

Article

Which Media do Polish Teachers Use to Support Sustainable Development among Students? Analysis of Research

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Abstract: Modern media, to a large extent, create the social, economic and environmental reality. They may become a support for the teachers who implement the assumptions of education for sustainable development in their teaching–learning process. The authors of the present text focused on the problem of using media in teaching by Polish teachers at the 3rd and 4th grade educational level. The main research enquiry was concerning media Polish teachers use to support sustainable development among students. As the results show, Polish teachers are not prepared enough to use the media to promote sustainable development.

Keywords: education for sustainability; teaching-learning process; media in education

1. Introduction

In this modern world, with networks of interdependencies becoming more and more strict, there is an urgent need to implement a development model that is different than that which is currently used [1–3]. The concept that is seemingly best suited to meet modern demands is the *sustainable development* model. That kind of development may be achieved mainly through well-planned and effectively conducted education for sustainable development [3].

Changes taking place today are, to a large extent, determined by the presence of new media in social and economic life of people all over the world. The presence of media in everyday life forces teachers to change their teaching paradigm—today, the desired paradigm in the education process is connectivism [4–6], wherein teachers should use different media and IT tools to teach and conduct the learning process. According to assumptions of the Education for Sustainable Development (ESD; sustainable education–SE), which is a new educational approach promoted by UNESCO, teachers should use ICT to affect students' attitudes and knowledge related to sustainability [1,7,8]. As scientist and UNESCO experts stress [3,7–9], only in this way, young people, who soon may become decision makers, politicians and who will definitely be producers and consumers, will understand the need to change the current development model.

In the last century, as a result of an intense development of new information and communication technologies (ICT), social changes have accelerated and became globalized. Furthermore, they progress more and more rapidly, and successively gain more ground. Modern generations live in a breakthrough period in which changes are more extensive than ever, in which subsequent social changes are revealed and intensified. Today's human life conditions, which new from a civilizational point of view, are referred to as *post-modernity*, *liquid modernity* [10], *late modernity* [11], and today's society is referred to as *post-industrial* [12], *risk society* [13], *network society* [14], or *informational society* [15]. The rapid

development of information and communication technologies, offering revolutionary new forms of communication and access to processing, publishing and receiving information, has forced changes in all domains of human activity—and those changes are the most extensive in human history. In the post-modern, globalizing society of the 21st century, *information* has become of superior value, gaining the status of a product. In fact, this rapid development has become a specific feature of modern societies. Tools such as mobile phones, the Internet and digital television, facilitate communication independent of time and location, and provide quick access to unlimited sources of information. As a result, in the communication process and the process of gaining information, temporal and spatial conditions (i.e., distance) become less significant. Social changes accompanying the creation of the informational society have turned out to be most important and extensive since the Industrial Revolution of the 19th century. Moreover, they are omnipresent and irreversible; the transformation that we witness today has become one of the greatest economic and social challenges in our history, but also a chance to develop to an extent humanity has never known before [9,16].

Nowadays, computers connected to Internet, as well as mobile phones and other, progressively more modern media, become an integral element of everyday reality and almost every human activity. These technologies have changed the extent and forms of social activity in every domain, in a consistent and continuous manner. Unlimited informational resources of the Internet, spatially and temporally independent communication, as well as hypertextual and episodic media coverage give information a global dimension in the society that also gains a virtual dimension. Modern man has become a *homo mediens* and a *homo irretitus*, his vision of reality is determined by the mass media, and the impact zone is enclosed within the limits of media hype. The media are the link between humans and culture, becoming tools for collecting, processing, and generating information. They can fulfill the following roles: information, communication, opinion-forming, monitoring, intervention. They facilitate the popularization of knowledge, the gaining of new skills and they impact people's attitudes—thus they can influence the development of competences of members of the global informational society [7]. The latest achievements have radically changed the life of people all over the world. Progress in every area of life has led to 6 billion people now inhabiting Earth, and forecasts indicate that by 2050, there will be 50% more inhabitants on the planet. In order to ensure the possibility to satisfy all their needs that are now met, we would need two more planets [8]. Modern issues of highest concern, related to an uncontrolled globalization, challenges faced by societies all over the world, demands made to social institutions—including schools and teachers working at those schools—have brought about the need to seek effective solutions in three spheres of human activity: social, economic, and environmental. The need has arisen to develop objectives of an effective concept of sustainable development and education that will prepare new generations to implement them [17]. Modification of education in accordance with the concept of sustainable development is promoted and supported by international organizations: UN, UNESCO, UNICEF and state agencies which, in their reports, indicate numerous courses that may be taken [18]. Practical implementation of objectives of the sustainable model can become a counterbalance to uncontrolled globalization. To make that possible, we should strive to make people aware of the need for sustainable development in the abovementioned fields, and adopt attitudes favoring harmonious development. The role of the media in the entire process is crucial. The media should become a tool supporting the development and gaining of competences, not an environment for creating new identities. They are to serve humanity, make everyday reality easier, not enslave it or make it dependent on technology. Modern media continuously change all domains of human activity of the global information era. They also have, obviously, a huge impact on 21st century education.

