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Sustainability and innovation in an educational context[1]

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Abstract

Innovation and sustainability will be of utmost importance in the educational workshops of the next decades and will necessitate distinct techniques and specialised skills. Regarding education, sustainability, and environmental awareness, the European Union has issued a number of suggestions to its Member States. These proposals include objectives such as incorporating sustainability into teaching and learning, integrating environmental consciousness into the education system as a whole, and supporting the acquisition of awareness, comprehension, and action-based competencies. Innovation in education is essential to modernising the nation's educational system and preparing pupils for the future. Developing an inventive mentality is a crucial objective of education, as it stimulates creativity, the development of problem-solving abilities, and the capacity to adapt to rapid change. Sustainability and innovation are essential components of contemporary education because they help students prepare for the future, provide chances for practical learning, improve career preparation, and increase environmental consciousness. Students that incorporate these ideas into their schooling will be better equipped to face future obstacles and capture opportunities.

Keywords: sustainability, innovation, education

Sustainability and the green turn

The 'green turn' on a worldwide scale is causing fundamental changes in economic and political life, with increasingly noticeable cultural implications. The package of ideas for the European Green Deal to be adopted by the European

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Commission in 2021 outlines a goal for Europe to become a climate-neutral continent by 2050. This green transition will result in an extraordinary reevaluation of the role of innovation, bolstered by the Horizon Europe initiative (2021-2027), which views innovation as a critical instrument for ecological and economic transformation and supports a new generation of research and innovation partnerships. With the adoption of the so-called "Innovation Principle" in 2019, the Commission has assumed responsibility for analysing the impact of future initiatives on innovation and will work to guarantee that new rules and policy decisions promote innovation. In 2016, the European Commission's statement "Closing the loop - An EU action plan for the circular economy" established the notion of "Innovation Deals," which encourages voluntary partnerships between entrepreneurs, regional and local governments, and the EU. The European Institute of Innovation and Technology (EIT) is tasked with stimulating innovation at a pan-European level by supporting the development of long-term partnerships, and an essential part of its activities is not only to support innovation in existing companies but also to encourage the creation of new businesses (particularly start-ups) (European Environment Agency, 2015; O'Brien, 2020; Siddi, 2020; Tataridas et al., 2022).

We are witnessing a paradigm change that will forever define the interaction between humans and the environment, changing the prevailing viewpoints of science by incorporating moral elements into the discourse on the relationship between nature and social subsystems, for instance. With the changing interaction between humans and nature, new dimensions of responsibility and corresponding cultural changes have evolved; hence, cultural studies must also consider the long-term effects of present acts (Szilágyi, 2021).

Increased responsibility in science is complemented by a collaborative urge that provides enormous problems for the humanities and social sciences, establishing new qualification standards and new jobs that necessitate an abandonment of closed-systems thinking. How compatible are our established thinking structures and traditions with this new reality, and to what extent can education, sociology, or ethics as a sectoral study contribute to the humanisation of technology? The natural sciences are now confronted not only with technological and methodological issues but also, in almost all cases, with ethical ones; this greatly benefits the humanities; however, can the humanities, for instance, become an equal partner in transdisciplinary scientific cooperation, and can the results of this cooperation be reflected in education? In scientific progress, can moral responsibility or the culture-shaping impacts of development be given the same weight as anticipated or economic benefits?

Sustainability and innovation are two themes that the majority of researchers address from an economic standpoint. In reality, however, the humanities are currently developing as an equal participant in research in both domains, contributing new dimensions to the disciplinary approaches of other disciplines in response to paradigmatic shifts that are shaping the era. We are convinced that the complexity of some occurrences transcends disciplinary borders and that the dispersion of information and research capacity among disciplines precludes a thorough understanding and study of the phenomenon. When a phenomenon or process involves multiple subsystems or impacts society as a whole, sometimes necessitating significant changes to the social order, a thorough understanding of the phenomenon or process is particularly crucial. Additionally, certain issues disregard the distinctions between fields. It is important to adopt a new scientific methodology to comprehend a phenomenon on the cutting edge of human knowledge. Mattei Dogan (1996), a French social scientist, employs the term hybridisation to explain the specialised disciplines that form between sub-fields of certain disciplines. When we discuss the emergence of green thinking in the realm of entrepreneurship or innovation, we are in a hybrid zone. Innovation and sustainability will undoubtedly play a pivotal part in educational programmes in the coming decades, and teaching them will necessitate the use of distinct techniques and specialised talents. Following is a concise overview of this procedure (Dogan, 1996; Szilágyi, 2021).

