

Education for sustainable development – from students' and geography teachers' knowledge to educational activities

Abstract

The paper presents the topic of academic education for sustainable development (ESD). A diagnostic survey was made in a form of a questionnaire in three groups of respondents: active geography teachers, participants of postgraduate program preparing for teaching geography and undergraduate students majoring in geography. The conducted research revealed how the groups of respondents differ in regards perception and preparedness to use of SD and ESD in school geographical education

Keywords

Education for sustainable development • geography teachers • professional development of geography teachers

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Introduction

The modern world brings increasing problems regarding the relations between the geographical environment and humans, who transform it in progressive and diversified ways. It presents new tasks and challenges for both school and academic teaching in the area of *education for sustainable development* (ESD), which appears at various levels of education and educational organization. The tasks and challenges are both substantive (WHAT?) and didactic (WHY? FOR WHAT PURPOSE? HOW? BY WHAT FORMS? METHODS?), but also organizational (WHERE? WHEN? E.g., conducting lessons, workshops, etc.). Then the most important question arises: *who* will take on the educational tasks and *who* is this *person*, that is, what qualities do they demonstrate? Also, what knowledge and skills do they have, for example, didactical skills to teach, or organizational skills to supervise students' learning processes? And what attitude towards the environment do they express? Therefore, this is the main focus of this article, however, the paper will also focus on the purpose of conducted research that has generated information about the knowledge of geography teachers (including pre-service teachers) on *sustainable development* (SD) and, to some extent, about their awareness as reflected in applying its principles in everyday life. It is a starting point for reflection on *how it should be*. The results of the research outlines the necessary changes in ESD for geography studies, such as setting new goals, making adjustments to topics (enhancing old topics, or introducing new ones), and didactics; including teaching methods. These changes refer to activities already performed during classes for full-time studies at the Faculty of Geography

and Regional Studies at the University of Warsaw (WGSR UW), as well as to the SD and ESD's agenda for the postgraduate program for future geography teachers. The results might be useful for the teachers themselves in adjusting their teaching of ESD in schools during geography lessons after having conducted a similar survey among students about their knowledge of SD, their awareness about its significance in the modern world, and their attitudes within this context.

The need to implement ESD has been stressed in numerous international declarations and documents (Earth Summit Agenda 21; ed. Batorczak 2017). ESD has been implemented by the United Nations, for example, in the actions taken by the UNESCO Commission on Geographical Education within the International Geographical Union. The Commission's efforts resulted in declaring 2005–2014 the UN Decade of Education for Sustainable Development. This decade was to inspire the determination of new standards in the field of education, and to focus on the role of education in achieving sustainable development (Kalinowska 2010).

The necessity of gaining knowledge and skills to promote SD is also emphasized in the 17 Sustainable Development Goals set by UN in 2015 as Agenda 2030, or "Transforming our World: the 2030 Agenda for Sustainable Development" (ed. Batorczak 2017).

It is worth mentioning that ESD is more than just ecological education; it applies to the relationships between the four pillars of SD, namely: natural environment, humans, economy, and culture (Lenart & Kafel 1996). ESD is of great importance in so-called "successful globalization", in which the natural environment and its rational management cannot be ignored (Little & Green 2009).

Teachers' recognition of SD and ESD – research aspects

The results of ESD depend on teachers' knowledge and recognition of its role in human life and of the functioning of the system: human and environment. Students of geography (some of these will become teachers) have knowledge about the environment and also want to protect the environment. In research carried out at the University of Warsaw, 66% of geography students had a level of knowledge regarding environmental issues, and 75% of them took specific steps to protect the environment in their everyday lives (Kalinowska et al. 2016). For example, research conducted in Malaysia (Adawiah & Esa 2012) verified a familiarity with the goals and content of ESD among teachers. The outcomes indicated that the general knowledge in this area was good. A similar study in Nigeria (Nwufor et al. 2017) and in South Africa (Dube 2017) also proved a satisfactory awareness of the 17 sustainable development goals. However, in both cases it was suggested that the teachers should update their knowledge about the implementation of those goals and improve their teaching skills. In Polish studies, the teachers mainly focused on the legitimacy of formulating and implementing SD's cognitive goals (knowledge), but did not pay enough attention to developing pupils' skills and attitudes (Mularczyk 2005).