Education is a keystone to any nation's development and is crucial for the achievement of sustainable development [16]; it stimulates scientific endeavor, enhances livelihoods, and injects a skilled workforce into the resultant modern job market. Indeed, it may be said that education fortifies a nation and fosters the resilience needed to comfort sudden challenges or ominous situations. Education may also instill youth with the requisite knowledge and moral responsibility needed

to better understand and solve social, economic and environmental problems [18–21]. Education for Sustainable Development aims at developing competencies that empower individuals to reflect on their own actions, taking into account their current and future social, cultural, economic and environmental impacts, from a local and a global perspective [22–27]. As it is stressed in the UNESCO report, individuals should also be empowered to act in complex situations in a sustainable manner, which may require them to strike out in new directions; and to participate in socio-political processes, moving their societies towards sustainable development [7–9].

Education for sustainable development is a new educational approach, which the subject is preparing young people to live in the world of the future and building a sustainable order in three dimensions: social, economic and environmental. The aim of the ESD is to improve the quality of education, focused on shaping students' competences. For this purpose, it is necessary to change the educational paradigm. To gain new competencies and develop already owned, students must work actively—teachers must use problem and activation methods and use the media in the teaching–learning process, as media are currently the environment of young people's activity [1,3,7–27].

It is worth noting that teachers are obliged to implement the principles of sustainable development in their education programs. In Poland, the principle of sustainable development gained a constitutional rank—it was enshrined in art. 5 of the Constitution of the Republic of Poland, and the definition of sustainable development was introduced into legislative provisions as early as in 1980 (The Act on Protection and Shaping the Environment). In Table 1 examples of key issues for sustainable development present in middle and secondary school education programs are indicated. It should be emphasized that the presentation of all issues covered in the education programs would require further research. In curriculums of all subject taught in the Polish education system there are issues crucial in education for sustainable development.

Table 1. Exemplary key issues for sustainable development included in curriculums in the middle and high school in Poland.

Subject/Group of Subjects	Exemplary Curriculum Content
Polish	Multiculturalism, the concept of a “small homeland”, national heritage, national diversity, the uniqueness of Polish art on the international map, globalization, aspects of mass culture, women in culture and as creators of art, etc.
Humanities and Social Studies (Social Studies, History, Cultural Studies, Introduction to Business)	Challenges of modern society, rights and obligations of the citizen, principles of functioning of the European Union, democracy, women's and children's rights, political systems of other countries, conflicts and ways of solving them, sustainable consumption and ways of producing goods, building a value system based on respect for the well-being of all people, etc.
Foreign languages	Culture of other countries; in addition, issues related to sustainable development are implemented, for example, when reading source texts, listening to recordings, etc.—while developing language competences
Mathematics	Exercises related to the subject of sustainable development, such as overpopulation, protection of nature, natural resources, sustainable consumption, etc.
Science (Biology, Chemistry, Physics, Geography, Family life education)	Sustainable management of natural resources, preservation/conservation of the nature, protection of the biodiversity, sustainable production methods, balanced diets, health as an integral part of sustainable development, striving for well-being in a sustainable way, ways of reducing pollution, etc.
IT and Technology	Protection of intellectual property, integrity on the web, internet security, proper use of new communication tools, culture of new media, etc.
Arts (Music, Plastic arts)	Heritage of past generations as a common good and value, communicating through art, culture as a way of expressing oneself in a globalized world, etc.

