reduction and treatment, with courses for young students and researchers

A quadruple helix approach is considered for the engagement of different stakeholders: hospitals, industries, universities and citizens are all involved in actions, with measurable effects on medium and long term. Number or initiatives, actors involved, labs' participation and training courses are some of the KPIs considered.

Keywords: health, innovation, waste management, training, green labs and hospitals

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Examining the Benefits of Nature Connectedness and Mindfulness on the Mental Health and Wellbeing of University Students

Molina Walters[1], *Cyna Schuster*[2]

There are increasing internalizing difficulties, particularly anxiety, and depression, reported in university students. University students negotiate multiple domains—including academic, health, social, cultural, work, and personal relationships—that alone or together can cause stress. The mindset students have during any situation they encounter will influence their stress level associated with that negotiation (Crum, Akinola, Martin, & Fath, 2017). Emerging adulthood (ages 18-30 years) is a critical developmental period characterized by mental health challenges, particularly for college students who experience distinct mental health challenges. Mindfulness-based approaches have been associated with mental health benefits such as decreasing stress levels, anxiety, and rumination while increasing self-compassion and self-esteem. Nature also contributes to a person's well-being. Biophilia is a theory that suggests humans have an innate tendency to connect with nature or other living things. Connecting with nature includes stress reduction, improved attention, positive influence on mental restoration, and a coping strategy for attention deficit (Grinde & Patil, 2009). Mindfulness practices and nature connectedness are critical components of this study. With the importance of mindfulness and nature connectedness as a coping strategy, this study examines 1) the perception of mindfulness practices experienced in a natural environment by students and 2) the outcomes (consequences) associated with incorporating nature and mindfulness into the university Environmental Education course curriculum. The findings from this study can inform teaching practices, curriculum development, and implementation, the importance of coping strategies as life skills, our individual mindset, and nature's importance in our lives.

Keywords: nature connectiveness and mindfulness

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Design and Implementation of the Educational Program to Promote Environmental Civic Actions in Japan

Tomoko Mori[1], Mitsuharu Mizuyama[2], Masahisa Sata[3], Masahiro Osako[4], Seita Emori[5]

To promote the transition to a sustainable society, it is necessary to encourage not only individual actions but also environmental civic actions (ECA) collaborating with community stakeholders. However, civic actions are not popular in Japan, and educational programs to promote civic actions have not been sufficiently developed, although many educational programs have been implemented to promote individual pro-environmental behaviors. In this study, we conducted various surveys to clarify the requirements for educational programs to promote ECA (details of the surveys were reported in 11th World Environmental Education Congress : WEEC). Based on the survey results, we designed an educational program in four stages:

1. learning a wide range of action types for problem solving,
2. choosing actions strategically,
3. practicing student-initiated actions, and
4. reflecting on actions and connecting them to the next action (Fig. 1).

We are currently implementing this program in two Japanese junior high schools and evaluating its effectiveness through both qualitative and quantitative analyses.

At Omoridairoku Junior High School, a public school in Tokyo, approximately 350 students are participating in this program. The first stage of the program included lectures on a wide range of actions and presentations by young ECA activists. In the second stage of the program, students chose one of the three themes (climate change, food loss, or peace-related issues) according to their interests and studied in groups. Students conducted interview surveys with experts in each field to promote an essential understanding of

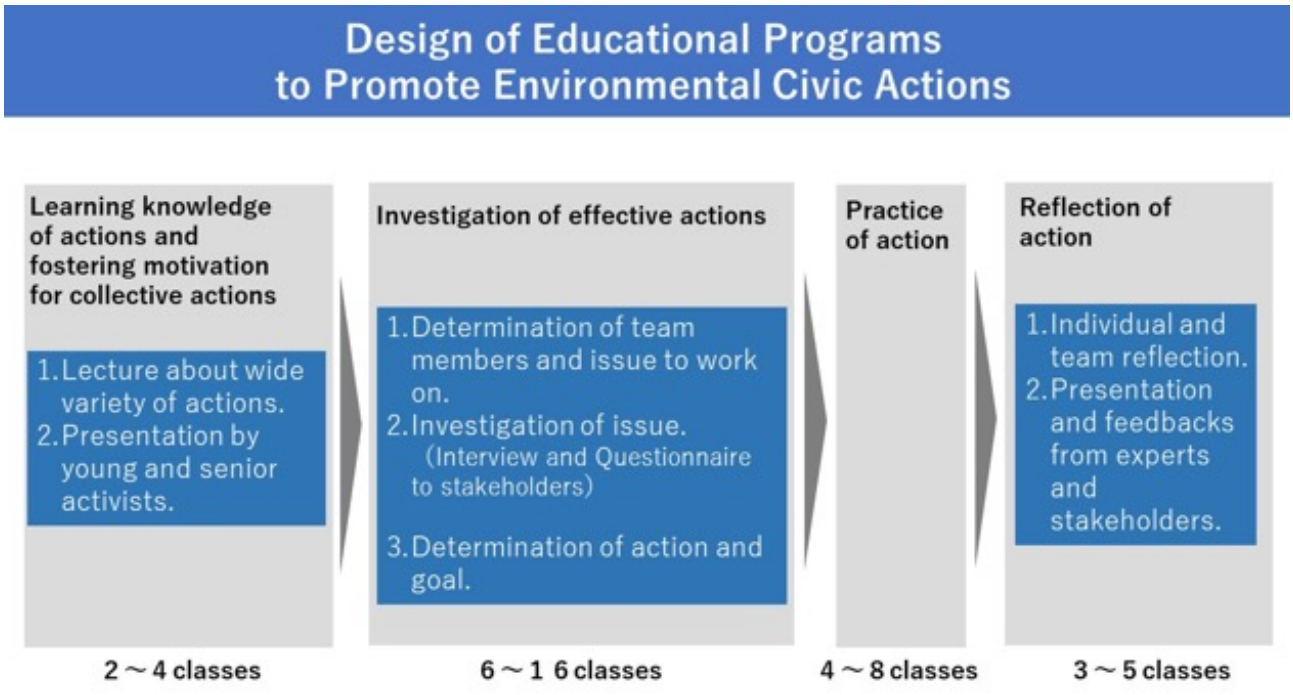

Figure 1

the problem and to consider strategic actions. As of June 2023, the program was in its third stage. Students choose their actions and are preparing for practice. We asked students about their action ideas on climate change and food loss before and after the program and analyzed their answers using text mining. As a result, while there were only individual actions before implementation, the number of action ideas for collaboration with the community increased dramatically after implementation.

We also implemented this program in a private junior high school called Dalton Tokyo. In this school, the first stage of the program was delivered to all 300 students, and the second and subsequent stages were delivered to small groups of students who wanted to participate. Students focused on oak wilt in the green area next to the school and considered actions to effectively utilize the timber cut down due to oak wilt in this community. We interviewed all the participating students after the program. Most students found it difficult yet interesting and rewarding to work on community issues through this program.

Thus far, this program has been found to encourage ideas for collaborative actions and increase motivation and self-efficacy in tackling community issues. We would like to explain the progress of this program and verify its effects at WEEC.

Keywords: civic action, program development, junior high school, sustainability transition

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Seeds of Hope: Tree Planting as a Climatic Collective Action Lead by Young People in Iraq

Melissa Kate Reid (1)

Iraq, a country eroded by more than two decades of corruption, armed conflict and oil extraction, is ranked amongst the top five countries most vulnerable to the negative impacts of climate change. Local impacts, including rapid desertification, are framing Iraq´s future under an umbrella of food and water insecurity, resource-induced conflict, loss of arable, and uninhabitable land and forced displacement. Building collective resilience in this context is crucial for safeguarding the health and wellbeing of all Iraqi residents. We, Bring Hope Humanitarian Foundation, aim to support Iraq´s resilience by greening the country through empowering and building the capacity of Iraq's population.

