



Remarks and Abstracts of the First Sustainable Globe Conference 2021 [†]

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Abstract: The First Sustainable Globe Conference 2021 was held virtually from 8 to 10 September 2021. The partner organizers were Martin-Luther-University Halle-Wittenberg from Germany, RootsGoods Private Limited from India, and the Vriksha Foundation from Nepal. The theme of the conference was sustainability for climate action. The focus topics of the theme were education, agriculture (nutrition), urban and rural development, and natural and cultural resources management. Abstracts were submitted from 20 universities in 13 countries. In total, 69 registrants attended the conference, and 29 papers were presented, of which 4 were poster presentations along with 10 invited and keynote speakers. The presentations were either in English or Spanish (with English subtitles and/or live translation). The conference was divided into two plenary sessions—first, education; and second, natural and cultural resources, urban and rural development, and agriculture. In the education session, most of the discussion was related to environmental education to improve environmental literacy in all age groups. The project-based education, along with formal and informal teaching and educational methodologies, was discussed. For the second plenary session, the discussion was mixed with protecting natural and cultural resources by promoting scientific applications and public participation in citizen science. However, the final remark was guided by one of the keynote speakers, who highlighted the importance of spirituality in sustainability, and how the discussion of spirituality is lacking in the public discourse on sustainability. Therefore, the conference aimed to develop future themes regarding sustainability by not missing the critical aspect of spirituality. The context of spirituality here was defined as approaching problems as not being separate from our existence but, rather, a part of our existence and, thus, in addition to applying scientific, technical, didactics, and engineering solutions, also applying attitudes, values, and beliefs toward the problem matter. To elaborate on these remarks, this issue presents the abstracts of the presented papers in the conference, while the keynotes and entire session can be revisited on the YouTube channel of RootsGoods Private Limited.

Keywords: education; environmental education; agriculture; natural resources; cultural resources; rural development; urban development; climate action; sustainable development; spirituality



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1. Oral Presentations in English

1.1. Interpretation of Reality and Transformation of Environmental Contexts

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Transforming non-viable environmental contexts for life depends largely on individuals' interpretation of reality. In this regard, education plays a relevant role in the

development of students' views. Therefore, this paper aims to illustrate different interpretations of reality promoted in some educational proposals. The interpretations of reality might consist of different levels of complexity. According to this complexity, individuals assume responsibility, possibilities, and commitments with regard to environmental phenomena with greater or lesser scope. Thus, the most elementary view of the environment is from a single discipline. The next complexity level describes ecologies of knowledge. Thus, individuals interpret and intervene in the environment from a multidisciplinary or interdisciplinary perspective. Finally, the inter-epistemological ecology constitutes the most complex interpretation of reality. From this last possibility, individuals establish connections between knowledge and ways of knowing belonging to different cultural traditions. Methodologically, this work is a qualitative and descriptive study of cases. The selection of cases depends on the level of interpretation of reality promoted in each proposal. The analysis consists of a case description as either (a) disciplinary, (b) multidisciplinary, (c) interdisciplinary, or (d) inter-epistemological. The results describe cases in which the educational community interpreted reality through (a) chemistry, (b) all subject matter, (c) art and science as interdependent languages, and (d) fishers' traditional knowledge and science. In conclusion, it is possible to interpret reality from different relationships between forms of knowledge, which potentially guides human action. However, environmental education also depends on a self-eco-organized curriculum.

1.2. Sustainability of Attariya Small Towns' Water Supply Scheme, Kailali District, Nepal

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This paper presents the overall sustainability of the Attariya water supply system (WSS), along with the possible linkage between the present and the use of alternative water sources. Primary data were collected through household questionnaire surveys, key informant interviews, field observations, and microbial water quality analysis. The data analysis was carried out using a multicriteria approach, considering five criteria of sustainability (technical, reliability/risk (environmental), social, organizational, and financial), for which the corresponding weightages for sustainability criteria, respective indicators, and sub-indicators were assigned based on literature review and expert consultations. The Attariya WSS obtained an overall score of 77.4%; however, it failed to obtain more than 70% in the financial sustainability dimension, which made the entire WSS "sustained but at risk" when compared with the WaterAid Nepal WSS sustainability index. The alternative water sources, such as hand pumps and tube wells (97% of alternative sources), were mostly used for agriculture and livestock (77.61%), followed by cleaning (13.43%). The availability of alternatives to piped water supply has influenced the household water consumption from the WSS, directly influencing the tariff collection and, ultimately, the profitability of the system. The calculated lesser per capita water consumption during summer and winter shows the underutilization of the water supply system, as it was designed for 112 L per capita day, which could be linked to the availability of alternative water sources. Solving underutilization and unaccounted water use to expand the WSS coverage could lead to improving the WSS's profitability and strengthening the financial situation.