Education for innovation and sustainability

Innovation will be a crucial weapon for sustainability in the coming decades, according to one of the key conclusions of the disciplines concerned with sustainability. Through innovation, new solutions to environmental concerns might arise, thereby contributing to sustainability. For instance, the development of energy-efficient technology, the utilisation of renewable energy sources, and the introduction of novel ways to the sustainable use of resources are all indicators of sustainability (Kougias et al., 2021). Individual industrial actors can also contribute to sustainability through innovation by adopting sustainable production processes, inventing environmentally friendly products, or eliminating negative environmental impacts. Nonetheless, this connection is bidirectional: sustainability may also drive innovation and contribute to the sustainable running of businesses (EMF, 2021).

The problem of sustainability is also gaining importance in education, as the responsibility of future generations in expanding sustainability to as many areas as feasible is crucial. In contemporary educational courses, sustainability is

usually integrated into environmental education programmes, science topics, social sciences, and educational policies and regulations. Education for sustainability and environmental awareness is not limited to a single stage of life, but is continuous; yet, values and attitudes related to the preservation of our environment are fostered from a young age and are fostered, among other places, in institutional settings (Dudok, 2021a; Education Office, 2020). The preservation of values for future generations begins with the teaching of the current generation, making it vital to educate about sustainability and environmental culture, which are currently dealt with jointly (Heuting & Reijnders, 1998). The United Nations designated the first decade of the twenty-first century (2005-2014) as the Decade of Education for Environmental Culture and Sustainability; hence, the emphasis shifted from promotion to education. This has permitted the implementation of environmental education in schools, resulting in a halt or fall in the growth of ecological problems (Dudok, 2021a; Major, 2012). In 2019, the European Commission coordinated its operations with the UNESCO framework, generating an Education for Sustainable Development (ESD) development agenda up to 2030 (UNESCO, 2021). (UNESCO, 2021). Within the framework, ESD focuses on accomplishing and enhancing the 17 SDGs, emphasising policies, learning environments, educators, and youth (UNESCO, 2019). These education guidelines also contribute to mainstreaming sustainability in education by encouraging the creation of sustainability-based education programmes. These programmes attempt to teach students how to reduce their environmental effects and implement sustainable solutions.

Currently, the European Union is encouraging educational sectors in many nations to join the Green Education project through various programmes designed to support the green transition and develop and reinforce students' skills in sustainability. Under the Green Education principle, all age groups must have a minimum degree of knowledge and environmental consciousness. Education is crucial in empowering individuals to act and desire to serve (European Commission, 2021a). Environmental education classes allow students to grasp the relevance of environmental concerns and show them how to live and work responsibly. Science topics, such as biology, geology, and chemistry, provide a more comprehensive view of the earth's natural resources and how they affect the ecosystem, whereas social sciences assist students to comprehend the social and economic aspects of sustainability (Hjeresen et al., 2000).

The European Union has provided its Member States with education, sustainability, and environmental awareness suggestions for 2021. These proposals include objectives such as incorporating sustainability into teaching

and learning, integrating environmental consciousness into the education system, and supporting the acquisition of awareness, comprehension, and action-based competencies (European Commission, 2021b).

For 2012-2024, the Hungarian government has devised a four-pillar policy titled the National Sustainable Development Framework Strategy, which promotes sustainable development across all sectors. The four pillars are human, economic, natural, and social resources (Fleischer, 2014). Through the four pillars, it is evident that a change in lifestyle, behaviour, and thinking, i.e. environmental education, is necessary (Bihariné, 2010). Thus, one of the key goals of education under this method is to cultivate in students an environmentally conscious attitude and set of values and to increase environmental-social knowledge through education (Dudok, 2021a; Thiengkamol, 2011). These can be formed, shaped, and developed in early infancy when education for sustainability and environmental consciousness is not yet a knowledge acquisition activity but an activity targeted at transforming everyday lifestyles in the lives of individuals (Dudok, 2021a; Sadik & Sari, 2010).

The connections between sustainability and innovation have long been established, but innovation in the education system has also become a priority in recent years. Innovation in education is essential to modernising the nation's educational system and preparing pupils for the future. The past decade has witnessed classroom innovation in various areas, such as the digitisation process that has been ongoing since the mid-1920s, which has seen the integration of technology into the daily educational process to enhance the learning experience for students and increase the efficiency of the education system. This involves the utilisation of digital textbooks, online learning platforms, and further educational technology resources. Hungary has historically placed a significant emphasis on science, technology, engineering, and mathematics (STEM) education: the education system encourages students to pursue careers in these fields, as these disciplines are essential to stimulate innovation and ensure Hungary's competitiveness in the global economy (Fehér, 2020; Xie et al., 2015).

The development of an inventive mentality is a crucial objective of education because it encourages creativity, problem-solving skills, and the capacity to adapt to rapid change. Participation in school provides students with access to fresh knowledge and technologies that can be utilised to create innovative solutions. Students are taught critical thinking skills that will enable them to participate in future breakthroughs through their education. Students are able to select their areas of interest and specialise in fields that can aid in the innovation process due

to the extensive educational opportunities available to them. In addition to fostering innovation, collaborative and interdisciplinary learning settings allow students to match their knowledge and ideas with those of others (Najatbekovna, 2021).