The triad of climate change, conflict and extractivism intensifies the negative individual and communal psycho-emotional of Iraqis, especially in future generations, with young people increasingly experiencing feelings of helplessness and pending catastrophe for their own, and their country's future(s). Bring Hope is committed to investing in Iraq's young people (over 50% of Iraq's population) through building climate resilience through education, and importantly, through equipping them with the skills and knowledge to be climate agents of change and enact practical measures to address Iraq's climate crisis, providing an opportunity to become a positive source of hope.

In this paper we introduce Bring Hope's Towards a Green Iraq project, an initiative that: engages teachers and students across Iraq to learn about the local impacts of climate change and its causes; provides hands-on capacity building for students to plant, and grow local and resilient trees (through the provision of training, seeds and ongoing support); and in partnership with Kirkuk-based NGO KOKAR lead by youth, will distribute 35,000 native trees to participating government agencies, non-governmental organisations, educational entities and community members to create green-spaces across Kirkuk.

Additionally, the project will include community-based events at the Kirkuk nursery where community members will learn about climate change including indigenous knowledge systems, cradle-to-cradle approaches and innovative to reduce the ecological footprint.

Whilst the project is being implemented in Kirkuk, Basra, and Erbil, Kirkuk is the primary location to capitalise on previous, and existing climate change adaption and resilience efforts, coupled with the fact that Kirkuk is heavily impacted by climate change given its proximity to oil and gas fields and arid environment. The purpose of this project is to provide a hands-on experience for young people to be engaged in mitigating climate change and to empower them through taking practical steps to do so.

We explore the interplay between direct engagement, nature´s own resilience and young people´s sense of agency through the lens of environmental psychology. The concept of constructive hope is here used as the backbone to support our claim.

Keywords: constructive hope, youth wellbeing, climate change, collective resilience

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286 Coalitions for Environmental Vibrancy @ Cheakamus Centre (British Columbia, Canada)

Victor J Elderton[1]

Over the course of more than 5 decades the Cheakamus Centre (NV Outdoor School) has not only been able to survive but thrive. The success of this bio-cultural field school on the banks of the Cheakamus River in unceded and unsurrendered territory of the Squamish Nation has only been possible through a establishing and nurturing coalitions. These coalitions have included; indigenous government, colonial governments at three levels, public jurisdictions, environmental/ ecological agencies to name a few and most importantly a coalition with educational programs and the more than human world. It is through these coalitions that the bio-cultural integrity and on-going experiential learning has been made possible for decades to come. The environmental vibrancy and adjacent natural habitats have also been enhanced through these complex and multi-layered coalitions, locally, regionally, nationally and internationally!

This narrative based dialogue will plot a course through key coalitions, their establishment and on-going nourishment over the decades, in bio-cultural terms. Particular attention will be given to those events that the author was directly involved in or lead, how those coalitions came about, how the they were nurtured and how the synergies of bio-cultural interactions continue to enhance their success.

Through this dialogue the intent is to provide insights into how to strength coalitions such as these to promote, enhance and engage in the wider success of place-based environmental learning initiatives, taking the lessons learned through the Cheakamus Centre and their application to other contexts and jurisdictions.

Keywords: coalitions, bio-cultural, case study, narrative story

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Science in the City: Building Participatory Urban Learning Community Hubs through Research and Activation

Constantinos Cartalis (1)

The Science in the City: Building Participatory Urban Learning Community Hubs through Research and Activation project* explores the open schooling concept in the theme "Cities as urban ecosystems", in view of creating new partnerships in local communities to foster science education for all citizens. Schools, in cooperation with other stakeholders become agent of community well-being. This is of considerable importance, taken that the urgency of cities to be approached as urban ecosystems is underestimated and only partially linked to science education for all citizens.

The project is based on the assumption that, schools provide a particularly effective starting point to teach students about cause and effect relationships, putting knowledge into actions requires the engagement of the communities at large including parents, families, neighborhoods, universities, local authorities, businesses, *etc*.

The paper describes (a) how new scientific knowledge for the city as an urban ecosystem is brought in to facilitate the participation of students in scientific discovery (b) how trust can be built to science through the own experience of participation, thus strengthening the awareness that building an own point of view and establishing own decisions are more effective than following general beliefs.

The paper further describes the concepts that interlink the natural environment, the built environment and the socioeconomic environment; understanding these links is essential to identify critical aspects such as exposure, sensitivity, adaptive capacity and vulnerability and to link them to urban resilience to climate extremes. At a final stage, common themes related to the city as an urban ecosystem are defined (termed as City Challenges) and examined against the Sustainable Development Goals of United Nations, whereas evaluation results are presented in terms of the potential to create knowledgeable, innovative and participatory communities able to cope with and actively contribute to addressing current and anticipated challenges at the city scale.

Keywords: urban ecosystems, resilience, climate extremes, open schooling

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Tracking Green Commodities, Chocolate Consumers and Sustainable Cocoa from Ghana: The Catalyst for Responsible Tourism

Edward Amankwah[1]

Enforcement of international environmental policies as UNCBD and the EU Deforestation- free products regulations *etc*. should be intensified to combat climate change, biodiversity loss, deforestation and forest degradation which are affecting human well-being, livelihoods and sustenance. Production of cocoa in Ghana is mostly cultivated in forest areas which includes riverine basins and catchment areas as it behooves on all stakeholders in adopting agricultural practices that would secure the forest habitats from degradation and biodiversity loss while increasing sustainable production. Applying voluntary sustainable standards would bring significant benefits to the small holder sustainable cocoa producers. Also to what extent carbon sequestration and ecosystem -based adaptation has pushed this drive for any success for the benefit of the industry and society. Certification of cocoa have arisen to address environmental, social and economic issues and improves the quality of the crop for consumers. Certification incorporates development, welfare of smallholder producers while mainstreaming gender, human rights which influences consumer choices for responsible travelling.

The paper has been written mainly from literature review and other secondary sources and through practice and personal observation.

Voluntary sustainable standards increases the capacity of farmers to strengthen conservation and sustainable use of biodiversity and natural resources, by reducing their vulnerability to climate change, enhancing sustainable agriculture and rural development . This would contribute to good health, food security, poverty alleviation and employment generation. The outcomes of implementing zero deforestation commitments from global actors is an initiative and innovative model 'Tracking Green Commodities that would increase tourism receipts for economic development in developing countries. This innovative business model should excite global consumers of green products about reductions of forest carbon emissions and biodiversity conservation by promoting responsible tourism in Ghana. It is also a catalyst for growth by reducing poverty and creating employment to improve development of host communities. Ghana has policy initiatives that seeks to generate enough financial resources to resuscitate the economy as well as achieving the targets of sustainable development goals 12, 2 ,6 11 , 10 ,11 and 14 in addition to the other goals that deals with cross-cutting issues. This approach of facilitation for an alternative livelihood should be a big boost for small holder sustainable cocoa producers.

Keywords: voluntary sustainable standards, green communities, sustainable cocoa, Ghana, responsible tourism, chocolate consumers

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Desarrollo De Una Propuesta Participativa Para la Resturación Ecológica Urbana De Un Espacio Público En Costa Rica

Marcela Gutiérrez Miranda (1)

Este documento presenta la sistematización del trabajo realizado por un equipo interdisciplinario en el Corredor Biológico Interurbano María Aguilar (CBIMA) en rehabilitación ecológica urbana con soluciones basadas en la naturaleza (SBN). Lo anterior con el propósito de mejorar las condiciones biológicas y restaurar los servicios ecosistémicos del territorio; ello, como herramienta para incidir sobre la salud física y mental de los habitantes y motivar a otras ciudades que deseen iniciar procesos similares.

