

Soils are an important component of the Earth's terrestrial ecosystems. Understanding the soil-forming processes, as well as the function of soils and their spatial variation, enables a more complete understanding and insight into the relationship between biotic and abiotic elements of the natural environment. Teaching soil science content is therefore the transfer of skills that allow a holistic understanding of natural phenomena and preparation for the conscious and rational use of environmental resources in the context of sustainable development.

Environmental science offers the opportunity to develop the ability to understand not only the process of landscape formation and the interaction between humans and nature, but also the consequences that result from everyday decisions made by both decision-makers and the general public. The importance of public awareness of the role of soils has been highlighted by the European Commission (EC, 2006, 2012), the Department for Environment, Food and Rural Affairs, (Defra, 2004) in the UK, the US government agency NRCS (Natural Resources Conservation Service; United States Department of Agriculture) and by other entities and organizations in many countries around the world. Soils should be considered a non-renewable resource (Friend, 1992; Cruse et al., 2013), which is why the process of properly teaching the basics of soil science is so important.

The functioning of modern societies is affected by natural hazards, climate change, energy supply disruptions, migration, land use, urbanization and conflict, among other factors. The aforementioned factors can be divided into natural and anthropogenic. Geography is a kind of bridge between the natural and social sciences and encourages holistic study of many issues. Soil science education can be an excellent tool for conveying information on the state of the environment, as it provides a clear picture of how it functions, and, with the right choice of methods and content, allows the formation of a pro-environmental attitude and a willingness to face not only current problems, but also those that need to be solved in the future.

Soils are a hidden, usually invisible element of the environment. Often referred to as "dirt" or "ground," and associated only with agricultural activities, they are sometimes considered uninteresting and unexciting. Insufficient soil science education can result in the perception that soil cover is less important than air, water or rocks (Urbanska et al., 2022).

This collection identifies selected articles by the author, the topics of which are related to the analysis of soil science education in local, national and global terms. The purpose of the research was to try to assess the level of soil science education in selected countries of the world on the basis of surveys and analysis of soil science content included in school textbooks on geography, biology, as well as those on environmental science. In the preliminary hypothesis, it was assumed that the teaching of soil science basics is done in a way that is inadequate to the needs of the audience, and the content provided does not correspond to the current state of knowledge and does not correspond to education based on the transmission of sustainable development principles. Research tasks were carried out on the possibility of developing methods and techniques to improve the transfer of soil science knowledge. The results made it possible to try to determine the role of soil science

education in shaping the understanding of the functioning of the natural environment in and to develop solutions leading to increased environmental awareness of the recipient in the field of soil science. The research methodology is presented in the individual papers of the collection.

The issue of soil science education is a topic that is not very readily taken up by researchers and is very modestly represented in the literature on the subject. This is especially true at the secondary school level, that is, the stage at which students' career plans are formed and choices are made regarding the direction of further education, as well as attitudes toward society and the environment. There are several analyses and proposals available in the literature on preschool and early childhood education in this regard (Capra et al., 2017; Xylander and Zumkowski-Xylander, 2018; Xylander, 2020), but it is difficult to find reliable comparative analyses on secondary education. There have been a few projects and studies characterizing the teaching of soil science at the university level (Field et al., 2011; Hartemink et al., 2008, 2013; Smith et al., 2020; ), but these are a small number of works, dealing with selected issues. Proposals for change and activity in teaching the basics of soil science at the high school level are more about informal education, and their reach is small (Hirai and Mori, 2020; Fritz, 2020; Reyes-Sanches, 2020).

Soil science education problems affect most countries of the world. The public is not sufficiently aware of the dangers of soil degradation, does not know its functions and, thus, may not be able to properly and skillfully manage soil resources. Many examples in the history of improper use of soils have contributed to the introduction of guidelines for the protection of soil resources and the start of training programs for farmers. The Dust Bowl period of the 1930s, when nineteen states in the Great Plains area of the United States were hit by an environmental disaster as a result of drought and severe wind erosion of soils (due to waterless dust storms known as "dusters,") resulted in the introduction of changes at the federal level and became a cause for proper education.