1.3. Citrus Farmers' Resilience Actions for Adapting to Climate Change, and the Role of Agricultural Knowledge and Innovation Systems (AKISs)

Esmail Karamidehkordi, Seyed Abdolhamid Hashemi-Sadatia, Seyed Hossein Mirmousavi, Yahya Tajvar

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This paper aims to investigate what resilience mechanisms and actions citrus farmers have used to adapt to climate change—particularly for responding to freezing stress and low temperatures—and what services agricultural knowledge and innovation systems have provided. The study was conducted through a case study using focus groups with citrus farmers, agricultural extension agents and specialists, and agricultural researchers in

the North of Iran. Citrus farms are damaged by and vulnerable to the extreme cold and freezing stress during winter. Farmers are exposed and sensitive to this stress, but have tried to use various mechanisms that are both local and introduced by extension agents or other knowledge and innovation systems' actors to respond to this crisis. Most farmers' actions tended to apply "response mechanisms" when faced with low temperatures and freezing stress, rather than applying mitigating, recovering, and preparing activities in the pre- and post-crisis phases—for example, using varieties resistant to low temperatures, or taking preventive actions for reducing damage to trees. Farmers have received information from various key actors—including extension agents, through extension training courses, meetings, workshops, mass media, and electronic networks—and exchanged it with other farmers; however, they still need appropriate innovations to enhance their knowledge and increase their resilience. The results can help agricultural knowledge systems' policymakers and researchers of farmers' behavior and needs to respond to climate change, and enable them to improve the resilience mechanisms and behavior of farmers through knowledge and innovation interventions—particularly through agricultural extension and advisory services.

1.4. Modelling Climate Risks to Rainfed Crops in Karnataka (India) for the 2030s Using Rainfall Projections and Crop Climate Thresholds

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In Karnataka, agriculture is the key contributing sector for the state's economy. Despite its importance, agriculture in the state is limited by the availability of irrigation (only 31.2%) and uncertainty in rainfall distribution. These factors greatly hamper the agricultural productivity of the state. A study assessing climate risks likely to emerge owing to climate change during the short-term period of 2021–2050, termed the 2030s, was undertaken for districts growing rainfed maize and groundnuts. The study establishes that districts will experience an increase in the number of rainy days, in Kharif season rainfall, as well as in extreme weather events (high- and very-high-intensity rainfall events). Risk analysis carried out using crop climate thresholds illustrates that for the 2030s in Karnataka, there will be no single dominant climate risk for all of the districts or the crops in the state. The rainfall during the maize growth period will primarily be lower than the optimum required at different phenophases, while it will be higher than the optimum required during the various phenophases of groundnuts, indicating an increase in rainfall variability and, hence, variability in yields. The findings of this study underscore the importance of assessing climate risks at the district level for all crops in all of the states practicing rainfed agriculture.

1.5. The Role of Woozen in Maintaining Eco-Sustainability

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Woozen is an important and vital material. It plays a role in maintaining eco-sustainability as a material used in the design of structures, frames, coverings, and finishes of buildings from the outside and inside, as well as structural foundations. This material is a form of premium eco-wood. The value of Woozen arises from its natural properties and specifications as a building material. It plays an important environmental role, as its availability enhances the opportunities for its investment in commercial activities. The variety of applications of Woozen in several internal and external uses in different climates and structures—including roofs, walls, floors, and coverings—makes it useful for the environmental sciences, with the potential for integration with technology in the future. Woozen is renewable, recyclable, and environmentally degradable, without contaminants. It also helps send the message that eco-materials are important products of our time. The aim of this paper is to discuss eco-sustainability design where new materials and designs have outperformed their original roles. This is evident in the convergence between the most powerful and

widespread eco-materials and the role of Woozen in maintaining eco-sustainability. The paper concludes with the integration of the methods of digital implementation mechanisms with the vocabulary of eco-sustainability design. The paper ends with a summary, results, and recommendations.

1.6. Functionalization of ESD—An Attempt at Critical Education for Sustainable Development (ESD)?

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The aim of school is to contribute to the preservation of the Earth in an interdisciplinary way within the framework of ESD, and to develop awareness of planetary boundaries and the role of human economic activity, as well as social justice. The Educational Standards in Geography for the Intermediate School Certificate state that by dealing with natural as well as economic, political and social contexts in different regions of the earth, pupils acquire important competences for these areas. Due to its contents and functions, the subject of geography is particularly committed to Education for Sustainable Development and Global Learning. This calls for enabling learners to understand, recognize, evaluate, and act in a sustainable manner in complex systems in order to meet current and future challenges facing humanity, including sustainable climate protection. The German-language ESD discourse to date has been primarily normative. From an ethical perspective, the question arises of the instrumentalisation or functionalisation of education for the purpose of achieving the goal of sustainable development. At this point, does the concept of education stand as value-neutral, individual, critical, and open-ended, or does it focus on a specific goal—that of sustainable development? How much individual freedom in critical thinking remains in the search for sustainable problem solving in the context of collective desirability? Using sustainability for climate action as an example, selected analytical results are presented.