La rehabilitación ecológica urbana es definida como un proceso que se lleva a cabo para mejorar los servicios ecosistémicos en estructura y composición de un ecosistema degradado a consecuencia de las actividades del ser humano (Gann y Aronson, 2013). De acuerdo con United Nations Environmental Program (UNEP), la rehabilitación ecológica es el proceso de detener y reversar la degradación que tiene como resultado, mejoras en los servicios de los ecosistemas y recuperación de la biodiversidad. Este proceso, abarca prácticas variadas y continúas, dependiendo de las condiciones locales y de las disposiciones e intereses de la sociedad que debe tener un rol activo en el proceso.

Las ciudades de Costa Rica presentan una serie de retos que demandan el trabajo conjunto entre los diferentes sectores y actores, para que, de manera articulada propongan y desarrollen ideas para una mayor sostenibilidad de las áreas urbanas y de esta forma incidir en mejorar el entorno para las personas. El pais debe trabajar para crear ciudades verdes y resilientes al cambio climático, donde todas las personas tengan acceso a estos espacios. La rehabilitación ecológica urbana en La Sabanita surge de una inquietud común de una gama diversa de actores que han estado trabajando juntos desde hace ya varios años en el CBIMA. Como resultado del trabajo conjunto y a las sinergias establecidas, se identificaron las necesidades de la comunidad y se llega al consenso de acercarse a la comunidad con la inquietud de mejorar el espacio verde disponible para que las personas habitantes de este sitio dispongan de un espacio verde de calidad, inclusivo, seguro y accesible.

Palabras clave: restauracion ecologica urbana, equidad, participacion, desarrollo sostenible

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397 NATURE ZOO CLUB, a Virtual Conservation Education Program for Families: Evaluation of the Effectiveness

Antonieta Costa[1]

The Nature Zoo Club, a family focused virtual Conservation Educational program was developed by the Lisbon Zoo directed mainly at households, aimed to increase the sensitivity, ecological awareness, and knowledge of its participants, to promote sustainable behavior. The highlights of this program are the large virtual component and the application of the Connect-Understand-Act social marketing model of behaviour change. The evaluation of its effectiveness aimed to test the following hypotheses:

1. Virtual pro-conservation educational programs are effective, in the short and medium term, in communicating about conservation and promoting sustainable behaviours, specifically having as a case study the Nature Zoo Club program, in the increase of the cognitive, emotional, and behavioural domains, for biodiversity conservation, of its participants.
2. There is a positive correlation between the evaluated domains. This effectiveness was assessed through the application of two complementary methodologies: quantitative analysis (by implementing questionnaire surveys, in three evaluation moments: before the program, immediately after the program and three months after the program) and qualitative analysis (by developing interviews with focus groups, in two evaluation moments: immediately after the program and five months after the program). This talk presents the results as consequence of the program's structure and methodology and evaluation, namely the use of a positive approach, the community-based social marketing model and virtual and distance learning.

Keywords: family focused virtual conservation educational program; behaviour change; evaluation

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Fostering Community Stewardship Through Place-Based Learning: Insights from Burrenbeo Trust Initiatives

Aine Bird[1]

Building upon the foundations of active citizenship and environmental stewardship, community stewardship presents a grassroots strategy for conserving local environments, heritage and their corresponding communities. This paper sheds light on the potential of a place-based learning approach on fostering community stewardship. The insights are derived from practical involvement with Burrenbeo Trust, an independent landscape-focused charity situated in the west of Ireland, and are informed by a recent comprehensive multi-phase PhD research study. The initial phase of the study considered and evaluated pre-existing initiatives while the second phase aimed to facilitate the expansion, diffusion, and sensitive implementation of initiatives within diverse local contexts across communities throughout Ireland.

Through a succession of place-based learning initiatives tailored for schools and local communities, participants engage in immersive experiences that cultivate familiarity with, within, and for their local place. Moreover, they are empowered to undertake projects that enrich and safeguard their local built, natural, and cultural heritage. This approach to place-based learning emphasizes the utilisation of local resources for mutual benefit, promoting a comprehensive perspective on localities that encompasses their intricate layers and interconnectedness. Importantly, this form of learning spans both formal and informal settings, catering to individuals of all age groups. There is also emphasis on learning networks and the sense of collective action derived from this.

This paper revolves around three key facets: firstly, an exploration of the tangible effects of community stewardship initiatives by Burrenbeo Trust; secondly, a contemplation of the challenges of up-scaling dissemination and implementation of community stewardship initiatives, while maintaining sensitivity to the unique local contexts; and thirdly, an articulation of the broader implications from these initiatives, which contribute to informing community stewardship undertakings generally.

In sum, this paper contributes a comprehensive analysis of community stewardship facilitated through place-based learning initiatives, offering valuable insights drawn from practical engagements and research, thereby enhancing the understanding of effective strategies to nurture community-driven conservation efforts.

Keywords: stewardship, community, networks

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453 Text, Video, or Podcast: Which is the Best Way to Conduct Environmental Education Online?

Vinicius Avelar São-Pedro[1]

The internet can be a powerful tool for developing environmental education (EE) practices. In addressing the current biodiversity crisis, for instance, there is a growing number of initiatives utilizing various digital media as a means to raise awareness and educate people about the primary threats to species conservation. However, exclusively online EE practices are relatively recent, and little is known about their limitations and actual impact on the audience.

Can exclusively online EE initiatives be effective in imparting knowledge and promoting environmental awareness? Do different digital media formats (Illustrated Text, Video, and Podcast) vary in their educational potential?

To answer these questions, we developed an exclusively online EE initiative centered around the theme of "amphibian conservation." Starting from the same basic text, we created three digital materials in the main formats used on the internet: illustrated text, video (whiteboard animation), and podcast. We recruited 147 volunteers from the general population with internet access, who were randomly assigned to four experimental groups: i) Podcast Group; ii) Text Group; iii) Video Group; and iv) Control Group (who were not exposed to any type of educational material).

After engaging with their respective educational materials, participants responded to a multiple-choice questionnaire assessing their knowledge and either negative or positive perceptions regarding amphibians.

The same questionnaire was administered in two rounds: i) immediately after the interaction with the educational material, and ii) three months later, to evaluate the persistence over the medium term of the EE intervention effects.

We utilized an ANOVA-ranked analysis to test the influence of the experimental treatments and the questionnaire administration round on the responses, followed by Tukey's multiple comparisons test for further analysis of variables. The responses to the questions assessing acquired knowledge about amphibians varied significantly among the treatments (df=3; F=7.33 and P=0.0001), with only the control group differing from the others, exhibiting a lower score. The treatments also influenced the perception about amphibians (df=3; F=3.25 and P=0.02), wherein participants from the control group, who had no exposure to any educational material, displayed a more negative perception of the animals, while access to text-based material resulted in more positive perceptions.

There were no significant differences in responses between the two rounds of questionnaire administration. The findings indicate that, regardless of the type of digital media employed, online EE interventions can be effective in disseminating scientific knowledge, and these effects persist in the medium term. On the other hand, if the goal is to change people's perception (raise awareness) about a subject, it is important to consider that illustrated texts may be more effective than other media types.