The documents adopted during the UN Conference in Rio de Janeiro in 1992 made clear the leading role that institutions in higher education are to play in transforming the world in the direction of sustainable development (Kalinowska & Batorczak 2015).

ESD in geography core curricula approved by the Ministry of National Education of Poland

The beginnings of a systemic ESD in Polish schools go back to the late 1990s, when they were implemented through the so-called interdisciplinary path of ecological education. Due to subsequent changes in the educational system, the path was abandoned in 2008. Since then ESD has been carried out within geography and biology lessons in middle and high schools (Podstawa programowa. Edukacja przyrodnicza 2008). In the current geography core curriculum (Podstawa programowa kształcenia ogólnego – Geografia klasy V-VIII, 2016), the introduction already covers a record of three aspects of SD, as well as the directions and agenda of ESD. It deals with the essence of geographical education, which consists of, among others, the following: a) understanding interrelationships between natural, social, and economic elements of the natural environment; b) preparing students to take responsibility for the condition of the geographical environment and its rational management; and c) preserving the natural and cultural values of the geographical environment. The document also indicates several general goals related to SD.

The role of the geography teacher in introducing SD to educational processes

The geography teacher plays a crucial role in the process of ESD. To the greatest extent they are responsible, not only for teaching *ecological thinking* (Sadoń-Osowiecka 2005), but also the broader scope of thought directed towards SD. In ESD a major role is played by: a) knowledge of its goals and scope, b) the ability to connect facts, data and information from various sources, c) an understanding of the spatial interactions between the elements of the geographical environment, and d) noticing crucial spatial relationships (Angiel et al. 2017). The perfect tools for facilitating all of the above are GIS (Geographic Information System) and Web GIS applications (Rahim et al. 1999; Baker 2015; Pokojski et al. 2018). A geography teacher who is aware of the importance of SD and ESD in human life and in the functioning of human and environmental systems should not be just a "transmitter" of knowledge about the natural environment, its values, and its connections with the other pillars of SD (society,

culture and economy) (Olbrycht 2009). This means that teachers should teach about the natural environment, and also about SD, while teachers who do not have knowledge about ESD should be educated in this area. Therefore, particular emphasis should be placed on ESD in both educating future geography teachers and the further training of current geography teachers.

ESD in teaching geographers at the University of Warsaw

The content of ecological education for teaching geographers was the subject of research conducted at the University of Warsaw (UW) in the early 2000s (Lewandowski & Ostaszewska 2005). The training was carried out within courses on the natural environment, and environmental management and globalization, which were an obligatory part of the minimum curriculum. Such a model of teaching in the field of ecological education (elements of SD built into the curricula of other subjects) complies with the general model of ESD developed by Wójtowicz (2010). Part of the postgraduate program for teachers at the WGSU UW is dedicated to the use of GIS in ecological education. The courses include *ecological education* and field studies under *regional and cultural studies methodology and school field studies*, which are also dedicated to, among others, SD and ESD (Angiel et al. 2017). Some students of the WGSU UW wrote bachelor and masters dissertations on the subjects of ESD, SD in tourism, and the introduction of SD to local government units and protected areas. There were also numerous theses dedicated to ecological education (University of Warsaw Theses Archive).

ESD in the teaching of geographers is supported by the activity of the University Centre for Environmental Studies and Sustainable Development (Kalinowska & Batorczak 2015).

Studies on SD and ESD – results and conclusions

The presence of educational content regarding ecological education, SD, and ESD in geography curricula at the academic level allow the hypothesis that both future and present geography teachers who have received a university education are aware of what ESD is and know how to conduct lessons about it in their school practice.

The *purpose* of the study was to determine: a) the state of the knowledge about the concept of SD among present and future teachers, and b) the prospects for using this knowledge in school practice during geography lessons.

First, a range of research questions were determined in order to achieve the objective:

- How familiar are the teachers and students with the concepts (principles) of SD?
- Do the respondents follow these principles in their own lives, and if so, to what extent and in what educational circumstances?
- Do teachers conduct ESD within geography lessons, and if so, what forms of work and teaching methods do they use?
- How do undergraduate geography students perceive SD and are they ready to introduce ESD into geographical education?
- Is it reasonable to connect education about ICT/GIS with ESD?