1.7. Education, Responsibility, and Sustainability—How Prospective Teachers Reflect on the Pedagogical Paradoxes of Sustainable Education

Jochen Laub

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Current approaches in education for sustainable development and the ideas of transformative education also focus on the importance of a reflective approach to sustainability values and ethical judgment in sustainability issues. Literature observations show a distinction in the orientation of education for sustainable development between an understanding of education for sustainable behavior (ESD I), or education for a reflected awareness of the value of sustainability (ESD II). Teachers are of central importance in the implementation of education for sustainable development. In particular, their understanding of education and sustainability is essential for their pedagogical practice. With regard to the implementation of ESD, one can ask how teachers deal with the normativity of sustainability or with the pedagogical antinomies that are implemented in the concept of ESD. The presentation shows the results of a qualitative study that looks at how prospective teachers integrate these paradoxes into their conceptions of ESD. Particular attention is paid to the relationships that are established between the terms education, responsibility, and sustainability.

1.8. Scientific and Traditional Ecological Knowledge as a Necessary Dialogue to Face Socio-environmental Issues: A Case Study in Bahia, Brazil

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Intercultural science education has immediate and important milestones, such as intercultural dialogue. From this perspective, there is a need to understand science as a knowledge system that can and must engage in dialogue with other systems to promote intercultural attitudes in the classroom. In this context, we present an experience developed

in the northeast of Brazil, with two farmer villages in the state of Bahia, where it was possible to promote educational interventions relating structural concepts in ecology and the traditional ecological knowledge of students and farmers from the community to create teaching–learning sequences aimed at approaching socio-environmental issues present in the community. We note that this kind of approach has an important component of philosophical and ethical discussion, because in the process of dialogue it is necessary to problematize the nature of science, the relationships between knowledge systems, and the role of scientific and traditional knowledge in searching for answers to environmental issues in society. In conclusion, it was possible to develop teaching–learning materials and activities in intercultural dialogue to face and solve socio-environmental situations within the daily life of those two villages, developing a more critical view of knowledge relations and a more complex approach to the environment, bearing in mind the cultural, historical, ecological, political, and economic dimensions.

1.9. Analysis of Formal Institutions in the Knowledge and Innovation System of the Handmade Carpet Industry

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Handmade carpets are among the most well-known handicrafts all over the world, and represent inherent patterns of the customs, religious beliefs, history, and social aspects of the areas in which they are produced. Handmade carpet production is important for these nations' economies and rural livelihoods. The stability and development of this industry requires the existence of effective structures and functions in the knowledge and innovation systems (KISs) of the handmade carpet industry, which itself needs appropriate formal institutions. This research aims to identify the formal institutions—consisting of laws and regulations, bylaws, memorandums of understanding, guidelines or procedures, instructions, and organizational constitutions—in the Iranian handmade carpet industry. The data were collected through document reviews and semi-structured interviews with handmade carpet industry experts and entrepreneurs, which were analyzed via a mixed methodology of grounded theory and multistage thematic analysis. The results indicated that institutions of this KIS were categorized based on seven main functions of the system, consisting of “knowledge creation”, “knowledge diffusion” “research orientation”, “resource mobilization”, “creation of legitimacy”, “market development”, and “entrepreneurial activities”. Concepts related to KISs were drawn in the format of a matrix of core categories at different stages of production. The highest frequency of institutions was related to carpet production infrastructure and financing at the pre-production stage. Institutions supporting the function of “knowledge diffusion” were the most frequent institutions of the KIS, while a few supported the functions of “resource mobilization” and “entrepreneurial activities”. Most institutions of the handmade carpet production industry were at the national level, and bylaws and instructions were approved in the 1990s and 2000s, while the institutions of the KIS in this industry were mostly related to laws, regulations, and bylaws ratified at the national level in the 2010s.

1.10. Sustainable Environmental Management Issues Associated with Rural Industrialization in Eswatini: The Case Study of Magindaneni

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This paper focuses on the environmental controls administered by the then Swaziland Environment Authority (now the Eswatini Environmental Authority, or EEA) on the establishment of rural industries in the country. The empirical data were obtained by interviewing officials from the EEA and those of the Ministry of Industry, Commerce, and Trade (MICT) responsible for the rural industrialization program. The results of the research indicate that the SEA/EEA was involved in the construction of the physical structures of factory shells in several areas of the country, but not for regulation of the industrial

operations of factories ultimately established in such structures. This was because the government erected the structures as a means of attracting direct foreign investment to the region without any knowledge of the industrial activities that would be accommodated there. The industrial operations in these factory shells were therefore not subjected to any environmental impact assessments (EIAs). Secondly, the SEA faced challenges in monitoring government projects before it became a parastatal in 2002, let alone issues of compliance with the environmental legislation itself. The result was the occurrence of several significant pollution events without a meaningful manner of controlling them, resulting in significant negative impacts on the environment and the people. This paper focuses on the consequences of the establishment of the new industries in factory shells in rural areas of Eswatini, using Magindaneni as a case study.