Keywords: amphibians, scientific communication, biodiversity conservation, digital media

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A Community Initiative to Prevent Food Waste in School Canteens: First Results of the "GINO! Let's Play not to Waste food!" Project

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Food waste (FW) is an urgent global problem related to environmental, economic, social, and ethical concerns. In Italian school cafeterias FW is particularly significant: the average FW is around 30%, but for some foods such as legumes, vegetables, and fish, well over half of the portion gets thrown away. School cafeterias are places for learning skills and behaviors that contribute to forming citizens who are aware and responsible in making food choices impacting on/affecting their well-being and that of the planet. Canteens are also places of expression of collective behaviors, different from individual ones. Finally, the choices made in the refectories and in the whole school food system leave an imprint the entire food chain. Therefore, the reduction of FW is a priority among the challenges for more just and sustainable local communities.

A "community of interest" participates in the initiative which includes the whole school population (students, teachers, managers, and parents), the actors of the canteen system (municipality, catering companies, canteen commissions), researchers and associations that work on environmental education and FW. The theme of FW is tackled with an integrated approach, through three main intervention strategies: (a) citizen science activities to measure and reduce FW at different times during the school year; (b) technical support and advice for decision makers; and (c) education and learning activities aimed at creating awareness and a sense of responsibility among community members. The waste of some specific foods such as bread, fruit, breadsticks, crackers, fruit juices, and puddings is reduced thanks to the distribution of a food bag with which students can take leftovers home. The reduction of waste from all the other foods which cannot be taken home is encouraged through play and education activities.

The project highlights the centrality of the school in the fight against FW:it is oriented towards the active participation of community members which allows to recognize the causes of the problem and determine a positive, systemic, and sustainable transformation. The deep involvement of the community, which has the opportunity not only to participate, but also to define and lead the activities, allows to develop the skills and confidence necessary to pursue the expected results. As participants gain confidence in the engagement process, they are driven to initiate change in the community themselves.

Building trusting relationships with community members was the most important enabler for the success of the project, but funding and time constraints often hinder the trust building process. Following the latter, the two elements which we found most significant were the promotion of a shared sense of purpose around the cause of FW prevention, and the awareness that by working together and building capacity, community members can take action on addressing their common issues.

Keywords: food waste, children, schools, community-based approach, citizen science

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DAcQUA AL PO ("Water the Po River" in Local language). Cultivate Educational Lands, Activate Environmental Natives, and Safeguard Water Networks of the Po River Land in Northern Italy

Silvia Crema[1]

The multiple socio-economic, environmental, and health emergencies (more and more overlapping) have spread a sense of discouragement and helplessness that is inevitably leading in a direction opposite to the achievement of the UN 2030 Agenda for SDGs. The project and its title revolve around the issue of the ongoing water crisis in Italy, which in recent years has dramatically involved all communities connected to Italy's main river. In this context, educational efforts have lost, or never had, coordination and shared objectives and actions to address the climate crisis with more participative and aware educational communities in the area. This project follows another project carried out in 2021 in the same region and presented in a field session at the Prague Congress 2022, aiming to provide continuity by presenting its ongoing progress.

The project aims to create socio-educational experiences for the school population in the riverine and rural areas, capable of generating empathy towards the issues of water and environmental crises while simultaneously stimulating good practices and contaminating processes for the educational community and the territory.

The program consists of 2 actions:

1. Approx. 60 teachers, school principals, municipal administrations, the third sector, private companies, families, and citizens will participate in educational and discussion meetings. This is aimed at collaboratively learning to develop civic education curricula and fostering awareness within the entire community regarding ongoing environmental sustainability and the climate crisis while taking joint action.
2. Educational activities with classes (approx. 400 students) both at school and outdoors: outings on the territory will aim not only to learn about the naturalistic aspects of the river ecosystem but also to document and create multimedia contributions that tell the emergencies that water and climate crisis are feeding on the Po River in the Mantua stretch.

The project is inspired by a decades-long experience of networked environmental fluvial education developed in the Po River basin, where various parks operate, and by the attention dedicated to rivers by the Italian WEEC network. In 2021, the project 'Future River' was carried out, followed up with this new project. The acceleration occurred during the Anthropocene, modifying flow rates and polluting the waters. Global warming with reduced Alpine and Apennine snow and increased extreme phenomena has further affected the Po. This situation poses new challenges.

The educational experiment of "WATER THE PO RIVER" makes it possible to update these considerations and to verify the potential or criticalities of environmental education in a new context: the aggravation of climate change and a (perhaps ...) greater attention and availability of financial resources for the ecological transition. The experience should provide the opportunity to compare similar situations in Europe and the world.

Keywords: educational community, water crisis, environmental natives, Po river

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Utilisation Du Digital Comme Moyen De Sensibilisation à l'environnement : Cas De l'application Mobile Ana Boundif

Khadija Chahidi[1]

Dans le cadre de sa mission de sensibilisation et d'éducation à l'environnement, la Fondation Mohammed VI pour la Protection de l'Environnement et ses partenaires ont lancé, dans le cadre de la troisième édition de sa campagne de sensibilisation de lutte contre la pollution plastique « #b7arblapalstic », une application mobile nommée Ana Boundif qui vise à éveiller collectivement les consciences et à encourager la prise d'initiative et le changement de comportement en faveur de l'environnement, de façon simple et divertissante.

L'objectif est de :

- Éveiller les consciences en faveur de l'environnement et encourager le passage à l'acte
- Créer une communauté active et militante pour la protection de l'environnement et permettre un réseautage efficace entre les utilisateurs de l'application pour accentuer leur impact positif
- Offrir un espace d'apprentissage ludique des concepts environnementaux

L'application mobile Ana Boundif est un outil de sensibilisation qui mobilise les communautés autour de la prise d'initiative en faveur des océans particulièrement, et de l'environnement généralement. L'application permet, à travers les défis qu'elle propose, de créer un réseautage efficace entre ses utilisateurs et leur incite à participer à des actions terrain en proposant des activités ponctuelles sur le territoire national, auxquels les personnes inscrites sur l'application peuvent participer collectivement afin de multiplier l'impact. Consciente de la nécessité de mobiliser en masse, elle facilite la coordination entre ses utilisateurs grâce au concept « ligue » et au chat de groupe qui offrent une plateforme ouverte d'échange.

A travers les ligues, les personnes peuvent choisir de créer ou de participer à l'un des groupes qui se mobilise pour une activité qui les intéressent, entre des actions de nettoyage de plage, de sensibilisation, de recherche, *etc*. Egalement, et afin de renforcer l'intérêt d'une action collective, elle propose un classement mensuel des ligues sur la base du total des points gagnés, dans un but de motivation et de challenge entre l'ensemble des ligues existantes.

Depuis son lancement, les retombés de l'application indiquent une bonne dynamique au niveau des groupes. Plusieurs actions ont été organisées à travers le réseautage disponible sur l'application telles que des actions volontaires de nettoyage de plage, la participation à des journées de sensibilisation ou encore, des défis écologiques collectifs relevés, ensemble permettant d'acquérir un comportement responsable en faveur des océans.

En conclusion, l'application mobile Ana Boundif représente un exemple concret de sensibilisation et de mobilisation des communautés en faveur des océans, à travers laquelle toute personne se sente capable d'apporter un plus dans la transformation vers un monde meilleur car toute action individuelle ou collective, même petite, en faveur des océans, peut avoir un impact important.

Mots clés: protection de l'environnement/ sensibilisation/ digital

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621 Schoolgrounds as Learning Landscapes and Green Livingrooms of Neighbourhoods

Ian Mostert[1]

In disadvantaged neighbourhoods' green public space is often sparse. Schoolyards are present in most neighbourhoods and a cost effective and quick option to add green public space, creating 'green living rooms' that also support climate adaptation, while enhancing nature education opportunities for school children. The Green Blue Schoolgrounds model was developed in 2014, has scaled in Rotterdam and has started scaling in the Province of South Holland. There has been increasing national and international attention for the model.

