United in Biodiversity: Research Project

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Introduction

Climate change and global sustainability issues are widely acknowledged and discussed around the world. Despite substantial efforts, the world continues to face significant challenges in achieving environmental sustainability. The United Nations (UN) addresses global environmental issues while acknowledging that poverty and lack of basic human rights must be tackled with strategies that promote health, education, equality, and economic growth. This is seen in their Sustainable Development Goals (SDGs) (*Transforming Our World: The 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs*, n.d.). The comprehensive and wholistic perspective adopted by the UN is essential for the effective transition into a greener future. This approach includes the integration of environmental education into the schooling systems to educate the younger generation, thus ushering in a more environmentally conscious population that can inflict change and educate the older generations to accelerate the necessary changes. This is just one component among a broad and inclusive strategy that the UN has employed. The United in Biodiversity research project focuses on the effective integration of environmental education into the schooling curricula and classroom. Specifically, this paper will outline the targets and relevant literature of the existing practices and policies in the EU and in Greece specifically. Governmental and administrative knowledge and practices are compared to the reality of individuals in local schools and communities. Data collected for this paper provides a unique and in-depth analysis of the discrepancies between official policy and the realities of teaching and learning in Greek schools. Furthermore, this paper highlights the current advantages and limitations for integrating environmental education into Greek schools.

The project is funded by ERASMUS+ and the EU. The ERASMUS+ program is an EU initiative that funds education, training, youth, and sport projects. It has a broad scope, aiming to foster European cooperation and mobility in these areas. It funds a diverse range of projects, including those that promote innovation, exchange, and cooperation between different countries. The United in Biodiversity project received funding through ERASMUS+ to support a 3-month practical job shadowing experience at a Greek primary school. This funding enabled the student to gain firsthand experience in the realities of implementing environmental education in a Greek school, contributing valuable data to the research project. The United in Biodiversity project aims to deliver comprehensive reports and analyses of the EU schooling system, informing policy makers and promoting the integration of environmental education into society.

Literary Review

The UN's SDGs comprise 17 global objectives addressing social, economic, and environmental challenges. SGD13 aims to limit global warming to well below 2 degrees Celsius and pursue efforts to limit it to 1.5 degrees Celsius. This involves building resilience to climate change impacts, such as extreme weather events, sea-level rise, and droughts. Additionally, it aims to mainstream climate change considerations into all relevant policies and planning processes such as education, urban development, etc. SGD13 pinpoints a major overarching goal of this research project, however it is supported by many more SGDs which are relevant to sustainability, biodiversity, and climate change:

> **Goal 6: Clean Water and Sanitation** – Aims to guarantee access to safe and clean drinking water for all, reduce water scarcity, and improve water quality. This should be achieved by minimising the discharge of pollutants into water bodies, such as industrial waste, agricultural runoff, and untreated sewage. Goal 6 also aims to protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, lakes and groundwater. This emphasizes the

importance of preserving and restoring ecosystems that play a crucial role in water cycle regulation, biodiversity, and climate resilience.

Goal 7: Affordable and Clean Energy – Improving access to clean and affordable energy sources, reducing reliance on fossil fuels and promoting renewable energy technologies. Furthermore, it aims to reduce energy consumption and waste through the development and promotion of energy-efficient technologies and practices.

Goal 11: Sustainable Cities and Communities – Making cities and human settlements inclusive, safe, and sustainable. It aims to create sustainable urban environments that are resilient to climate change, natural disasters, and other shocks. It also seeks to minimize the environmental footprint of urban areas, including air pollution, waste generation, and greenhouse gas emissions. It also focusses on promoting sustainable transportation options, such as public transit, cycling, and walking, to reduce reliance on private vehicles and improve air quality.

Goal 12: Responsible Consumption and Production – Promote sustainable consumption and production patterns, reducing waste, resource depletion, and environmental impact. This will optimize the use of natural resources, such as water, forests, and minerals, to minimize environmental degradation. This can be achieved by promoting circular economy principles, such as recycling, composting, reusing, and ultimately fostering an informed and educated society on sustainability practices.

Goal 14: Life Below Water – Protect marine ecosystems, such as coral reefs, mangroves, and seagrass beds, and sustainably manage fisheries by reducing marine pollution, including plastic pollution, nutrient pollution, and chemical pollution. It also aims to restore degraded marine ecosystems and enhance their ability to absorb carbon dioxide and protect coastlines.