1.11. Community-Based Gully Rehabilitation Efforts in the Ngcanyini Chiefdom of Eswatini Using Different Sustainable Methods

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Many rural communities in Eswatini experience the consequences of extensive land degradation and soil erosion, with the result that Eswatini loses some 3000 ha of land annually in this way. Given the increasing population of the country and the projections that climate change is likely to decrease the productivity of the land in the future, the country cannot afford such losses if it intends to provide food security for its people into the future.

This project sought to work with the impoverished rural communities of Ngcanyini to address this problem by offering practical alternatives, while at the same time meeting several of the Sustainable Development Goals (SDGs) of the UNCCD.

An opinion questionnaire was applied to a sample of 50 individuals in the community, so as to gauge people's views and perceptions concerning the project, and this also assisted in the discussion with community leaders in terms of finalizing the actual sites to be rehabilitated.

The principal objective of the rehabilitation project was to work together with a local community in Eswatini to bring small catchments that had been degraded (principally by erosion) back into use as productive land for the community. A secondary objective was to demonstrate a range of rehabilitation strategies to communities, enabling them to decide which rehabilitation strategy (or strategies) best suit(s) their needs. It is hoped that the data generated in this way will go some way towards showcasing the options to other communities, thus facilitating an information transfer to other communities within Eswatini.

1.12. Exploring the Relationship between Modeling-Based and Environmental Education: Towards Sustainable Educational Designs

Maria Esther Téllez-Acosta

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Science education research and policy have been increasingly emphasizing students' grasp and actions regarding environmental issues. One way to contribute is with educational designs, which can foster students' favorable discourses around such issues, beyond guiding them to understand scientific content and practices. This paper explores how researchers have addressed environmental education in relation to learning disciplinary ideas and scientific practices—especially scientific modeling. Following a qualitative exploratory methodology, this study aims to search for and characterize studies in which designs that cover this relationship have been proposed or implemented in different settings since the adoption of the Sustainable Development Goals by the United Nations in 2015. The analysis focuses on a few cases to examine the main theoretical elements that embody the designs and the implementation features. Preliminary results show some central patterns in the relationship of environmental education and learning through scientific practices: (a) the development of positive beliefs or environmental attitudes, (b) the development of

scientific knowledge about environmental issues (e.g., climate change), (c) understanding of core disciplinary ideas, (d) understanding the role of models and scientific modeling, and (e) using epistemic tools to explore environmental issues. These results have important implications for the design at two educational levels: At the classroom level, students engage in both disciplinary and environmental discourses when they develop models of particular issues. At the level of pre- and in-service learning programs, it is essential that teachers can learn how to engage with and support students not only to talk about those particular environmental issues, but also to develop actions to make our lives more favorable, respecting all living and non-living resources.

1.13. Long-Term Tea Cultivation as a Cash Crop Diminishes the Soil Organic Carbon Stock in the Eastern Mid-Hills of Nepal

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Land-use type and land-use changes affect the soil carbon pool, with significant impacts on the global carbon cycle. A large area of tea cultivation—a managed perennial monoculture cash crop—is intensively cultivated in the mid-hills of Eastern Nepal. This study aimed to quantify and compare the soil organic carbon (SOC) stock and to assess the variation in soil's physicochemical properties due to increasing tea cultivation. The study was conducted in Kanyam, Ilam district, Eastern mid-hills Nepal. Soil samples were collected from four land-use systems, namely, privately owned tea estates (9 years of cultivation history, hereafter referred to as “new tea estates”), forest land, agricultural land, and government-owned tea estates (30 years of cultivation history, hereafter referred to as “old tea estates”). Four replicate samples were taken in each land-use system at four different depths (0–15 cm, 15–30 cm, 30–60 cm, and > 60 cm). The collected soil samples were analyzed for SOC and other physicochemical parameters following standard methods. Two-way ANOVA and correlation were used to analyze the data. The results showed that the SOC decreased with soil depth in all land-use types. SOC was highest at the depth of 0 to 15 cm, and it was significantly different from the other three depth levels ($p < 0.01$). Soil under agricultural land had higher values of SOC stock (449.475 t/ha), while the lowest value of SOC stock was (434.421 t/ha) for government-owned tea estates (old tea estates). However, there was no significant effect of land use on SOC, while land use had a significant effect on soil moisture, pH, phosphorus, potassium, and CEC ($p < 0.01$). Tea estates' soil had significantly lower amounts of potassium ($p < 0.01$), while agricultural soil had significantly higher amounts of phosphorus ($p < 0.01$). This implies that land-use changes will have implications on soil quality, and this merits further rigorous experiments with appropriate management strategies.