The role of both new media and social media is central to raising awareness and providing better understanding of the agenda for Sustainable Development [7]. Media are crucial to build capacity in each of the countries in order to empower them to advance media and information literacy and intercultural dialogue, and to promote freedom of speech, freedom of information and the free flow of ideas and knowledge [7]. The media can also help build peace and social consensus, which are crucial in achieving sustainable development. Moreover, the media shape public opinion. Social Media tools are seen by many authors as powerful drivers of change for teaching and learning practices, in terms of openness, interactivity and sociability [28]. They strongly influence human thought, feelings, and imagination. They penetrate social life, unbound by age or environment. In time, they gain ground and influence. Nowadays, the significance of Internet and social media in education increases. With the rapid development of the Internet, we have seen the growing popularity of the Internet community. Not only does the Internet provide a platform for discussion, but also allows users on the network to easily and quickly exchange views and ideas with others around the world [29]. Social networking was found to be one of the factors impacting organizational knowledge sharing [9]. Moreover, social media platforms are an indispensable part of entrepreneurship practices [30,31].

In that context, the choice of media used by teachers to shape the knowledge and attitudes towards sustainable development is extremely important. The media may serve teachers as a source of knowledge in terms of content and methodology when implementing objectives of education for sustainable development, and also as teaching aids supporting development of competences crucial to sustainable development of students.

Issues addressed in this paper are an attempt to answer the following question: which media are used by Polish teachers in the teaching process to shape the knowledge and attitudes towards sustainable development in the economic, social, and environmental aspects. It should be noted that this research problem is innovative and has never been tackled before. Although literature concerning the paradigm of education for sustainable development and the significance of the media in supporting implementation of sustainable development principles in social and economic life and natural environment is abundant, the problem of inclusion of the media in implementation of objectives of education for sustainable development has not yet been explored.

The method used in the study was the survey-questionnaire method. The research tool, i.e., questionnaire prepared by the authors of this paper, was sent to teachers working at general schools, in the 3rd and 4th educational stage. The questionnaire was composed of 3 parts—one of them was dedicated to the problem of use of media in the process of education for sustainable development. For the purposes of this study, results of surveys relating to teachers' declarations concerning their use of specific media and usefulness of those media were taken into account. For the purpose of the study, in terms of the didactic process, taking into account the classifications proposed by the researchers, the media classification was developed [31–40].

The paper is structured as follows. Firstly, we characterize the living conditions of modern society within the context of sustainable development needs and the new model of education. Secondly, we present the methodology. Then we analyze, in detail, the results of the aforementioned research. As the research enquiry is innovative, has, to the authors' knowledge, never been studied before, and is exploratory in nature, we shall not discuss the results, due to an absence of similar research that could serve as a reference point. And finally, we present the conclusions and limitations of our study.

2. Methodology

Empirical studies have been carried out by means of diagnostic survey. Such a method is frequently used in the studies through questionnaires, conversation, interview [40]. Due to the objectives of the study, a questionnaire has been considered to be the most appropriate data collection technique. Therefore, the authors of this paper have prepared an original questionnaire composed of three parts. The first part was dedicated to methods and forms used by teachers in the process of education for sustainable development; the second part, media used by teachers, and the third part,

teachers' knowledge concerning education for sustainable development. For the purposes of this study, the following teachers' responses were analyzed: (1) responses concerning media used as teaching aids; (2) media used to support the implementation of objectives of education for sustainable development.

Teachers were asked which media they use in their work to promote sustainable attitudes and broaden students' knowledge about sustainable development in its three dimensions: social, economic and environmental. Each group of teachers, before filling out the questionnaire, held a conversation with the pollster, who asked them how they understood each question. The issue of application in the educational process for the sustainable development of new media, which was included in the questionnaire, was based on postulates of scientists and UNESCO experts. According to the assumptions of the concept of SE, teachers should select, in a critical way, the optimal media to promote the principles of sustainable development. It can also help in shaping key competences for sustainable development, such as critical thinking, anticipatory thinking, creativity and innovation, etc. It had been explained to the teachers that in the questionnaire they only had to mark cases in which they use new technologies to develop students' awareness, knowledge and competence for a sustainable future.

Table 2 presents the dependent and independent variables and their indicators.

Table 2. Variables and their indicators.

Dependent Variables		Indicators
Use of the media to broaden knowledge on education for sustainable development	-	Traditional and modern media indicated by teachers, used as a source of information and knowledge concerning the history of the term, objectives, proposals and goals, as well as methods of their implementation in education for sustainable development along with the frequency of use of specific sources
Media used during lessons (teaching aids)	-	Media indicated by the teachers as those used as teaching aids supporting the development of specific competences, crucial to sustainable development and facilitating inclusion of problems important for sustainable development into curricula
Independent variables		Indicators
Teacher's gender	-	Female
	-	Male
Subject taught	-	Polish
	-	Humanities and Social Studies (Social Studies, History, Introduction to Business)
	-	foreign languages
	-	Mathematics
	-	Science (Biology, Chemistry, Physics, Geography, Family life education)
	-	IT and Technology
	-	Physical education
Level of education	-	Middle school
	-	High school
Years worked	-	0–5 years
	-	6–10 years
	-	11–15 years
	-	16–20 years
	-	21 years and more

Table 2. Cont.