Goal 15: Life on Land – Protect terrestrial ecosystems, such as forests, grasslands, and wetlands, and promote sustainable land use practices. It will promote sustainable agricultural practices, such as agroforestry and organic farming, and sustainable forest management in conjunction with addressing the illegal trade in wildlife and wildlife products that threatens biodiversity and undermines conservation efforts.

EU: Action to address SGDs

These goals have been adopted by all UN Member States since 2015 (*Sustainable Development Goals - European Commission*, n.d.). There have been extensive actions taken across the European Union (EU) in support of the UN's SDGs in environmental legislation, action plans, and sustainability strategies, making the EU the global leader in environmental policy and practices. The European Green Deal (EGD) is an ambitious package that includes a broad range of initiatives to tackle climate change and sustainability issues across Europe. The package includes several initiatives that streamline the goals of the EGD. The Fit for 55 Package included in the EGD is a set of legislative proposals to reduce greenhouse gas emissions by at least 55% by 2030. It includes measures to strengthen the EU's Emissions Trading System (ETS), promote renewable energy, improve energy efficiency, and establish a carbon border adjustment mechanism. The package aims to align EU policies with the goal of climate neutrality by 2050 (*Fit for 55 - The EU's Plan for a Green Transition*, n.d.). The EGD also has the Circular Economy action plan which addresses the EU's current linear "take-make-use-dispose" economic model wish is unsustainable. The Circular Economy Action Plan promotes the transition to a circular economy by reducing resource consumption, minimizing waste, and fostering sustainable growth. By adopting a circular approach, the EU will protect the environment, conserve biodiversity, and achieve climate neutrality. The new Circular Economy action plan, adopted in 2020, outlines strategies to accelerate this transition (*Circular Economy - European Commission*, 2024). The EU's Biodiversity Strategy for 2030, another component of the EGD package, aims to protect and restore

nature by reducing pressure on habitats, promoting sustainable use of ecosystems, and supporting nature's recovery. This includes combating pollution, invasive species, and habitat loss, as well as creating jobs and ensuring sustainable economic growth that benefits both people and the planet. While these are some integral Europe-wide initiatives in the EGD package, there are also many significant initiatives on national levels too.

Greece: Current initiatives and environmental action

Greece has adopted several environmental policies to align with the EUs goals. This includes the National energy and climate plans (NECPs) which outlines Greece's strategy to achieve the EU's 2030 energy and climate targets by reducing greenhouse gas emissions, increasing renewable energy integration, improving energy efficiency, and phasing out lignite-based power generation, while ensuring a just and sustainable transition to a climate-neutral economy by 2050 (*Greek National Energy and Climate Plan – Policies*, 2023). The Greek National Strategy for the Adaptation to Climate Change (NASCC) is a comprehensive plan designed to help Greece prepare for and respond to the impacts of climate change. It outlines a series of measures aimed at increasing the country's resilience to climate-related risks, such as extreme weather events, rising sea levels, and water scarcity. The NASCC covers various sectors, including agriculture, water resources, coastal zones, and health, and promotes a coordinated approach to climate adaptation at national, regional, and local levels.

Recent national legislation in Greece has significantly impacted waste management practices with key developments including the amendment of the National Waste Management Plan, allowing the transformation of existing facilities into Waste Treatment Units. Law 5037/2023 transferred waste management to the Regulatory Authority for Waste, Energy and Water, enabling the installation of small biological treatment units. Furthermore, Law 4819/2021 incorporated EU directives on waste and packaging, aiming to minimize landfill reliance and promote energy recovery from waste. Additionally, Ministerial Decision no. 99398/6484 streamlined the environmental licensing process for waste processing facilities. These legislative changes collectively aim to improve waste management practices, promote circular economy principles, and reduce environmental impact (*Greece Waste Management Opportunities*, 2023).

Greece is also taking great advantage of the Natura 2000 network, a cornerstone of European nature conservation, protecting valuable habitats and species. In Greece, it covers approximately 28% of the land and 20% of the sea, safeguarding a rich biodiversity, including 299 plant and animal species, 177 bird species, and 89 habitat types. This extensive network is particularly significant for Greece, given its high levels of endemism, especially in snails, freshwater fish, orthoptera, and plants. By balancing human activities with nature conservation, Natura 2000 promotes sustainable development and climate resilience (*NATURA 2000*, n.d.). These initiatives in Greece are just a few of many environmentally focussed movements within the country, demonstrating Greece’s commitment to a greener future from a legislative and official point of view.