2. Oral Presentations in Spanish (English Translation)

2.1. Environmental Interpretation in Sustainability Processes: Dialogues in the Context of Global Warming

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The perceptions and beliefs that human beings may have about the environment directly influence global climate change. This document seeks to reflect on the environmental interpretations (EIs) of three people (aged 7, 30, and 75 years) from the rural area of the municipality of Landázuri in the department of Santander, Colombia. Each participant responded to an interview to ascertain their EI regarding an environmental problem. The results consisted of analyzing the epistemological construct of the environment of each participant according to their age. The results also consider environmental sustainability content in their responses regarding regional environmental problems. The analysis of the interviews used the concept of EI. EI is a discipline that incorporates the conceptions of citizens in the construction of the idea of the environment. The theoretical framework from inter-epistemology and Buen Vivir (good living) was also used. Among the conclusions are

that (a) the construction of the environmental reality of the participants is fundamentally a personal interest, (b) they did not talk about the environment, but about nature, and (c) although they did not know about global warming, they described the obligations of human beings concerning the preservation of nature.

2.2. *Proposal for Environmental Education in the Otomí Biocultural Memory of the Santa Cruz Ayotuxco Community, Huixquilucan, State of Mexico*

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The community of Santa Cruz Ayotuxco has historical, cultural, and natural wealth, and belongs to the Otomí community. However, the community has lost its identity and indigenous configuration over time. Consequently, there is migration, loss of traditions, devaluation of the land, linguistic loss, and loss of the sense of belonging. Thus, the community is the victim of political clientelism and its indifference. As a result, evident environmental deterioration, modification of the landscape, extraction of flora and fauna, urbanization, and violation of the territory are taking place. This research seeks to recover part of the knowledge of this Otomí community, and some traditional practices rooted in some older members. These practices involve the inhabitants in actions to improve their relationships with their place of origin, recognize the environmental history of the community, visualize the social and environmental problems, and recreate cultural traditions and language. The environmental education proposal seeks the formation of the inhabitants in the knowledge of the elements of nature, the relationships between them and humans, their processes or dynamics, and their useful potential over time. This process would strengthen the values and attitudes of the inhabitants, recreate biocultural memory and identity, and contribute to the sense of belonging to the particular environment.

2.3. *“Siembra tu Espacio” (Sow Your Space). Systematization of the Home Garden and Food Security Experience at the El Minuto de Buenos Aires School*

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This study systematizes the strategy and sequence of initial activities for the reactivation of the “Siembra tu Espacio (sow your space)” project, developed with 7th- and 8th-degree students from the “El Minuto de Buenos Aires” school in the city of Bogotá. This systematization seeks to initiate the reconstruction of the history of the environmental strategies developed in the school. Another objective is to provide the academic community with a reflection on the consolidation of environmental education (EE) processes that teachers can achieve in the classroom. Likewise, this report seeks to inspire other teachers to develop EE strategies and their socialization through systematization. For achieving these purposes, this work describes and contextualizes from (a) the narrative of one of the teachers in the project, (b) a review of written and multimedia materials made by students, and (c) class observations and field notes. The researcher uses these sources to reconstruct the sessions and activities developed with the students. The researcher also describes the reflections made by the students around gardening and food security. Finally, there is a discussion about the strengths and weaknesses detected in the strategy, as well as recommendations for improvement.

2.4. *Environmental Education as a Cosmopolitan Value*

Anya Lis Rodrigues Souza

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The focus of this work is to carry out a theoretical reflection on the value of the cosmopolitanism described by Kant when we think about environmental education (EE), and how EE can be an essential part of the construction of citizenship. This position is a way to contribute not only to environmental knowledge, but also to the socialization of students. This work approaches cosmopolitanism, applying it to education to spread the feeling of

belonging to a global community. This perspective shows that the constitution of humanity is collective, and that it is necessary to reduce the importance of national borders in order to construct a mentality that we are inhabitants of the same world. As a result of full rationality, there is pacification in human relations. Understanding the cosmopolitan ideal helps us to think about how EE is intrinsically linked to such values, since when citizens take care of the environment, they care for the world. Therefore, teaching children to take care of the planet is of the utmost importance, since it helps to develop citizenship, and is a relevant tool for students' physical, mental, psychological, and academic development. Thus, developing an EE project also creates moments where students can develop both intellectually and socially. In conclusion, caring for the environment is closely linked to empathy, understanding that when citizens care for the planet, they provide themselves and others with better, healthier, and happier lives.