In general, there is a significant relationship between innovation and education, as education enables students to find innovative and practical solutions to various problems, including sustainability challenges. People of all ages should be able to shape their knowledge, skills, and attitudes towards a more sustainable life. Education and training are crucial in empowering individuals to become more environmentally conscious and empowered to act individually and collectively. As evidenced by the efforts of the European Commission, there is a growing demand for education and training on sustainability throughout Europe. Despite this desire, sustainability education and training are not yet a standard part of EU education policy and practice. The purpose of the European Council Recommendation on environmental education and learning for sustainability is to support Member States' efforts and encourage EU-wide cooperation in this area; to develop a new European sustainability competencies framework that identifies the knowledge, skills, and attitudes that learners of all ages will need for the green transition; and to develop a new European sustainability competences framework that identifies the knowledge, skills, and attitudes that learners of all ages will need for the green transition (European Commission, 2021a, 2021b).

Educating teachers about sustainability

Numerous nations have joined the worldwide effort for sustainability, sustainable development, and environmental consciousness (European Commission, 2021a; Heuting & Reijnders, 1998), however, there are still challenges and gaps in teacher education. The European Union's Charter of Fundamental Rights declares that the goals of sustainable development require equitable access to information for everyone (I.m.1.§) and that a sustainable society requires improvements in education, training, and skills (I.m.14.§) (EUR-Lex, 2020). In accordance with this, the European Quality Assurance Reference Framework for Vocational Education and Training (EQAVET) contains a training plan for trainers and teachers emphasising environmental sustainability. Part II.m.A aims to expand capacity, assist quality improvement, and boost performance (EUR-Lex, 2020).

Long before the official European Union efforts, the protection of the human environment in Hungary was defined by Act II of 1976 and the National

Environmental Protection Concept and Requirements System, which stipulated that everyone should develop environmentally responsible citizenship and, as a result, incorporate modern environmental knowledge into the curriculum (Takács et al., 2004). In 1980, the non-mandatory topic 'Human and Its Environment' was added to the primary school curriculum (Kárász, 2015). In the early 1990s, environmental education content was specified, and new pedagogical methods were created in ecological, environmental education (Bihariné, 2010).

To what degree can we educate students about sustainability through the curriculum, or is it more necessary to mould students' sensitivity through attitudes and approaches to problems? In the current Hungarian educational system, it is evident that sustainability may be taught through the curriculum. Sustainability issues encompass many fields, including environmental sciences, economics, social sciences, and natural sciences, allowing for incorporating numerous topics within the curriculum. Students can think critically about environmental challenges and contribute to sustainable development if sustainability is taught in schools. Teaching kids about sustainability can also educate them to contribute to sustainable workplace growth in the future. The importance of schools in conveying a sustainable attitude, however, extends beyond the curriculum. Teachers can assist students in learning about sustainability, for instance, by employing a sustainability strategy, implementing sustainable practices in schools, and organising sustainability projects (Dudok, 2021a; Major, 2012).

The National Core Curriculum (NCC/ Nemzeti alaptanterv - NAT) determines the essential structure and content of education in Hungary, which has resulted in considerable improvements to education and sustainability education. In 1995, the NCC established environmental education as a required task for all instructors, which was limited to cross-curricular assignments (Kosáros, 2007; NAT, 1995). In 2003, environmental and health education were designated key development areas (Kosáros, 2007; NAT, 2003), placing the field at the centre of education. The 2007 NCC provided modest modifications compared to prior years (Solt, 2012), however, the 2012 amendments permitted environmental education to be replaced by environmental education and established student expectations (NCC, 2012; Solt, 2012). The most recent National Assessment of Educational Progress (NCC) 2020 embraces the notion and idea of sustainability across all subject areas, but provides teachers with few alternatives to increase the subject scope (Dudok, 2021a; NCC, 2020).

Lower secondary school teachers in Hungary must hold a bachelor's degree, which can be earned in eight semesters at a college or university for teacher training. Methodology (subject pedagogy), general pedagogy, and psychology are taught to students. The minimum educational requirement for elementary school teachers is 4+1 years (8+2 semesters + 1 year of professional practise). These revisions have entailed changes to the curricula, which are aligned with the provisions of the Education Code. In addition, the principles outlined in the NCC are included into teacher education programmes and their significance is emphasised. However, there is variation in which teacher education programmes include which grid plans, as well as differences in the subjects and their descriptions, which may lead to a completely different emphasis in Hungarian teacher education programmes; the question of whether sustainability education is included in the grid plans remains (Dudok, 2021b; European Commission, 2020; Mullis et al., 2016).