The conducted research was also aimed at revealing how the three groups of respondents differ in regards to: a) the perception of SD and ESD, b) following the principles of SD, and c) preparedness in using ESD in school geographical education. The *subjects* of the study were: a) respondents' knowledge about the concept of SD and their methods of explaining it, and b) respondents' methods of using the issues of SD in geographical education.

Characteristics of the respondents and the manner in which the research was conducted

In 2017 the authors performed a diagnostic survey in the form of a questionnaire. The survey was completely anonymous. The questionnaire contained three main groups of topics: 1) respondents' characteristics, 2) the concepts and subjects of SD, and 3) the use of GIS applications in ESD.

As has already been mentioned, the survey was conducted with three groups of respondents (Table 1).

Research on undergraduate and postgraduate geography students was carried out using the CAWI (Computer-Assisted Web Interview) method. About 50% of people from the target groups completed the questionnaire. A survey among geography teachers was conducted during training courses; in this case, a printed version of the same questionnaire was used. The questionnaire was completed by 70% of the participants in the courses. The first part of questionnaire concerned the social characteristics of respondents. Respondents were asked to provide answers to questions in which they were asked to choose between two or more answers. Questions could be as simple as "yes/no" or alternatively could be multi-choice answers. For some questions it was possible to give written answers in the form of a paragraph.

The first group consisted of current geography teachers from the Masovian voivodeship. The survey among geography teachers was conducted during training courses organized by the Masovian Teacher Training Centre. The questionnaire was completed by 70% (30 teachers) of the course participants who took part in training courses, 66% of whom were working in middle school, and 33% in high school. In this group, 66% had received their master's degree, while the remainder had completed postgraduate programs in teaching geography. Over 30% of the respondents had completed their studies before 1996, and a further 20% before 2006.

The second group of respondents were current teachers (excluding geography teachers) – participants in postgraduate programs at the University of Warsaw in preparation for teaching geography. Half of this group had received their master's degrees in fields connected with the natural environment (biology, environmental protection). Half of the respondents in this group had completed their studies before 1996. Only 6% of this group had participated in GIS courses within their bachelor and master's studies. Half of these teachers worked in elementary schools, while the other half worked in middle and high schools. Comparative research was also conducted among 40 undergraduate students who were majoring in geography.

As the survey was conducted in three separate groups of respondents who were connected with geography and geographical education, the authors were able to compare them in the following aspects: a) perception of the concepts of SD, b) pro-environmental behaviour, and c) attitude towards ESD.

Comparison of the survey results from the three research groups

It was assumed that all the respondents were familiar with the concept of SD, as they should have encountered it during their school and academic educations. All teachers confirmed that they had. However, further questions revealed that only 80% of the undergraduate students demonstrated knowledge about SD. Some of the respondents found out about SD only during their academic education (Table 2, Fig. 1).

More than 27% of *geography teachers* found out about SD during their school lessons, and these were the people who had completed their education in the last 10 years. As many as 87% indicated various forms of professional development (lectures, conferences, etc.) as being their source of knowledge about SD, while 40% pointed to other sources, mainly the internet.

Table 1. General characteristics of the respondents

Research group	Number of respondents	Characteristics
Geography teachers	30	Current geography teachers, participants in training courses
Postgraduate students	30	Current teachers of other subjects, participants in postgraduate programs for teaching geography
Undergraduate students	40	Undergraduate students majoring in geography

Source: authors' compilation

Table 2. Questionnaire results (selected topics)

Topic	Geography teachers	Postgraduate students	Undergraduate students
Familiarity with SD	100%	100%	80%
Source of knowledge about SD (more than one answer possible)	87% lectures and conferences, 40% internet, 27% school education	66% lectures and conferences, 23% internet, 16% school education	50% lectures and conferences, 37% internet, 45% school education
What is SD? (open question)	60% caring about the environment, 50% keeping the balance in the environment, 37% preservation of the elements of nature for future generations	70% keeping balance in the environment, 30% preservation of the elements of nature for future generations, 23% caring about the environment	77.5% keeping the balance in the environment, 33% – caring about the environment, 27.5% preservation of the elements of nature for future generations
Following the principles of SD in life	97%	70%	48%
Using SD in teaching	83%	70%	60%
Teaching aids	Talk and brainstorming, multimedia	GIS, multimedia	GIS, multimedia
Potential of GIS in ESD	66%	94%	100%