2.5. *Freirean Environmental Education: The Importance of Paulo Freire's Pedagogy in Combating the Socio-Environmental Crisis*

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This work aims to analyze environmental education (EE) from the perspective of Paulo Freire. It is essential to incorporate the Freirean philosophy to break the paradigms that intentionally separate human beings from nature. This philosophy is present in *the Pedagogy of Autonomy*, which integrates the human being with nature to reformulate environmental conceptions in any area in the teaching and learning process. When we attack nature, we harm human beings. Therefore, it is essential to highlight the impacts of the environmental crisis on the most vulnerable social classes, oppressed by inequality. When the impact reaches an unstoppable level of environmental degradation, it poses a risk to the planet, depending on technological and industrial demand. Therefore, it is essential to incorporate the complexities of the issue in the educational field and the relationships between oppressor and oppressed developed by Freire in his book *Pedagogy of the Oppressed*, and apply them in EE to mitigate the impacts of the crisis, as the oppressed social classes are more vulnerable to socio-environmental impacts. As an oppressor, the capitalist system that seeks infinite profit needs to exploit nature more and more. A dialogic, critical, liberating, and anti-colonial education, which seeks to break the banking model of education based on market interests, helps to illustrate that it is oppressive to omit fundamental knowledge necessary to understand the role of the individual in the world. This reality is part of the EE in a transdisciplinary way. Therefore, the Freirean approach is helpful to stop the climate crisis and end socio-environmental inequality on the way to utopia.

2.6. *Study of the Environmental Conditions of the Municipality of Fómeque (Cundinamarca) for the Recognition of Diversity and Cultural Differences in Science Teaching*

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This communication addresses how a sociocultural approach to environmental studies can contribute to the generation of teaching content for science classes on food sovereignty and security with the participation of local wise people. The municipality of Fómeque (Cundinamarca), 56 km from Bogotá, in the eastern mountain range of the Colombian Andes, has environmental (i.e., soil, hydrography, and biodiversity) and agroecological characteristics that justify its study. For example, Fómeque has great water wealth due to its proximity to the Chingaza National Natural Park. Likewise, the municipality's conditions favor agricultural production, and make it an agricultural pantry for the country. Therefore, the methodology implies a sociocultural approach to environmental studies, which includes the stages of (1) design of the instrument for collecting ethnoecological information, (2) systematization of the information, and (3) making the information available. As a result, the designed instrument allows us to glimpse the potential of the municipality's biodiversity to respond to the scenarios proposed by SDG 2 (zero hunger) and SDG 4 (quality

education). In addition, these results can be part of educational innovation processes that promote dialogue between local and academic knowledge. The success in dialogue is in linking traditional local and academic communities to science teaching practices.

2.7. Equity and Educational Quality: Analysis of Concepts from the 10-Year Education Plans Applied in Colombia

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Equity and quality as totalizing concepts and goals of the educational systems of all of the world's nations have been the source of inspiration and discussion for many educational researchers. However, educational quality runs out of ground if one does not think about teaching quality, understanding its implications, and the globalization of quality towards social issues such as environmental, political, and economic issues. This document seeks to trace notions of quality and equity using the analysis of theoretical documents—mainly the national education plans proposed in Colombia since 1996 under the order of Law 115 of 1994: plan 1996–2005, plan 2006–2016, and plan 2016–2026. The research question is how, from the perspectives of the 10-year education plans, is educational quality sought in Colombia, and what role do teachers play in the construction of equity and quality? The results identify teachers' difficulties, such as labor stigmatization in the educational system. The qualitative analysis makes evident that institutionalization sees education in Colombia as a path for social transformation towards equality. However, since education does not consider the realities of social groups, it only focuses on the economic development of a part of society. This approach leaves out social equality and the reflection on the reality of each subject–student and subject–teacher relationship within the social fabric and, therefore, their influence on its transformation.

2.8. Eco-Restaurants: An Alternative for Food and Nutrition Security

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The eradication of hunger in the world is one of the main objectives of developing the new millennium. Thus, techniques such as urban agriculture (UA) contribute to reducing the problems of world hunger and malnutrition. This document focuses on interpreting the contribution that eco-restaurants can make to food and nutritional security. For this reason, this study takes up the experience lived with the eco-restaurant “La Cocina”, located in the municipality of Girardot in the department of Cundinamarca, Colombia. The eco-restaurants link the theoretical foundations of UA in their culinary practices to optimize the use of electricity, water, and organic waste to convert restaurants into environmentally sustainable places. The experience analysis allows us to conclude that (A) the eco-restaurant is a means of social interaction where diverse knowledge converges to improve nutrition in everyday life, (B) the optimization of organic waste for compost production is a technique that generates excellent economic and environmental benefits, and (C) local customers receive the menu prepared with the plants grown in the “La Cocina” restaurant very well.