Dependent Variables	Indicators
Professional rank	- Intern teacher
	- Contract teacher
	- Nominated teacher
	- Certified teacher
School location	- Village
	- Town
	- City

Sample, Area and Organization of Research

In order to collect the research data, convenience sampling [41] has been applied, in accordance with the following criterion: the consent of the participants to take part in the survey. The study was conducted from the beginning of May until the end of November 2016. A total of 927 copies of the questionnaire were handed out, and 337 filled out forms were collected from general subject teachers, employed at schools from the 3rd (middle school) and 4th (high school) educational stages. Due to the specificity of the teaching methods, teachers who participated in the study were divided into seven groups, according to the subject taught: (1) native language, (2) Humanities and Social Studies, (3) foreign languages, (4) Mathematics, (5) Science, (6) IT and Technology, (7) Arts.

An analysis of the process of collection of questionnaires has shown that the completed forms were more often returned by teachers from village schools and those with higher seniority. This phenomenon may be explained in two ways: (1) village schools are more seldom studied than schools in large cities, including academic centers; (2) teachers with higher number of years worked need less time to prepare for their lessons than beginner teachers, therefore they had time to fill out the form. Demographic and statistical features of the teachers studied are presented in Table 3.

Table 3. Statistical and demographic data of teachers who participated in the survey.

Gender	Female	263
	Male	70
School Location	Village	128
	Town	136
	City	73
Educational Level	Middle school	177
	High school	160
Years Worked	0–5	36
	6–10	64
	11–15	85
	16–20	102
	21 and more	50
Professional Rank	Intern teacher	14
	Contract teacher	45
	Nominated teacher	82
	Certified teacher	196
Subject Taught	Polish	60
	Humanities and Social Studies (Social Studies, History, Cultural Studies, Introduction to Business)	67
	Foreign languages	74
	Mathematics	36
	Science (Biology, Chemistry, Physics, Geography, Family life education)	86
	IT and Technology	9
	Arts (Music, Plastic arts)	5

3. Results of the Research

Quantitative data collected during our own research were coded and subjected to statistical analysis using Statistical Package for the Social Sciences—SPSS software. Depending on the group of analyzed data, the following formulas were used: Pearson Chi-square test, Levene's Test, Cramer's V, ANOVA, Bonferroni correction and Games–Howell Test. Dependencies for which in the Chi-square test $p < 0.05$ were adopted as statistically significant.

When implementing the objectives of education for sustainable development, teachers most often use the Internet and traditional, printed books and textbooks. Internet sites are considered very helpful by almost a half of the participants (47.5%). It should be noted that one of the key proposals of the education for sustainable development is ensuring access of all the people, all over the world, to knowledge, tools, and materials that may support harmonious development of self and the sustainable development of the society. This proposal is brought to life by posting the so-called *Open Access* materials online—free, widespread, permanent and immediate access for each person to digital forms of data saving, scientific content, and educational materials. It means that, if a person has access to the Internet, they may read, download and use sustainable development materials, free of charge.

Books and textbooks are, however, used by teachers more often than Internet sites—more than a half of the respondents declare that they use them more often (54.6%). The Internet was indicated as an unsupportive medium by 4.75%, whereas books and textbooks by 7.12%.

Very often an auxiliary role in implementing the objectives of education for sustainable development is played by the press (35.9% use it from time to time, and almost 14% very often) and films (used from time to time by 37.7%, and very often by 11%). Television is used more seldom. Teachers use it rather sporadically (44.5%). It is used as a teaching aid more often by 25.5% of participants.

E-books are used significantly less often—8.31% of teachers indicated them as the main teaching aid; so are discussion forums (5.04% indicated forums as significant aid, 48.07% do not consider them any aid at all) and social media (4.45% indicate them as significant aid, 51.4% consider them useless). Podcasts are used least frequently. A total of 21% use them with varying frequency, most of them but rarely.

Figure 1 presents which media do teachers use as a teaching aids when implementing objectives of education for sustainable development.