Over the past 5 years the approach has gained in national and international attention. Various international organisation have also shown interest in the model. Green-blue schoolyards are focused on 'deprived' neighbourhoods with very limited public space. The quality of the homes is often moderate to poor, with many children and families living in small apartments without outdoor space. This leads to unhealthy situations and outcomes. Opening up school playgrounds while greening creates space for these children and families, improving their health and wellbeing. This investment also makes neighbourhoods more adapted to climate change (water absorption and heat limitation) and offers more space for biodiversity and outdoor education.

How can we stimulate communities and teachers to create and use greenblue schoolgrounds as rich learning landscapes and as green livingrooms of the neighbourhood?

In a Dutch perspective on greenblue schoolgrounds you will join us on our journey through several perspectives on obstacles and successes, so that you can bring this approach back home.

At the end of this round table, you will:

- Know some best practices and how to tackle common obstacles;
- Be able to have insides in your own approach;
- Understand the importance of knowledge and experience to organize the best approach;
- Understand the importance of support of teachers, parents, neighbourhoods and Municipalities.

Video for an impression of the schoolgrounds and communities: ***https://www.youtube.com/watch?v=Z9_Vv7JdZJs***

Keywords: communities, participation, bottom-up, outdoor learning, play freely

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648 Nature-Based Education Networks

Luis Alberto Camargo[1]

The session aims to provide a comprehensive overview of the Nature-Based Education Networks, an initiative by the Organization for Environmental Education and Protection (OpEPA) in Colombia aligned with IUCN CEC. This initiative is recipient of the 2023 WISE Award for Innovation in Education. The session will focus on sharing experiences and building a bridge between theory and practice. The session will be conducted by Luis Camargo, Founder and director of OpEPA, who has led the project's creation and implementation.

The program promotes nature-based education and regenerative practices among children and youth. The program aims to reconnect children and youth to nature and people to the Earth to build more sustainable, regenerative, and peaceful communities. The program also aims to promote citizenship skills that harmonize the relationship between people and nature, allowing them to become planetary stewards and ensure social wellbeing.

The program will begin with an overview of the Nature-Based Education Network, its origin, and its objectives. The session will then explore how OpEPA has implemented the network in 14 cities throughout Colombia. The session will cover topics such as nature-based education, empowering teachers as changemakers, regenerative leadership, creating cities of learning, and climate and biodiversity education with a systemic approach.

The session will also focus on consolidating a learning community with citizenship skills that promote harmonizing the people and nature relationship. It will also favor the positioning of students and teachers as multipliers of good practices and ethical behavior to face environmental and social challenges in their schools, communities, and cities.

The session will include presentations building a bridge between theory and practice. We will present the assessment from the perspective of relevant theoretical frameworks. The session will also evaluate the Nature-Based Education Network's impact on diverse learning communities around NBE and the appropriation of green spaces in and surrounding cities.

The session will conclude with a summary of key takeaways from the Nature-Based Education Network initiative. The expert will provide recommendations for theory and practice based on their experience implementing this project. And how it can be the base for implementation in other cities worldwide. The round table discussion will explore how this approach to weaving learning communities and addressing city climate-biodiversity challenges can be implemented in different contexts.

Keywords: nature-based education, networks, learning ecosystems

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Investigating Climate Change Narratives in Fire and Flood Events in the Media: Developing a Research Framework

Rebecca Keogh[1]

Research demonstrates that public acceptance of human-induced climate change is affected more by what people believe rather than what they know, and will typically be influenced, among other things, by political affiliation and where individuals obtain their news and information (Tranter 2011, 2017 cited in Tranter, 2020; Huntley, 2020).

In a recent survey spanning 40 countries, Australia had the third highest percentage of climate deniers, with strong links identified between preferred news sources and whether climate change was considered a serious issue (Park *et al.*, 2020). Furthermore, in Australia, the issue of anthropogenic climate change has divided voters in three federal election campaigns and been instrumental in the ousting of several Prime Ministers (Colvin & Jotzo, 2021).

This lack of political consensus has likely significantly delayed Australia's progress into making the urgent transitions outlined by the special report issued by the Intergovernmental Panel on Climate Change (IPCC). Ecolinguistics is a branch of linguistics which explores, through critical discourse analysis, the role of language in the development and possible solution of ecological and environmental problems.

This paper will show how a research framework was developed using ecolinguistics to code and analyse news articles over the course of two federal Australian elections (2019 and 2022) concerning extreme fire and flood events.

The overall objective being to categorise language that supports a scientific understanding of complex natural systems, and language that does not.

An anticipated outcome of the study is that the findings will support social learning and cohesion by providing a shared language for discussion and debate, particularly in media reporting, but within other institutions across society.

Keywords: ecolinguistics, climate change, critical discourse analysis, research framework, social cohesion

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708 Redesigning Educational Cities through Common Practices. Historic Garden as Intergenerational Playground

Maria Letizia Montalbano (1)

It has been almost half a century since the publication of 'The Child in the City' in which Colin War explored the relationship between children and their urban environment. Ten years before the Convention on the Rights of the Child, he questioned whether something has been lost in that relationship by hypothesizing ways in which the link between childhood and the city can be improved. Since then child-friendly cities, pedibus, children's councils and other initiatives started blooming. However children are still not seen and their voices do not count, public space has not become child-friendly.

The invisibility of childhood, emerged forcefully during the pandemic period, starts from here: from the rhetoric of attention, care, and sacredness from the denial of accessibility of living spaces and of their right to play.

Starting from the idea of childhood as an actor in the social production of public space, and of the act of playing as its transforming element, what happens if "playing in the city" and "playing with the city", in their two different meanings (playful and design), meet the space, real and imaginary, of the garden?

In the hypothesis of a redefinition of everyday spaces that can invite encounters, a number of questions emerge: How do children and adolescents appropriate the living space 'city' that is often hostile to them? How do they shape urban space themselves? What life project do they realise in relation to the environment? What places are 'destined' for them?

Open public spaces produce enzymes to develop social processes and bonds based on trust, it is a matter of learning to live in order to recompose social relations and create common languages.. One aspect of caring for the commons is the emotional attachment people feel towards the goods entrusted to them: in the narratives of the practices, the expression of civic sense is intertwined with an almost affective attachment the places they care for. The Giardino del Guasto, in the historical center of Bologna, is an example of what some authors have called 'affective citizenship'.

An architectural project created in the 1970s by observing and listening to children playing on piles of debris, and a project of recovery, care, and collective management, imagined by thinking of streets, arcades, and gardens as threads connecting the lives and activities of inhabitants who relax, work, meet and reflect in a neighbourhood. An antidote to the risk of solutions that contribute to segregating and privatising city life through conditional access to semi-public spaces.

This paper inquires what makes a public space a common space. As it is not just a matter of being open to all, but accessible to all, A common space must give everyone the chance to imagine oneself as part of an ecological corridor, and to children's specifically the freedom to play and move independently.

Keywords: community gardens, playgrounds, commons , public spaces, urban environment

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Urban Cohousing in Search of (Eco)Sustainability. Italian Cases

Carmine Urciuoli[(1)], *Fabio Corbisiero*[(2)]

Cohousing is a new form of human settlement that offers a possible solution to the housing crisis. In cohousing communities, people come together and share facilities and resources, such as a garden, a laundry area, a kitchen, or even a shared means of transportation. This communal way of living not only provides a mode of social organization on a non-standard scale but also contributes to rethinking the concept of a city that leads to a lifestyle based on saving, energy efficiency, and sustainability.