Source: authors' compilation

In the group of *undergraduate students* as many as 50% of the respondents indicated university education as their main *source of knowledge about SD*; about 40%, school education (before the study); and 37%, the internet. It is notable that only

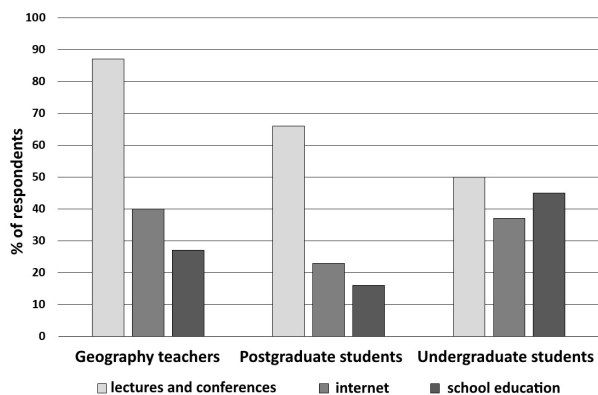


Figure 1. Source of knowledge about SD (more than one answer possible). Source: own elaboration

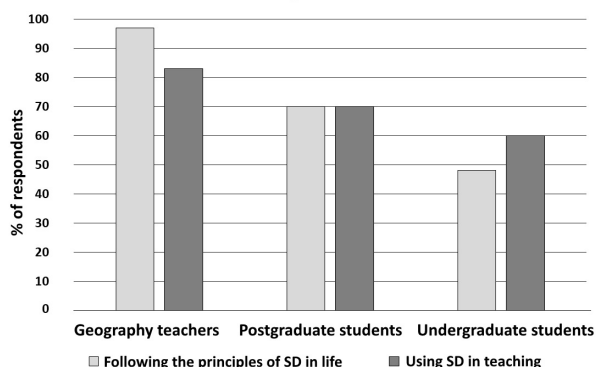


Figure 2. What is SD? (open question). Source: own elaboration

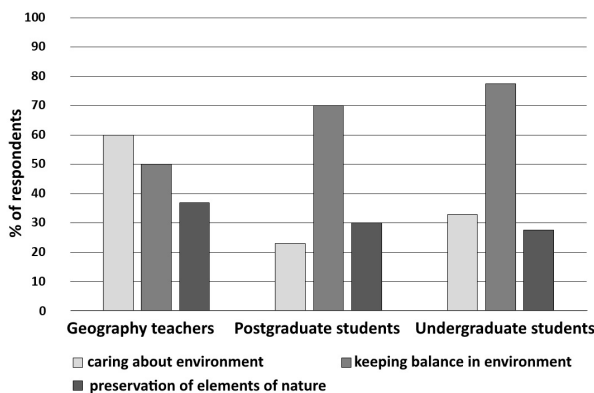


Figure 3. Application of SD principles in everyday life and using SD in teaching by the respondents. Source: own elaboration

16% of *postgraduate students* pointed to their school education as the source of their knowledge about SD, 1/3 to graduate studies and conferences; while as many as 1/3 became familiar with issues of SD only during postgraduate studies. These were mainly people who did not major in environmental studies. The data above denotes the need to include the issues of SD in full-time studies within programs for future science and geography teachers (among others, within *science didactics* and *geography didactics*), as well as within lectures and fieldwork in postgraduate programs for future geography teachers. Finally,

for current geography teachers, SD issues should be included in professional development courses and seminars that are organized, for example, in local methodology centres or regional teacher development centres.

All the respondents were asked an open question: *What is SD in your own understanding?* Next, the answers were grouped into several categories. In the first group (geography teachers) the majority of people (60%) included *caring about the environment* in their definition; for 50%, it was *keeping the balance in the environment*; and for 37%, the answer was *preservation of the elements of nature for future generations*. In the second group (postgraduate students) 70% of the respondents marked *keeping the balance in the environment* as the substance of SD; and for 30%, it was *preservation of the elements of nature for future generations*. In comparison, 78% of the undergraduate students defined SD as *keeping the balance in the environment*, 33% as *caring about the environment*, and 28% as *preservation of the elements of nature for future generations*. The answers were vague and general, which proves the need for educating teachers about SD and ESD (scope, content), primarily during undergraduate programs for pre-service teachers (Fig. 2).