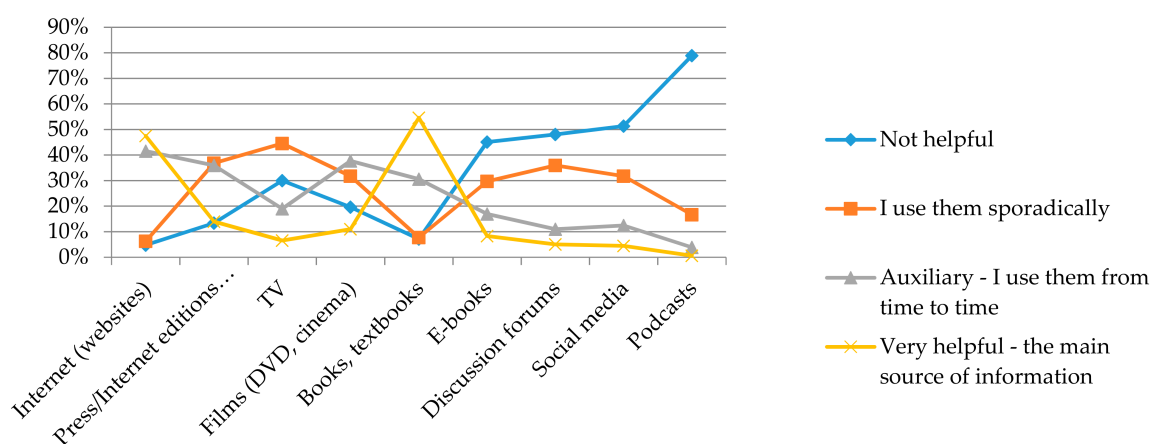


Figure 1. Media indicated by the studied group of teachers as teaching aids when implementing objectives of education for sustainable development.

It is worth noting to what extent the teachers of each subject/group of subjects consider the media as helpful or unhelpful when implementing the objectives of education for sustainable development.

The Internet is most helpful to teachers of foreign languages—more than a half of them consider it very helpful, whereas only 5.41% of participants consider it useless. 10% of Polish teachers who participated in the survey declare that this modern medium is not helpful to them when implementing the sustainable teaching–learning process. Almost all teachers of Social Studies and Humanities other than Polish consider the Internet very helpful or auxiliary when organizing the teaching–learning process aiming at acquiring and developing competences for sustainable development.

Television, and accordingly, popular science and journalistic programs or features are considered less helpful by teachers actively implementing the objectives of education for sustainable development with their students. Only to ca. 5% among Polish teachers, foreign language teachers and those teaching other Humanities and Social subjects does the television constitute a significant teaching aid. Television is used most often—and most effectively—by teachers of Science subjects, which may be related to the nature of those subjects and the knowledge of teachers on those subjects and available materials.

On the other hand, the press is most useful to teachers of Humanities and Social Studies—one fifth of participants in both groups consider it ‘very helpful’. Approximately 15% of surveyed teachers of all subjects consider traditional press as unhelpful when implementing objectives of education for sustainable development. It is considered least useful by Mathematics teachers.

A vast majority of teachers consider films (including those posted at www.youtube.com) as fulfilling an auxiliary role when implementing the objectives of education for sustainable development. However, for almost a half of mathematicians this medium is not helpful at all. Similarly, approx. 20% of teachers of the remaining subjects found that films are not helpful when preparing the sustainable teaching process. Films are most useful to foreign language teachers—it should be mentioned that, in view of the subject they teach, they have easier access to foreign language materials which may be valuable to those teachers who implement objectives of education for sustainable development.

More than a half of the teachers of each subject consider books as very helpful when designing the teaching process in accordance with sustainable development objectives. For more than 10% of mathematical books are not helpful, whereas they are considered most helpful by Polish language teachers. What is more, approx. one third of teachers of all subjects consider traditional books and textbooks as auxiliary when designing the sustainable teaching–learning process.

E-books are significantly less popular among all the teachers. They are considered useless by more than a half of the surveyed Polish and Math teachers, 48.65% of foreign language teachers and 35% of teachers of Humanities and Social Studies. Only 10% of teachers of all subjects consider them ‘significantly helpful’. This aversion of teachers to e-books may seem surprising, as teachers often declare that they use the Internet when seeking support implementing objectives of sustainable development in the educational process, and e-books are an important resource on the Internet, that may prove very helpful to teachers in that respect.