This contribution will present the work carried out within a doctoral study that aims to examine the construction of cohousing in Italian urban contexts, exploring the debates on cohousing, sustainable communities, and social interaction in urban areas. Three case studies (Naples, Rome, Turin) will be considered in order to examine the role of cohousing in creating sustainable environments in the broadest sense of the concept. The concepts of cohousing will be analyzed based on their spatial-social dimensions and characteristics, community structures, and cultural and economic values that support this form of living.

It will be examined how cohousing can be used as a tool for assessing social sustainability, guiding behavioral change, and promoting a sustainable life (Farinella & Moiso, 2021). Through a series of sociological interviews conducted with community coordinators, active cohousers, and aspiring cohousers, the investigation aims to outline how the concept of sustainability is interpreted and implemented within these collective environments.

The interviews reveal that the concept of sustainability is closely intertwined with daily practices ranging from resource sharing to food production to waste management. "Sustainability is seen not only as an ecological imperative but also as a path towards greater social cohesion and individual well-being" (Brown, 2012). However, the examined communities show significant variability in their adherence to sustainability principles, often influenced by socio-economic factors and specific values.

One significant finding is that the communal dimension is fundamental to the implementation of eco-sustainable practices. "The sense of community and the co-creation of norms and rules are often the driving force behind sustainable change" (Williams, 2005). In the Italian context, it seems that the culture of sharing and mutualism are elements that facilitate the adoption of eco-sustainable behaviors.

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Keywords: cohousing, eco-sustainability, Italy

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Role of Corporate Social Responsibility (CSR) in Greening Young Minds: How is HCLFoundation Reaching the Unreached through Environment Education

Aishwarya Balasubramanian[(1)], *Eisha Mirta*[(2)], *Santanu Basu*[(3)], *Nidhi Pundhir*[(4)]

Apart from the common challenge of putting Environment Education (EE) as an important agenda on education policy/decision making, finding financial resources for implementing EE in a large country like India is a major challenge. In addition, making EE accessible for students, youth from underserved communities is often or always overlooked. HCLFoundation (HCLF) which is delivering the Corporate Social Responsibility (CSR) agenda of HCLTech in India is committed to elevate people and the planet through collaboration with various stakeholders. HCLF under its environment action programme called "Harit" is investing in meaningful partnerships with NGOs, government bodies, education departments, local communities towards building environmental awareness and leadership among students/youth from underserved communities for individual and collective environment action.

The 5-step methodology followed is: LEARN the science and anthropogenic causes behind environmental changes, EXAMINE environmental issues within immediate surroundings, ENGAGE in identifying solutions for local environmental issues, ACT on resolving those problems, LEADERSHIP for continued environment action. Key highlights of the programmes offered are; Inclusion of both AWARENESS and ACTION components which help students not only learn but also apply their learnings in taking positive environment action within their immediate surroundings; Adopting two types of approaches: a) Infusion which aligns with existing school curriculum thereby increasing adoption rates in government schools and enhances students' understanding of environment concepts in textbooks. B) Standalone is offered to schools who have an inclination to voluntarily take up environment/climate action – A national level climate leadership challenge called the Generation for Climate Action (GenCAN) offered by HCLF in partnership with Centre of Environment Education is a great example where 62 schools in 16 Indian states, 330+ students, 65 teachers have voluntarily signed up to reduce the carbon footprint in schools; Programmes are also designed taking into consideration local geography, culture, traditional practices, language; In addition, one programme is catering to children with special needs where HCLF is helping 200+ deaf and mute students set up nutrition garden at home and schools. HCLF is being the catalyst in bridging the financial gap to reach the unreached for EE, collaborating with NGOs to establish regional presence and sensitize masses on environmentally responsible behavior and practices, working with local education departments in strengthening existing school systems for environment & climate action. HCLF through various EE initiatives so far has reached out to 16,000+ individuals &100+ schools across India.

Keywords: environmental education

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725 مبادرة مركز التعليم البيئي مؤتمر التربية البيئية

سميرة البريكي[1]

وفقا لمسؤولية المدرسة البيئية اتجاه المدارس الأخرى ضمن فئة المدارس القيادية، يُعتبر من الضروري توفير بيئة

تعليمية خاصة لنقل الخبرات البيئية للمجتمع المحلي. إضافةً إلى ذلك، يسعى المركز لخلق تواصل أكبر مع المجتمع

وتعزيز الوعي البيئي، وتشجيع الممارسات الإيجابية نحو الحفاظ على موارد البيئة في الإمارات.

الكلمات الرئيسية: مبادرة مركز التعليم البيئي مؤتمر التربية البيئية

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Informal & Non-formal Environmental Education – Valuing Community Endeavours

Jennifer Pearson[1]

The notion of non-formal and informal education is taken from the OECD statement that "non-formal education as more-or-less organized and with learning objectives and a semblance of curricula... informal learning is never organized, is non-institutional, and has no established objective in terms of learning outcome.

This project revealed a lack of governance, from a national Australian governmental perspective, for a workable process to gather this data. The AAEE advocates for education for sustainability in sites ranging from early years to tertiary institutions. Drawing on the AAEE network and significant key environmental researchers considerable knowledge of implementation of environmental education a paper was prepared as requested. The AAEE membership is broader than formal education and many engage in community environmental education activities addressing a range of issues at a national and local level. With attention beginning to focus on addressing climate change issues in Australia, and many other countries, who has responsibility for gathering this information to effectively align the considerable efforts of a range of programs, projects and initiatives at a national level?

The Living Sustainably: the Australian Government's National Action Plan for Education for Sustainability (2000-2009) articulated what this should look like across the different sectors. The objective was to support environmental education across government, the community, business and industry as well as primary, tertiary, vocational education– with the aim of equipping all Australians with the necessary skills, knowledge and values to promote sustainable environmental management. Furthermore, such a review could examine trends and identify directions where we need to be moving in the future? Many of the informal and non-formal EE programs & initiatives support schools, or could be aligned if Federal and State government policies enable this to happen.

The United Nations Sustainable Development Goals offer an international binding set of outcomes many countries have adopted, could this capture non-formal and informal EE? Australian informal and non-formal environmental education learning is typically organised and facilitated by volunteers. As such, volunteers might capture some of their participant's feedback post an informal or non-formal environmental education activity, but it is not common for non-formal or informal environmental educators to research and document their own practice or program outcomes. What does your organisation or country employ to acknowledge achievements in this area? This presentation asks delegates to collaborate on possible models to collect effective data across key indicators to acknowledge the informal and non-formal EE capital generated by many volunteer dependant organisations and groups.

Keywords: non-formal, informal, environmental education, community climate change initiatives

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730 Teaching and Learning for a Future We Do not Know – A Change Project Approach

Shepherd Urenje (1)

The workshop aims to introduce the implementation of the Sustainable Development Goals (SDGs) into university teaching and learning, specifically Goal 4, which seeks to "ensure inclusive and equitable quality education and promote life-long learning opportunities for all" (UNESCO, 2015). The emphasis is placed on the relationship between Education for Sustainable Development (ESD) and educational quality, explicitly, target 4.7 of SDG 4 which requires all governments to:

"By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development." (UNESCO, 2015)

In addition, the workshop is also expected to contribute to Goal 12 - ensure sustainable consumption and production patterns and Goal 13 - take urgent action to combat climate change and its impacts. As we enter into the 21st Century, we are confronted with a supersonic rate of globalization resulting in snowballing challenges which demand a different educational approach, an approach that matches this complexity in order to meet the local and global challenges (Urenje, 2019).