Among geography teachers almost everyone (97%), *followed the principles of SD in everyday life*. Such a declaration was made by only 70% of teachers of other subjects (second research group); whereas just half of undergraduate students were guided by the principles of SD, specifically: waste segregation and using public transportation. The results mentioned above give rise to the conclusion that the introduction to university programs of issues regarding the wide-ranging benefits derived from following the principles of SD, especially at the undergraduate level (Fig. 3), should be proposed.

The following part of the research concerns using the issues of SD in teaching. The undergraduate students were asked about their intentions in this matter.

Over 80% of geography teachers addressed SD issues during geography lessons, they were focused on issues related to natural resources and environmental protection, which used to be the scope of former ecological education; while 30% undertake teaching on the more broadly interpreted sustainable economic development.

Teachers use the following methods and techniques during geography lessons regarding SD: interactive talking and brainstorming (53%), and multimedia. The most common teaching aids were PowerPoint presentations and videos. According to the respondents the most efficient teaching aid in ESD is multimedia, however, the most effective form of teaching are field studies. This might result from the fact that the teachers in this particular research group are eager to learn and develop, and they probably conduct fieldwork with their pupils because they have noticed positive effects.

Only 60% of undergraduate, and 70% of post-graduate students, declared a willingness to use their knowledge of SD in ESD. These are mainly people who follow the principles of SD in their own lives (Fig. 3).

The potential of GIS in ESD was noticed by all undergraduate students and almost all postgraduate students (93%). It was also remarked on by more than 66% of geography teachers. While 73% of them expressed a willingness to improve their knowledge about using GIS in educational processes, indicating training courses as the most desired form of professional development.

Summary. Reflections and conclusions

As was noted in an expert opinion by the Ministry of the Environment (Eksperyta ... 2012) the guidelines provided by the Ministry of Science and Higher Education regarding ESD in higher education institutions are too general and they only take

into account some of the degree courses, even though they should be present in the syllabi of all degree courses. It was also stressed that teachers who did not deal with environmental education had difficulty with understanding the definition of SD, and this is even more common among students. According to an expert opinion by the Ministry of the Environment, 29% of students have never before encountered the term ESD, while as few as 10% are very familiar with it.

The conclusions from the report coincide, in large part, with the conclusions derived from the authors' research, as described herein. The hypothesis regarding the familiarity with the concepts of SD has been proved and the questions about present and future teachers' knowledge about SD and the possibility of using it during geography lessons, were answered. However, the research has exposed the incompleteness of this knowledge and the need to improve it. Therefore, it is justified that further educational activities are undertaken in order to provide future geography teachers with a full knowledge of SD and ESD.

Graduates of the Pedagogy Program at the WGSU UW are prepared to teach geography in elementary schools. They are obliged to be ambassadors for SD in their local environment. Therefore, the role of ESD within undergraduate studies is very important. At this particular faculty it is conducted in the form of seminars and classes. Due to Polish society's minimal ecological awareness it is still necessary to promote ESD strongly within classes that prepare students for becoming geography teachers. Also, it is crucial to conduct classes for undergraduate, graduate, and postgraduate students using ICT in ESD (Angiel et al. 2017).

The authors' research also established the need for the preparation of methodological handbooks concerning ESD and the ways of implementing it in school and academic education for both teachers and students.

The need for GIS applications for ESD arise from both the literature review and the study results. According to the authors' research, more than 60% of teachers marked the huge potential of GIS tools in ESD. The results of the studies also prove the necessity of educating teachers in implementing ICT and geoinformatic technologies (Korevaar & Schee 2004). This was demonstrated in research conducted, among others, in Singapore (Yap et al. 2008).

To conclude; current geography teachers who have broad knowledge of SD and who follow the principles of SD in their lives, are most willing to use the concepts of SD in geographical education (97% of them), although they often gained this knowledge only after graduating, for example, during additional courses and training. Teachers of other subjects that are preparing to teach geography less frequently, follow the principles of SD or implement ESD in their classes, despite their understanding of SD and ESD that was acquired during postgraduate studies. Only half of undergraduate students are guided by the principles of SD, even though SD and ESD content are undertaken during academic classes. In their case, theory does not pair with practice. This will encourage academic teachers to reflect on whether it is only the knowledge that counts (and passing exams), or developing opinions and attitudes as well. Maybe, also (perhaps primarily?) it is important to simply be a role-model and indicate other examples of people worth following.

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