Teachers are also reluctant when using Internet forums to seek inspiration, exchange ideas and experiences when designing the sustainable teaching–learning process. None of the Polish teachers indicated that internet forums are ‘very helpful’ to them; more than a half consider forums useless, whereas one third of the surveyed Polish teachers declare that they seldom use forums as a teaching aid. Similarly, almost a half of the teachers of Humanities and Social Studies, 40% foreign language professors, over 60% of mathematicians and 45% of Science teachers do not use forums at all. Those results lead to a conclusion that the studied group of teachers are not used to exchanging *good practices* and sharing ideas using new media.

Social media are also not very popular among the surveyed teachers. Humanities and Social Studies excluded (in their case, the percentage of persons who do not use social media is lowest—38%), more than a half of surveyed professors of each subject never use social media, whereas ca. one third of teachers in each group declare that they use social media sporadically when seeking support in designing a sustainable teaching process.

None of the surveyed teachers has evaluated podcasts as ‘very helpful’ in implementing objectives of education for sustainable development. More than 80% of Polish teachers, mathematicians and Science teachers declare that podcasts are not helpful to them. As little as one fourth of foreign language teachers use podcasts only rarely. Such a low indicator may seem surprising, as podcasts are very popular today. Nowadays, those short forms of audio or video publications, usually released regularly as episodes of a series, using the RSS technology, provide information and inspirations in almost every field. Their authors are competent, introduce their audiences to the topic quickly, and provide all the essential information. Moreover, podcasts may be listened to practically everywhere, using a mobile phone, smartphone, or tablet. In Table 4 media used by teachers while they implement objectives of education for sustainability are showed.

Table 4. Media used by teachers when implementing objectives of education for sustainable development.

	Polish		Humanities and Social Studies		Foreign Languages		Mathematics		Science	
Internet	N	%	N	%	N	%	N	%	N	%
<i>not helpful</i>	6	10.00%	1	1.49%	4	5.41%	2	5.56%	3	3.49%
<i>rarely helpful</i>	4	6.67%	4	5.97%	2	2.70%	1	2.78%	8	9.30%
<i>auxiliary</i>	21	35.00%	30	44.78%	29	39.19%	21	58.33%	36	41.86%
<i>very helpful</i>	29	48.33%	32	47.76%	39	52.70%	12	33.33%	39	45.35%
Television	N	%	N	%	N	%	N	%	N	%
<i>not helpful</i>	19	31.67%	14	20.90%	21	28.38%	19	52.78%	21	24.42%
<i>rarely helpful</i>	27	45.00%	30	44.78%	41	55.41%	13	36.11%	35	40.70%
<i>auxiliary</i>	11	18.33%	19	28.36%	9	12.16%	3	8.33%	21	24.42%
<i>very helpful</i>	3	5.00%	4	5.97%	3	4.05%	1	2.78%	9	10.47%
Press	N	%	N	%	N	%	N	%	N	%
<i>not helpful</i>	8	13.33%	9	13.43%	8	10.81%	6	16.67%	12	13.95%
<i>rarely helpful</i>	23	38.33%	25	37.31%	26	35.14%	15	41.67%	29	33.72%
<i>auxiliary</i>	20	33.33%	19	28.36%	26	35.14%	13	36.11%	37	43.02%
<i>very helpful</i>	9	15.00%	14	20.90%	14	18.92%	2	5.56%	8	9.30%
Films (incl. youtube)	N	%	N	%	N	%	N	%	N	%
<i>not helpful</i>	11	18.33%	14	20.90%	13	17.57%	16	44.44%	11	12.79%
<i>rarely helpful</i>	15	25.00%	27	40.30%	22	29.73%	13	36.11%	26	30.23%
<i>auxiliary</i>	29	48.33%	21	31.34%	29	39.19%	6	16.67%	33	38.37%
<i>very helpful</i>	5	8.33%	5	7.46%	10	13.51%	1	2.78%	16	18.60%
Books, textbooks	N	%	N	%	N	%	N	%	N	%
<i>not helpful</i>	4	6.67%	3	4.48%	4	5.41%	4	11.11%	6	2.5%
<i>rarely helpful</i>	1	1.67%	8	11.94%	14	9.46%	1	2.78%	2	2.33%
<i>auxiliary</i>	20	33.33%	21	31.34%	16	31.08%	12	33.33%	29	33.72%
<i>very helpful</i>	35	58.33%	32	52.24%	40	54.05%	19	52.78%	49	61.46%
E-books	N	%	N	%	N	%	N	%	N	%
<i>not helpful</i>	32	53.33%	24	35.82%	36	48.65%	20	55.56%	39	45.35%
<i>rarely helpful</i>	12	20.00%	26	38.81%	23	31.08%	9	25.00%	24	27.91%
<i>auxiliary</i>	10	16.67%	11	16.42%	10	13.51%	3	8.33%	19	22.09%
<i>very helpful</i>	6	10.00%	6	8.96%	5	6.76%	4	11.11%	4	4.65%
Discussion forums	N	%	N	%	N	%	N	%	N	%
<i>not helpful</i>	33	55.00%	33	49.25%	30	40.54%	23	63.89%	39	45.35%
<i>rarely helpful</i>	20	33.33%	24	35.82%	32	43.24%	7	19.44%	34	39.53%
<i>auxiliary</i>	7	11.67%	4	5.97%	7	9.46%	5	13.89%	11	12.79%
<i>very helpful</i>	0	0.00%	6	8.96%	5	6.76%	1	2.78%	2	2.33%