The workshop will engage participants in designing a Change Project which will respond to the sustainability inadequacies in the current university curriculum. The emphasis will be on how the institution can make use of the Change Project Approach as one way of aligning their teaching and learning to the Sustainable Development Goals and at the same time to build their ESD story of learning and change.

We describe the Change Project as any project that brings about change in an institution's policy, strategy, curriculum, learning programs, learning environments, or institution-community relationships, with implications for ESD 'on the ground'. The Change Project must be co-defined and should be collaboratively developed and implemented in a small community of practice (*i.e.* with your colleagues) from the same or another department.

Workshop Objectives

- provide capacity building for lecturers to respond to the Sustainable Development Goals (SDGs) with a didactical/ pedagogical focus centered around a contextually defined Change Project,
- develop innovative ESD practices that can be scaled, and
- develop critical didactical analytical competence in order to organize and evaluate ESD teaching and learning activities.

Keywords: teaching and learning for a future we do not know – a change project approach

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738 Inclusion of People with Disabilities in Environment Education

Alba Godall Mateo (1)

Persons with disabilities, being among those at the greatest risk of being left behind in education and society, should be actively included in discussions, both in formal and informal settings, given the importance of environmental education and its potential impact on them. This inclusion is vital for integrating individuals with different needs and abilities into environmental education frameworks.

This 60-minute hands-on session is tailored for people with disabilities. We will introduce basic concepts within environmental education, with a specific focus on designing spaces that cater to the diverse needs of individuals with disabilities.

This workshop aims to showcase a method for introducing and engaging people with disabilities in environmental education settings. It is intended to serve as a blueprint for future educational activities in the UAE and other parts of the world, with specific objectives including:

- Including people with disabilities in environmental education settings.
- Creating an inclusive learning environment for people with disabilities.
- Providing guidance for educational institutions on environmental accommodations and best practices for educating people with disabilities.

Keywords: inclusion, accessibility, environmental education, sustainability, equity, disabilities

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755 Engaging Students to Share 'Stories from Our Environment' through Literacy and Art Skills

Hamda Al Ameri [1]

Programme Goals

- Shape and encourage the next generation of conservationists, to inform K-12 students of the challenges and opportunities facing the houbara population, and to promote the preventative intervention conservation model.
- Design cross-curricular experiential learning experiences that embrace the houbara as a flagship species and focuses on conservation education topics in authentic contexts.
- Increase a sense of responibility, confidence and empowerment through participating in active citizenship and taking collective action to resolve environmental isuues.
- Initiate opportunities and learning environments which encourage creativity and develop global awareness through outreach activities.
- Foster community values and attitudes by encouraging personal growth and well-being through direct contact with nature.

The Short Story Challenge, an educational initiative by the International Fund for Houbara Conservation (IFHC), was introduced in 2021 as a three-year program within the framework of IFHC's Educational Program. This initiative focuses highlighting the significance of safeguarding indigenous species in the UAE, particularly the houbara bustard, with a profound connection to Emirati heritage and culture.

The program encourages students from UAE schools to contribute their ideas by writing short stories reflecting their understanding of sustainability issues related to indigenous species' preservation and their challenges. By emphasizing creativity and storytelling, the initiative fosters collaboration among writers, designers, editors, and illustrators to explore innovative solutions and narrative frameworks.

Three editions of an educational storybook titled "Stories from Our Environment" was published by student authors and distributed to all school libraries in the UAE in collaboration with the UAE Ministry of Education and the Emirates Foundation for School Education. Since its inception, the Short Story Challenge has garnered considerable success within the educational community, instilling positive environmental attitudes among the youth. These competitions catalyze constructive change, encouraging active engagement with the natural world and fostering a commitment to nature conservation.

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757 Curating Interactive Learning Experiences to Create the Next Generation of Young Conservationists

Sarah Jizzini (1)

Programme Goals:

- Shape and encourage the next generation of conservationists, to inform K-12 students of the challenges and opportunities facing the houbara population, and to promote the preventative intervention conservation model.
- Design cross-curricular experiential learning experiences that embrace the houbara as a flagship species and focuses on conservation education topics in authentic contexts.
- Increase a sense of responsibility, confidence and empowerment through participating in active citizenship and taking collective action to resolve environmental issues.
- Initiate opportunities and learning environments which encourage creativity and develop global awareness through outreach activities.
- Foster community values and attitudes by encouraging personal growth and well-being through direct contact with nature..

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Conservation and Education Professionals Working Together. How Lessons Learned During Covid Have Informed and Energised One Environmental Education Programme - Engaging the Expertise and Energy of Conservation Professionals has Connected and Involved Young People and Their Teachers in a Pan African Perspective on Biodiversity and Nature Conservation

Penny Fraser [1]

The world is experiencing an extinction crisis. The conflict between humans, wildlife and ecosystems exists in many forms, with many causes, but lack of information and engagement are major contributing factors. PACE, the education programme of Tusk, a UK based conservation charity has brought conservation and education professionals together to inform, engage and energise teachers and learners. Tusk supports forward-thinking wildlife conservationists across Africa, 79 partner projects in 23 countries in 2022. It builds long term relationships with partners, working hard to build knowledge sharing, collaboration and exchange between conservationists working in different communities, ecosystems, and cultures. PACE, which addresses human aspects of conservation as much as non-human, is privileged to be able to draw on this network of conservationists in the support it gives to educators.

PACE provides educational materials, activities and training to teachers, schools, NGOs and education centres. It was founded with a goal of sharing simple solutions to common environmental problems, sharing learning. The PACE pack, first produced in 2006, was central to this, a set of multi-media educational materials arranged in chapters: Soil, Water, Trees, Energy, Living with Wildlife, Urban Living and Living by the Ocean. It contains a beautifully illustrated reader, with background information, case studies and activities; 33 short films illustrate the case studies; 90 action sheets explain how solutions featured can be put into practice, plus an educator's guide and poster. More than 1.25 million people have benefitted from PACE materials, which have been shown to inform and change behaviours towards the environment.

When Covid stopped people meeting we discovered that on-line events were possible and effective, even in some very remote and under-resourced areas. We organised virtual visits and live webinars. Professional conservationists gave presentations on their work, from Ghana, Uganda, Kenya, Zimbabwe, Mozambique, South Africa & Madagascar. Participants were equally spread. Giving young people and teachers, from their homes, schools and education centres, direct contact with experts was powerful. Children asked some direct and challenging questions. They also revealed gaps in knowledge and teaching, like strong awareness of local issues but less of wider perspectives. Children on the coast knew about sea turtles and mangroves, their place in a global picture, but not why species and habitats elsewhere were important: children in Uganda not realising gorillas didn't live everywhere; teachers not realising they could use local food chain examples.

As a result, we built on these virtual events by co-writing new content with our experts. Use of these resources has resulted in new networks, facilitated by PACE, energised by conservationists, in demand on the ground. One vulture network

has school clusters in South Africa, Kenya and Nigeria, kids have visits from experts, up to date printed materials, share video and network with each other.

Our learning during Covid helped us re-set and refresh, reshape the PACE pack and wider programme. We are introducing more digital, more facilitation and connecting. Our conservation partners are busy people, focused on other priorities, to get them involved we do the groundwork, acting as impact enablers.