Environmental education in Greece has been formally integrated into the curriculum since the early 1990s. It is incorporated into various subjects, including science, geography, and social studies. Schools are encouraged to implement environmental projects, such as recycling initiatives, energy conservation programs, and biodiversity conservation activities. However, the level of implementation and effectiveness of environmental education can vary among schools. While some schools have dedicated programs and resources, others may lack the necessary support. Additionally, challenges such as teacher training, limited funding, and a lack of standardized curriculum can hinder the full potential of environmental education in Greece. Despite these challenges, there are ongoing efforts to strengthen environmental education in Greek schools. Organizations like WWF Greece and the Hellenic Society for the Protection of Nature (HSPN) provide educational resources and programs for teachers and students. Initiatives promoting outdoor and experiential learning are increasing, connecting students

with nature and deepening their understanding of environmental issues. (*Education and Training Monitor 2024*, 2024; *Greece | Global Environmental Education Partnership (GEEP)*, n.d.)

Despite the numerous national and international initiatives highlighted above, a tangible gap persists between policy and practice in environmental education. This research delves into this disconnect by examining the perspectives of primary school teachers in Greece, contrasting their experiences with the seemingly progressive policies outlined in the literature. This research, conducted under the 'United in Biodiversity' project, aims to identify discrepancies between policy and practice through direct observation and data collection. The project involved participation in a 3-month practical job shadowing experience within a Greek primary school, funded through *ERASMUS+* and the EU, where firsthand insights into the realities of environmental education implementation is attained. This immersive approach allows for an unparalleled understanding of the challenges and opportunities faced by educators, providing valuable data that can inform future efforts to bridge the gap between policy and practice in environmental education in Greece and across Europe.

Methodology

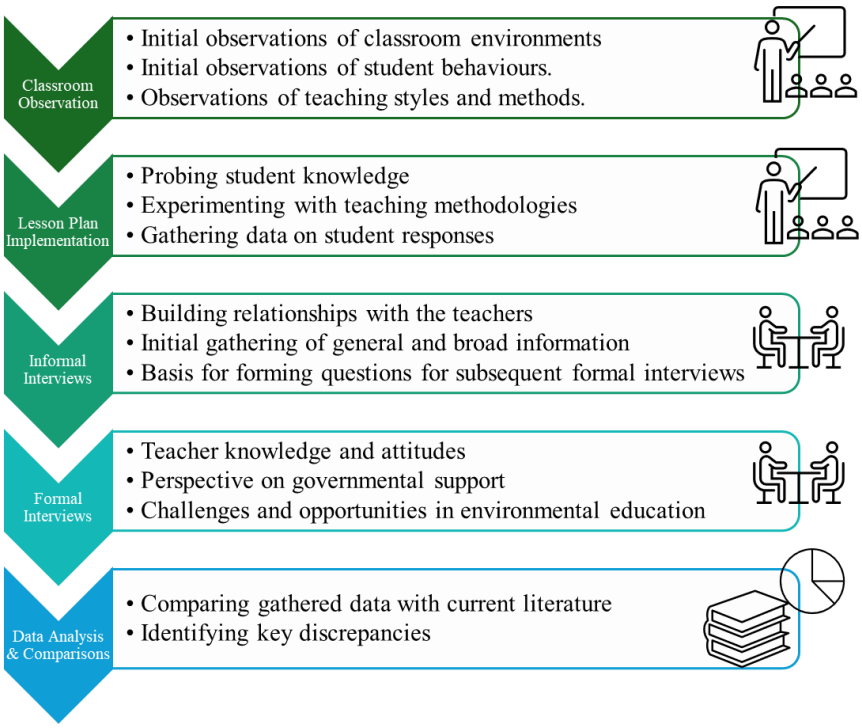

Figure 1: Methodology graphic outline.