Table 4. Cont.

	Polish		Humanities and Social Studies		Foreign Languages		Mathematics		Science	
Social media	N	%	N	%	N	%	N	%	N	%
not helpful	32	53.33%	26	38.81%	37	50.00%	22	61.11%	51	59.30%
rarely helpful	20	33.33%	23	34.33%	20	27.03%	12	33.33%	26	30.23%
auxiliary	6	10.00%	15	22.39%	11	14.86%	1	2.78%	6	6.98%
very helpful	2	3.33%	3	4.48%	6	8.11%	1	2.78%	3	3.49%
Podcasts	N	%	N	%	N	%	N	%	N	%
not helpful	52	86.67%	53	79.10%	45	60.81%	31	86.11%	73	84.88%
rarely helpful	8	13.33%	12	17.91%	19	25.68%	3	8.33%	12	13.95%
auxiliary	0	0.00%	2	2.99%	8	10.81%	2	5.56%	1	1.16%
very helpful	0	0.00%	0	0.00%	2	2.70%	0	0.00%	0	0.00%

An analysis of the collected data leads to the following conclusion: the prevailing criterion for the surveyed teachers was *availability* (Internet) and *attachment* or *credibility* (books) when seeking support in creating a sustainable teaching-learning process. In certain cases, the choice of media as means of support when shaping competences crucial to sustainable development was dependent on specific variables (Chi-square test, $p < 0.05$).

A study of the survey results has shown that the use of television as a medium supporting teachers when developing competences crucial to sustainable development depends on the subject taught—a statistically significant correlation has been observed (Chi-square test, $p < 0.05$). Figure 2 presents correlation between the subject taught and the use of television in order to implement objectives of education for sustainable development.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	24.085	12	0.020
Credibility quotient	23.245	12	0.026
Linear relationship test	0.306	1	0.580
N Valid observations	323		

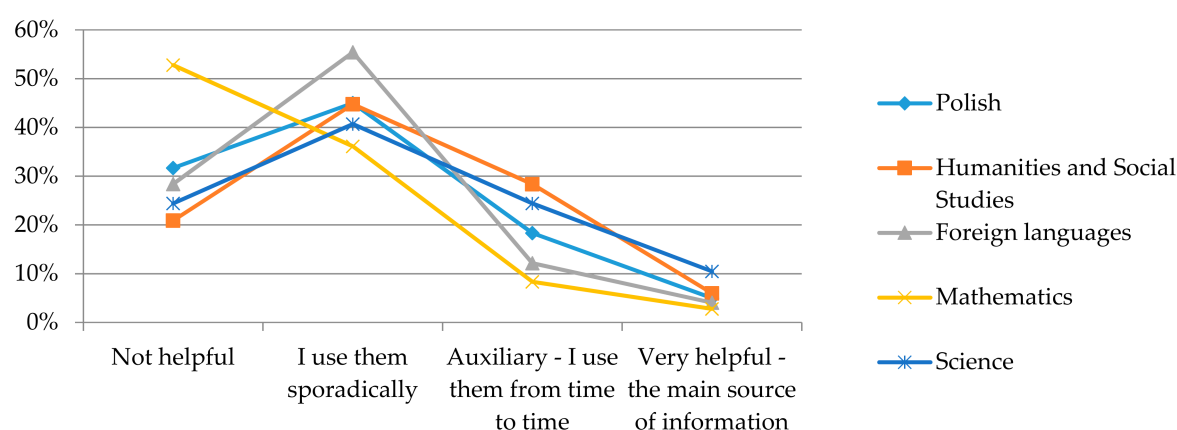


Figure 2. Television as a support to teachers when implementing objectives of education for sustainable development in the context of the subject taught.