Incorporating sustainability and environmental consciousness into teacher education programmes can help future teachers comprehend the significance of sustainability and implement it in their classrooms. This permits teachers to comprehend the significance of environmental challenges, as well as the concepts of sustainability and the significance of environmental consciousness. Teaching prospective teachers about sustainability and environmental consciousness contributes to the growth of environmental consciousness in education. In Hungary, the presence of sustainability and environmental consciousness in higher education, with an emphasis on teacher education, may vary. In some universities and institutions of higher education, sustainability and environmental education play a significant role, whilst in others, they play a lesser role.

In Hungary, there are several mechanisms to ensure that teachers participate in in-service training, with fines for noncompliance (Mullis et al., 2016). In Hungary, teachers must engage in at least 120 hours of in-service training every seven years. School principals can lessen the strain on teachers by participating in in-service training sessions. Experience from previous years suggests that subject examination preparation courses are the most prevalent form of professional development. These courses often cover instructional administration, pedagogy, and professional services, but sustainability and environmental education remain underrepresented (Dudok, 2021b; European Commission, 2020; Mullis et al., 2016).

The guidelines and definitions in the regulatory texts provide requirements for teachers, which they must also convey to their students regarding sustainability. Teachers have access to various training options and in-service training linked to sustainability. Examples of training opportunities relating to sustainability include: [1] Sustainability and environmental awareness conferences provide teachers with the opportunity to learn from professionals and share their own insights. [2] Similarly, workshops on sustainability enable educators to apply their learned knowledge and develop inventive solutions to environmental concerns. [3] University or college courses provide teachers with the opportunity to gain expert-level information concerning sustainability. [4] Professional associations provide teachers with the opportunity to network with individuals who share their interests and attend events where they can obtain training on sustainability-related themes.

To increase environmental awareness and teaching in schools, the European Union has established many principles and guidelines for the sustainability training of teachers. The EU encourages incorporating sustainability into all curriculum subjects, including science, technology, and social studies. The EU acknowledges the need to provide teachers with training and resources to successfully teach sustainability. This includes online classes, workshops, and other chances for professional growth. The EU emphasises the significance of involving students in the learning process and fostering active learning opportunities relating to sustainability. This includes activities such as field trips and community service. The EU encourages collaboration and partnerships between schools, businesses, and community organisations to promote sustainability education, and the EU recognises the importance of raising awareness of sustainability and communicating the importance of environmental protection to students, teachers, and the wider community (European Commission, 2021a,b).

These are the fundamental concepts and criteria followed by the European Union in training sustainability educators. The objective is to provide instructors with the information and assistance they need to educate pupils about the significance of sustainability and the environment.

In the European Union, numerous possibilities and training programmes for educators emphasise sustainability. The Erasmus+ programme, for instance, provides support for education and training projects, including those related to sustainability. Teachers can apply for funds to participate in training programmes, workshops, and other opportunities for professional development.

The European Schoolnet Academy, which offers online courses and training programmes for teachers on various topics, including sustainability, is an important project. The courses are aimed at assisting educators in incorporating sustainability into their curricula and fostering environmental consciousness among students (Hristova, 2015). The European Environment Agency provides teachers with various sustainability-related resources and training opportunities, including online courses, workshops, and training programmes. These are only a few of the numerous possibilities accessible to teachers in the European Union who wish to learn more about sustainability and incorporate it into their lessons.

Summary

Sustainability and innovation are becoming increasingly significant components of contemporary education since they prepare students for future challenges and opportunities. Climate change and other sustainability issues necessitate imaginative solutions. By teaching kids about sustainability and innovation, schools can aid in developing problem-solving and critical thinking skills applicable to various potential vocations. Sustainability and innovation are essential to many of the world's greatest challenges and opportunities of the present and future. By incorporating these concepts into their education, students will be better equipped to navigate a world undergoing rapid change and contribute to resolving particular challenges. Numerous sustainability and innovation efforts, such as renewable energy projects and sustainable agricultural programmes, offer experiential learning opportunities to students. This form of experiential learning can be beneficial, and aid students gain a deeper understanding of a subject. Many employment in the 21st century will require a comprehensive understanding of sustainability and innovation; kids who study these topics in school will be better prepared for these careers. This encompasses vocations such as renewable energy, sustainable agriculture, and green technology.

Sustainability and innovation are essential components of contemporary education because they help students prepare for the future, provide practical learning opportunities, prepare them for vocations, and raise environmental consciousness. Students that incorporate these ideas into their schooling will be better equipped to face future obstacles and capture opportunities. By teaching sustainability and innovation, schools may assist in developing environmental awareness and promote a more sustainable future. This can lead to developing ecologically friendly habits that last a lifetime.

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