Current behaviours, attitudes, knowledge, and practices of students, teachers, and members of the public are a highly complex and diverse form of information. The attainment of such data requires extensive investigation and monitoring. Therefore, the United in Biodiversity project involved a 3-month practical component where the student was immersed in the country's education system by job-shadowing at a local school. During this period, the student gathered data and observations while implementing environmental lesson plans in partnership with the local teachers in numerous classroom settings. Specifically, the student made observations about the Greek students aged 5 to 12 at a rural school in the Epirus region of Greece. The student also conducted a series of semi-formal interviews with the teachers and the headmistress of the school to investigate and assess their knowledge and opinions relating to the research question. The teachers' opinions on government involvement in schools, both generally and regarding environmental education, was a key focus. Their knowledge of support programs and existing initiatives and projects was investigated along with their mindset and current attitude towards environmental education programs and personal involvements. Similar questions were

asked to each teacher during the formal interviews to allow cross-referencing, however the interviewees were encouraged to dive into as much detail as they felt comfortable doing and to relay their knowledge and opinions to the extent they desired. In this way, information regarding the key research questions was gathered from a diverse range of teachers with different backgrounds and expertise, providing a robust compilation of relevant data to be further analysed.

Results and Discussions

Governmental Perspective on Environmental Education:

The Greek government has made significant strides in developing environmental policy and legislation and at incorporating environmental education into its national curriculum. The integration of environmental topics into various subjects, such as science, geography, and social studies, underscores the government's commitment to fostering environmental awareness among students. The encouragement of school-based environmental projects, like recycling initiatives, energy conservation programs, and other projects aligning with the EU SDGs and initiatives further exemplifies the government's proactive approach. Moreover, the Greek government's alignment with EU directives and its active participation in international conventions and agreements highlight its dedication to promoting environmental sustainability on a global scale. However, the interviews of local teachers revealed a contrasting perspective of the reality of the governmental involvement and progression of environmental education. This indicates a potential disconnect between policy and practice, suggesting significant limitations to the effective execution of well-intentioned initiatives. (Idoiaga Mondragon et al., 2023; Mogren, 2024; Parry & Metzger, 2023)

Teachers' Perspectives on Environmental Education

The interviews with teachers revealed a contrasting perspective on the reality of environmental education compared to the efforts seen in governmental policies. Many teachers expressed a lack of adequate training and resources to effectively deliver environmental education. Furthermore, they confessed lack of awareness of methods to gain skills development for environmental education as a teacher. They highlighted the absence of governmental support and the inadequacy of teaching materials, hindering their ability to integrate environmental topics into their lessons. Although many teachers demonstrated inspirational and passionate teaching methods to educate their students about the environment, it was evident that schools across Greece are not fortunate to have such environmentally pro-active and progressive teachers. This information is supported by the opinion of the teachers having diverse teaching experiences in different schools – all the interviewed teachers had been assigned to new schools after every year of their teaching career. Furthermore, teachers demonstrated innovation and significant dedication in their approach to environmental education; however, without this spontaneous passion and initiative of the teachers at the observed school, majority of the student's exposure to environmental education would vanish. Previous experience and observations strongly indicate this to be the case for many other schools in Greece.

This difference between policy and practice underscores the need for greater governmental involvement in supporting teachers and equipping them with the necessary tools and training to implement environmental education effectively. It also indicates ineffective communication between governmental and administrative bodies to the teachers and members of the public; specifically, about the opportunities and ongoing initiatives that are available. Teachers could not recall any governmental initiatives involving the support of environmental sustainability in education and explained that a school's involvement in larger sustainable and environmental practices or projects was solely dependent on the principal and that small projects were dependent on the teacher but were not enforced or supported by any external body. These testaments from a diverse array of teachers demonstrated a significant difference in perspective between the administrative bodies and the teachers in the field.

(*Encyclopedia of Biodiversity*, 2013; Foster-Turley, 1996; Jeronen et al., 2017; Navarro-Pérez & Tidball, 2012)

The legislation and official initiatives present a highly involved and supportive framework that promotes the education of students on environmental sustainability and encourages climate action while providing numerous initiatives and projects to demonstrate this belief. However, the teachers' perspectives display governmental involvement as near to non-existent and argue that the administrative framework is entirely unsupportive of progressing environmental education.

Discrepancies and Implications

The discrepancies between the government's aspirations and the teachers' experiences raise concerns about the successful implementation of environmental education. The lack of adequate teacher training, the absence of governmental support, and the inadequacy of teaching materials impede the effective integration of environmental topics into the curriculum. This may result in a superficial understanding of environmental issues among students, limiting their ability to become environmentally responsible citizens.