2.9. Scientific and Environmental Education through Innovations That Promote Dialogue between Academic Scientific Knowledge and Traditional Local Knowledge with the Participation of Local Wise People

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This document presents the proposal “inclusion and recognition of diversity and cultural difference in science education, through educational innovations that foster dialogue between academic scientific knowledge (SAK) and traditional local knowledge (TLK) in and for rural communities. Case studies: Fosca and Fómeque”. The question is, through what theoretical and methodological categories is it possible to design and implement educational innovations in science education that foster dialogues between

scientific academic knowledge (SAK) and traditional local knowledge (TLK) around food sovereignty and security from interdisciplinary approaches (e.g., educational, social, and environmental)? The project involves educational institutions in the rural sector of the municipalities of Fosca and Fómez in Cundinamarca, Colombia. The theoretical framework considers an intercultural perspective in science teaching. The methodological approach is qualitative. The process follows 4 stages and 16 phases. First, as a pedagogical strategy for implementing innovations in the classroom, the Intercultural Communities of Practice assure the inclusion of the community, its traditional local knowledge, and the school. The study uses theoretical and methodological perspectives and open educational resources for scientific education that fosters dialogue between SAK and TLK in and for rural communities. Finally, the project seeks to transfer its results to the training of professionals in the environmental and scientific education fields.

2.10. Background Review: Renewable Energy Education from the PBL Perspective and the STS Approach

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This work describes the background of renewable energy education (REE) and its approach from project-based learning (PBL) and the science, technology, and society (STS) approach. The study analyses 220 articles through the informational bibliographic mapping methodology. Of the total number of articles, 100 refer to the primary research trends in REE, 70 articles describe guiding aspects for citizen education through REE with an STS approach, and 50 articles describe the main perspectives of PBL in REE. The criteria for selecting the articles emerge from the most general purposes of REE from the STS and PBL approaches at all levels of training, including empirical and reflective articles. As a result, the following aspects of the teaching–learning process of renewable energies are relevant: (a) teacher training; (b) practice-based and interdisciplinary teaching methodologies (e.g., socio-scientific issues, problem-solving, excursions, discussions, projects, laboratories); (c) teaching materials (e.g., readings, images, videos, animations, educational kits, web-based tools); and (d) curriculum and public policies. Other results indicate trends for the design of innovative educational proposals in the REE from the STS and PBL approaches. The conclusion highlights the need to deepen the perspective of projects in REE, considering their characteristics, stages of development, perspectives, and orientations of the STS approach.

2.11. Development of a Sustainable Energy Matrix Project (MESUS)

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This project aimed to design, develop, integrate, and build technologies intended to promote the formulation of a sustainable energy matrix model (MESUS), according to the feasibility of the materials. The MESUS focuses on local social development, and makes constructive interdisciplinarity possible, bringing together IFSP Itapetininga students in lines of research and development aimed at the self-sufficiency of the campus itself. The initiative was intended to join the existing lines of action and/or present innovative and technological prospects whose purpose is to cover the needs and reduce the maintenance costs of the campus, specifically in terms of energy. The main objective of this project was to promote a survey of the areas that generate the highest costs for the campus through simple, cheap, and viable technologies, designing an energy matrix to be built gradually according to the availability of material resources. In its execution, eight new scientific initiation projects started, and they can be used and disseminated in needy communities and the homes of low-income families. Not only the campus, but also these families, can receive energy, gas, lighting, and sources of food through simple initiatives and technologies whose materials are primarily recyclable.

2.12. The Inequality behind the Complexities of the Socio-Environmental Crisis, and the Need for an Enlightening and Democratic Environmental Education

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This work aims to synthesize a set of qualitative studies that show how the environmental crisis, driven by the constant search for infinite capitalist profit, affects the less favored classes with extraordinary cruelty. The capitalist system and its agents who own capital are the leading exponents of the environmental crisis, based on the rampant extraction of natural resources to satisfy an unstoppable technological demand. We take a journey from the construction of the capitalist ideal in the Industrial Revolution, which marks the beginning of the exponential growth of environmental degradation. Next, we pass through the 20th century, where the development of environmental disasters and the beginning of global discussions on the subject are notorious. Finally, we come to the 21st century, highlighting how the global concern about the environmental crisis was not enough to stop it. We point to examples that illustrate that the less favored classes are more deeply affected by environmental disasters. Examples of this fact include the Dust Bowl, the use of toxic agents in the Vietnam War, the contamination of rivers in Brazil and its links with international mining companies, and the COVID-19 health crisis. We conclude that it is essential to deepen the environmental complexity so that we have a critical and liberating education. This education understands large companies as oppressors of the less favored classes, cruelly affected by the growth of the environmental crisis—the main threat to human civilization.