The results of the analyses presented by the author make it clear that there are clear deficiencies in soil science education. Compared to other issues discussed in natural science education (hydrosphere, atmosphere), soils are treated as a less important component of the environment. This manifests itself in the smaller number of lesson hours allocated to the introduction of the basics of soil science, fragmented and unstructured content, and a lack of emphasis on the applicability of the issues discussed. Soil science information contained in geography, biology, or nature textbooks, i.e. subjects related to soil science education, is outdated and inconsistent with the current state of knowledge. The working methods are not adapted to the needs of a modern audience. The representative of the digital generation is extremely demanding in terms of the form of content transfer due to the reality that surrounds him and to which he is accustomed. He can be called a "digital native", while the teacher tends to be a "digital immigrant" (Prensky, 2001). This division perfectly determines the level of skill in the use of technology and multimedia communication in those who use them. School lessons based on traditional didactic means seem outdated and boring to such an audience, and the memory-based way of assimilating information arouses sincere

resentment. The primary tool for expanding knowledge for a young person are new technologies that allow them to function efficiently in the virtual world (Kulik, 2015). The results of expert studies on changes in the ways of learning of people born after 1990 suggest that the generation of 'digital natives' can also be called Generation C or 7C, from the words that describe their behavior: Connected, Communicating, Content-centric, Computerized, Celebritized, Community-oriented, Clicking (Morbiter, 2014). It is believed that for the "digital natives" generation, the virtual world is the natural operating environment and is shaped by image culture, while for the "digital immigrants", before the Internet age, the basis was printed text. Because text affects the intellect and image affects the emotions, modern students are more emotional than rational (Morbiter, 2014). In such a set-up, with two to three classroom hours allocated to soil science education, is it possible to try to make this time more attractive by using available multimedia or gamification elements? It seems difficult, but nevertheless, with the right choice of means, possible to implement. This is one way to enrich the information provided and motivate the recipient to actively participate in the class (Urbanska et al., 2019). Activating the student in the field of soil science education will not only increase his involvement in the educational process, but also contribute to the level of his knowledge of the role that soil cover plays in the environment.

Nevertheless, the random soil science knowledge that students will obtain is the content contained in the core curriculum, teaching schedules and educational guidelines. It should be noted that the information contained in textbooks, is the knowledge base not only for the student, but also for the teacher, through whom the transfer of knowledge in the educational process takes place. The discussed studies indicate a clear gap in soil science education, as well as the lack of sufficient, reliable literature on this education (Charzynski et al., 2022). It should be emphasized that the analyses carried out focus both on the knowledge of students, as well as on the content of textbooks whose knowledge students can potentially acquire, and are global in nature.

Sustainable geographic education is needed to conserve the earth's resources, and proper teaching of soil science basics should be a very important part of it. Soil conservation is essential to the proper functioning of any society. Mismanagement of pedosphere resources has already resulted in the collapse of many societies on several occasions (Spurr, 1986; Van Andel et al., 1990; Sandor and Eash, 1991; Zangger, 1992; Runnels, 1995). Changes over time in our natural environment are imprinted in the soil cover. This historical record provides reassurance that the sustenance of modern civilization will depend as much on soil conservation as on innovation (Montgomery, 2007).

The results of the research on soil science education obtained by the author have contributed to expanding the existing knowledge of the diversity and specificity of this education. Insightful analyses and assessment of soil education on a global, national and local scale presented in this collection are characterized by novelty both in terms of the metrics used and proposals for solutions to the problems noticed. The publications in question constitute a unique body of knowledge about soil science education and its role in

shaping the environmental awareness of societies. The collected data can support decision-making processes in constructing a curriculum framework for teaching soil science at the national level based on common international guidelines in line with sustainable development principles.