It appears that teachers are unaware of many current initiatives and policies involving environmental education, however, this is likely a result of their experience with feeling unsupported by the government in general. The teacher's frequently expressed frustration with lack of resources and support to improve the state of their school, stating that simple things such as internet connection and regular access to projectors would significantly improve the quality of education they can provide for the students, especially in regard to including environmental topics into their lessons.

Teachers demonstrated and expressed great interest and passion for teaching environmental topics. They showed dedication in their classrooms by selecting educational examples that favour environmental topics. Furthermore, the teachers showed enthusiasm and passion for environmental education by encouraging students to participate in their school environmental programs. The headmistress of the school demonstrated significant involvement and pro-active initiative in environmental education by organising school trips to recycling centres and local places of biodiversity and environmental significance. This demonstrated a unique dedication to environmental education at the observed school. However, it was clear that this was indeed unique to the school and that other schools across the Epirus region and greater Greece did not have such pro-active and environmentally passionate staff.

A key theme emerging from the teacher interviews is the significant influence of individual schools on students' environmental awareness and attitudes. The interviewed teachers, with experience across various schools and regions in Greece, consistently observed a wide disparity in educational quality, support, resources, and funding. This disparity directly impacts students' environmental understanding. While most students grasp basic concepts like recycling and waste management, their depth of knowledge varies considerably, and their potential for deeper learning often remains untapped.

Interestingly, the school associated with this study exhibits a stronger environmental focus due to the headmistress's environmental passions and proactive approach. This is evident in the school's involvement in other ERASMUS+ projects which often brings extra work for the teachers and principal. However, the teachers' diverse experiences across different schools allow for broader generalizations about environmental education in the Epirus region and Greece. They emphasize the need for improved facilities and, more importantly, enhanced teacher training. Many feel ill-equipped to effectively teach environmental topics, believing students are only scratching the surface of their learning potential. While teachers value flexibility in lesson planning, core subjects often overshadow environmental education, with dedicated time frequently reallocated to other disciplines, which indicates a lack of support in the structure of the curriculum or the priorities of the department of education's learning targets.

Recommendations

1. **Enhance Teacher Training**: The government should invest in comprehensive teacher training programs focused on environmental education. These programs should equip teachers with the necessary knowledge, skills, and resources to effectively deliver environmental education. (Elegbede et al., 2020)
2. **Strengthen Governmental Support**: The government should provide greater support to schools and teachers in implementing environmental education. This could involve financial assistance, curriculum development, and the provision of teaching materials.
3. **Improve Teaching Resources**: The government should develop high-quality teaching resources, including textbooks, multimedia materials, and online resources, to support environmental education. These resources should be aligned with the curriculum and tailored to the needs of different grade levels.
4. **Foster Collaboration**: The government should encourage collaboration between schools, environmental organizations, and local communities to create a supportive ecosystem for environmental education. This could involve partnerships for developing environmental projects, organizing field trips, and providing guest lectures. The Natura 2000 Network provides abundant locations for environmentally educational field trips.
5. **Empower Students**: Students should be empowered to take an active role in environmental conservation and sustainability. This could involve encouraging student-led initiatives, such as environmental clubs, awareness campaigns, and community engagement projects. The National Waste Management Plan provides numerous opportunities for students to engage in local environmental sites and facilities.

By addressing these areas, the Greek government can bridge the gap between policy and practice, ensuring that environmental education translates into tangible outcomes and nurtures a generation of environmentally conscious citizens.

Conclusions

This paper has highlighted the significant discrepancies between governmental policy and realistic practice at schools in Greece regarding environmental education and action. There needs to be significant improvement in communication of environmental initiatives to the teachers of Greek schools. Furthermore, the teachers' potential to teach environmental education is significantly inhibited by lack of resources and governmental support. While teachers at the observed school displayed a unique affinity for environmental education, most schools lack environmental initiatives and projects and do not effectively educate students on environmental issues on a local or global scale. The integration of sustainability and climate change education in school curricula is crucial for fostering environmental awareness and action among young learners. This is an essential step for improving global environmental sustainability and ensuring a green future. Measures must be taken to effectively integrate policies and practices that support this change in schooling and the educational department as a whole. This paper should be used to inform the areas that need to be addressed for improvement and provide guidance to how it can be achieved.

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