Keywords: conservation education community, pan-African, networks, multi-media, collaboration, African education, African conservation education, enabling impact

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760 Nurturing Youth Leadership in Green Transition

Katre Olmez (1)

In a time marked by increasing environmental challenges and the urgent need to shift towards a more sustainable global economy, the concept of "green jobs" and "green skills" has taken center stage in the realm of education. As the world contends with the pressing issues of climate change, resource depletion, and social inequality, the idea of green jobs presents an essential avenue for tackling these complex issues.

The Ban Ki-moon Centre for Global Citizens, with years of expertise in Global Citizenship Education and Education for Sustainable Development, is actively contributing to the global efforts of equipping the young generations with skills necessary for the green transition. We believe in the power of youth and green jobs to solve the climate crisis and accelerate action for the Sustainable Development Goals and the Paris Climate Agreement.

In December 2023, at the RewirEd Summit held at COP 28 in Dubai, the Ban Ki-moon Centre, supported by Dubai Cares and together with Unbounded Associates and Plan International, presented the "Your Future in Green Jobs" Online Course. The goal of this course is to provide an engaging and accessible educational platform for young people who are concerned about the environmental challenges our world is facing. The course aims to empower youth to connect their passion, interests, and skills with meaningful careers that address climate change head-on.

In conjunction with that, in 2024, the BKMC will support and mentor around 20 young changemakers who want to apply their green skills gained from the online course and put them into practice. They will receive mentoring by professionals in the green job sector, place themselves at the heart of climate action by implementing an SDG Micro-Project. These micro-projects aim to tackle one or more of the SDGs in their communities and lead to a better greener future.

Green transition needs skilled and empowered young people, and with this program the BKMC and its partners are making a significant contribution to unlock passions and skill sets of youth and place them at the heart of climate action to lead the transition to a greener economy and a sustainable future.

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How to Develop and Deliver Tailored Educational Content to Initiate a Sustainability Habit-change Journey?

Walaa Hirzallah[1], Huda Masalmeh[2], Toka Ahmed[3], Ounsi El Daif[4]

This study explores the methodologies employed by Eedama in developing and delivering educational content for school students. These educational extracurricular learning experiences aim at fostering a transformative shift in behaviors related to environmental awareness and sustainable actions. The lack of universal understanding of the roles and responsibilities of individuals and societies regarding climate action has prompted Eedama to carry out a study to ameliorate the impact of its services provided. Over the course of 60 months, Eedama conducted a series of workshops, engaging a diverse audience spanning all school ages, with the primary objective of instigating meaningful and lasting behavioral change.

The key components of Eedama's approach encompass tailored educational content, interactive learning experiences, and targeted outreach efforts. The importance of understanding the varied demographic characteristics of the audience to tailor content effectively is highlighted. Moreover, the study will discuss the role of innovative and engaging methodologies in capturing the attention and interest of participants, ultimately enhancing the efficacy of the educational interventions.

The ongoing study will demonstrate feedback from recipients on how the sessions received affected certain behaviors carried out in daily life practices at work, school, home, or in general. Moreover, the feedback from instructors on their content amendment and the reasons behind it will be presented.

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765 THE EARTH PRIZE - School Teams Around the World Competing for Innovative Solutions to Sustainability Problems

Angela McCarthy (1)

This competition challenges teenage students to identify and solve specific environmental sustainability problems, mainly focusing on the third leg of the Triple Planetary Crisis: Pollution and Waste.

Since starting in 2021, three editions of The Earth Prize have engaged thousands of solution-minded high school students in 154 countries and generated nearly 2,000 project submissions. Feedback from teachers and participants asserts that students rolling up their sleeves and solving problems replaces eco despair with the power of hope for a better future for them and the planet.

The Earth Foundation founder, Mr Peter McGarry, provides the $100,000 prize money for the winning entry, split between the student team and their school. Three runner up teams earn $25,000 each for their school's environmental studies programs along with an educator of the year prize of $10'000 that Professor Mario Salamone presents. Financial incentives for schools and students can power EE too, says Angela!

Once a school registers for the competition, assigns a teacher to oversee the teams of up to five 13-19 year olds, The Earth Foundation provides free environmental science learning videos and textbooks. While working on their submissions, the students have access to advice from 50 university student mentors through the foundation's platform. This is project-based learning on a global scale.

Teams from schools as diverse as elite private institutions in Europe and refugee camp schools in the Near East compete on a level playing field.

An Adjudicating Panel of world renowned experts in science, the ESGs, entrepreneurship and finance select the winning entries. The selection criteria are originality, effectiveness, scalability/ repeatability, and commercial potential.

The winning team in The Earth Prize 2022 was three girls from Hanoi, Vietnam who may well have invented the world's first biodegradable female sanitary pad via the novel solution of using dried dragon fruit peels as the absorbent core, in a world where tens of billions of non biodegradable plastic pads wind up in landfills every year. The "Adorbsies" pads have attracted venture capital for development and commercialization.

Last year, the winning team was four girls from southeast Turkey concerned by water waste.

They created a device which attaches to laundry machines and recycles and purifies 90% of the 50 litres of waste water in every load of wash. They are in discussions with Turkey's largest conglomerate about a licensing deal.

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Empowering the Future: Integrating Education and Behavioral Change in Abu Dhabi's DSM Strategy for Sustainable Energy Management

Amna Almheiri (1)

In the quest for a sustainable future, the role of education, particularly in shaping the mindset of the younger generation, is crucial and is an important part of our work at DoE.

The Abu Dhabi Demand Side Management and Energy Rationalization Strategy 2030, developed by DoE, aims to reduce electricity and water consumption by 22% and 32% by 2030. It consists of nine programs managed by various government entities, with the DoE responsible for overseeing the strategy's implementation and progress.

Governments are increasingly using behavioral sciences to improve the effectiveness of policy making. A better understanding of behaviors can indeed help encourage the uptake of energy efficiency measures and appliances and increase policy compliance. Behavioral change can support short term goals as during the energy crisis around the world sparked a rapid roll out of energy saving campaigns as well as long term goals which is the focus of today's presentation.

This presentation, titled "Empowering the Future: Educating Children for Sustainability, DoE Abu Dhabi's behavioral change program" is focused on the nexus between education and Demand Side Management (DSM).

The initial part of the presentation introduces the audience to DSM, the Abu Dhabi DSM Strategy, and the ambitious targets set for electricity and water savings. Emphasizing the importance of behavioral change, this section also sets the stage for understanding how education can serve as a catalyst in this paradigm shift. The link between Education for Sustainable Development (ESD) and DSM is examined, highlighting the reciprocal relationship between sustainable practices and educational initiatives.

The main body of the presentation highlights the methods, initiatives, and tools implemented by the DoE to foster energy-efficiency awareness and practices among children:

- Arguably our biggest piece of work in the context of greening education relates to the reshaping of curriculums to incorporate energy efficiency principles, ensuring that children are equipped with the knowledge and skills needed for a sustainable future.
- Efficiency kits were designed for school children to teach them about energy and water efficiency and sustainable practices. The kit includes interactive learning materials and efficient items and nudges. to emphasize the impact of everyday and low-cost efficient items (for instance efficient bulb and shower heads) to facilitate hands-on learning experiences, fostering a deeper connection with energy efficiency.
- Awareness sessions in schools and social clubs across the Emirate and with the different community events and social stakeholders highlight the collaborative efforts in promoting energy efficiency education.
- A key element of the presentation is the exploration of an innovative educational game, designed to engage children in energy efficiency principles in a fun and interactive manner. This segment underscores the importance of making the learning process dynamic, memorable, and enjoyable for young minds.

The final part of the presentation is dedicated to an in-depth awareness session, offering a platform for immersive discussions and presentations.

We hope this will inspire and guide other nations and organizations towards a greener, more resilient future.

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