3. Poster Presentations in English

3.1. Wilderness Education in the Context of Education for Sustainable Development (ESD)

Anne-Kathrin Lindau

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In the 21st century, humanity is presenting the Earth with major global challenges, such as climate change, soil degradation, and loss of biodiversity, which are impressively demonstrated in the planetary boundaries model. The concept of ESD is considered to make an important contribution to solving these challenges, as its content relates to the 17 Sustainable Development Goals (SDGs) anchored in the 2030 Agenda. In search of possible concepts to implement ESD, the approach of wilderness education shows potential. Wilderness education focuses on the experience of wild nature, with the aim of promoting the understanding of complex systemic relationships to critically reflect upon their basis in sustainability issues, and to discuss the possibilities and limitations of more sustainable actions. Wilderness education deliberately imposes a detachment from learners' everyday lives for a defined period, whereby the participants live in wilderness camps under simple conditions. Wilderness camps are in areas where nature can develop freely, without human intervention, and natural dynamics can be experienced. Examples include wilderness development areas in large protected areas (e.g., national parks), but also former military training areas and (sub)urban wastelands or wild gardens. Spending time in wild nature offers the potential for breaking up daily routines, and offering emotional experiences of the power of nature, as well as one's own freedom and the associated "wildness", with a reference to the SDGs.

3.2. Whole Institution Approach of the Catholic University of Eichstätt-Ingolstadt

Anne-Kathrin Lindau

Catholic University of Eichstätt-Ingolstadt, Eichstätt, Germany

Business enterprises, municipalities, and educational institutions have a global responsibility to contribute to climate protection and other sustainability goals. Universities have an outstanding accountability in this regard. On the one hand, universities generate scientific knowledge on climate issues, and on the other hand, they prepare future decision-

makers for their future role in society. In the search for solutions, the whole-institution approach is a promising concept. The Catholic University of Eichstätt-Ingolstadt (CU) pursues a whole-institution approach and orients itself towards the guiding principle of sustainability in six fields of action: governance, research, teaching, campus management, student initiatives, and transfer. The CU strives to establish education for sustainable development. This requires close integration of research and teaching, and can only be truly successful and credible if the entire university campus itself is actively committed to sustainable development. The comprehensive sustainability concept for 2020–2030 builds on the first concept from 2010, and outlines the development goals until 2030. The framework aims to consolidate and further develop measures that have already been implemented, and to define new goals for the next 10 years until 2030, taking into account new scientific findings and previous experience. The annual sustainability program according to EMASplus provides the framework for the sustainable development measures to be implemented at KU. Since 2012, the annual sustainability report has recapitulated the goals, achievements, and examples of increasing sustainability at KU in the fields of action. With this level of implementation, KU is among the most sustainable universities in Germany.

3.3. The Impact of Medicinal Plants on Sustainable Rural Ecosystems in Western Ghats of Karnataka

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RootsGoods Private Limited

The medicinal plants grown in tropical evergreen forests are used to treat disease and pest infestations afflicting cows and sheep in the region. Traditionally, this knowledge is confined to particular families of the region, and is not effectively used even by the people of the same region. Researchers listed the disease and pest data against a panel of medicinal and aromatic plants grown in the tropical evergreen forest of Karnataka. The panel data after the quantitative analysis showed the effectiveness of the usage of these plants on the diseases in question, which could be increased twofold (200%). The data used in this research were collected from 250 local families or individual experts who use this traditional knowledge to solve problems arising in the animal husbandry sector.

4. Poster Presentations in Spanish (English Translation)

Sustainable Development Goals, Cross-Cutting Projects, and Didactic Content Knowledge in Chemistry: A Reflection of the Past, Present, and Future in Search of Educational Quality in the Natural Sciences

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The Latin-American educational systems, including the Colombian one, result from international dynamics that seek the growth and competitiveness of their societies. Therefore, educational quality is an indicator of the strengthening of society by guaranteeing the development of learning, personal, and social skills of students, allowing them to act in a democratic, peaceful, and inclusive manner (Ministry of National Education, MEN). The MEN reports highlight the growth in the synthetic quality index, arguing for the application of spaces for pedagogical discussion, promotion of bilingualism, and continuous teacher training programs, among other strategies. However, the literature maintains that, since the 1970s, education has not departed from excessive centralism, equity and quality are lacking, and there is little autonomy and minor participation in the educational community. Considering education from a systemic approach, and viewing the teacher as a subject who transforms the social fabric, this document addresses the following question: how is the educational quality in natural sciences influenced by the trans-disciplinarity between the pedagogic content knowledge (PCK) of chemistry teachers, the Sustainable Development Goals (SDGs), and educational environmental projects (EEPs)? The methodology is qualitative and descriptive, and analyzes articles specializing in science education.

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