As we can see, programs broadcast on TV are least helpful to teachers of Mathematics—more than 50% of the surveyed professors consider television ‘not helpful’ when implementing education for sustainable development. Over 50% of foreign language teachers declare that television programs are ‘very helpful’ to them when creating a sustainable teaching process. It should be noted that foreign

language teachers, often fluent in several languages, may also use foreign TV channels where they can find many inspirations concerning sustainable development and education for the future.

Using film as a medium supporting the teaching process, aiming at supporting sustainable development, depends on the size of village or town in which the school is located. This correlation is presented in Figure 3.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	17.929 ^a	6	0.006
Credibility quotient	18.357	6	0.005
Linear relationship test	5.184	1	0.023
N Valid observations	332		

^a Expected size is less than 5 in 0.0% cells (0). Minimum expected size is 7.58.

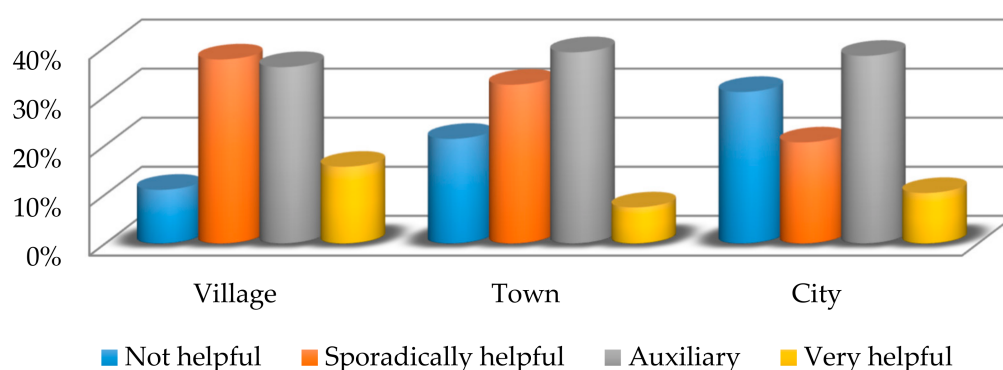


Figure 3. Films as a medium supporting implementation of education for sustainable development.

An analysis of the collected data shows that films (including those posted at the www.youtube.com website) are most often used as a source of support of the teaching process prepared in accordance with objectives of education for sustainable development by teachers from village schools (the lowest number of 'not helpful' responses and the highest number of 'very helpful' responses). This may be due to the fact that teachers in those schools have less access to other traditional media, such as books or journals, than teachers working in cities.

Use of Internet forums depends on the level of education. A similar number of middle school and high school teachers shows that Internet forums are very useful to them when preparing a sustainable teaching process. However, a half of teachers employed in high schools and approximately 40% of middle school teachers think that forums are not helpful when implementing objectives of education for sustainable development. In Figure 4 dependence of using forums as a support in shaping competences of the future in the context of educational level is presented.

Chi-square tests

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	11.725 ^a	3	0.008
Credibility quotient	12.380	3	0.006
Linear relationship test	7.069	1	0.008
N Valid observations	326		

^a Expected size is less than 5 in 0.0% cells (0). Minimum expected size is 7.31.

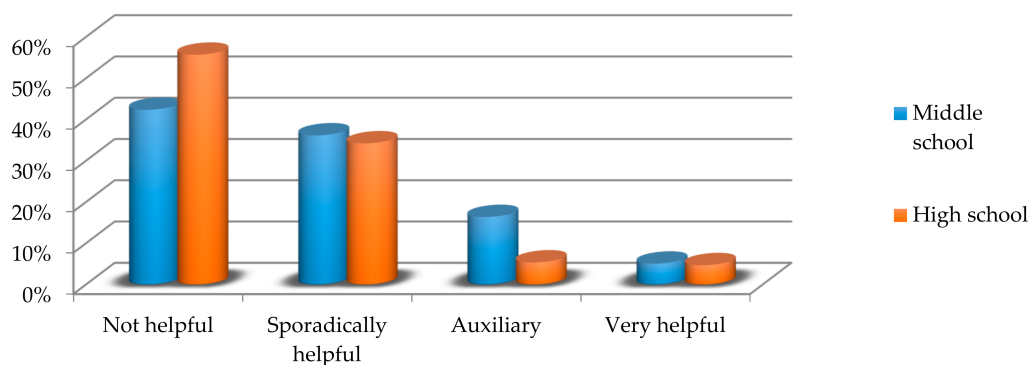


Figure 4. Forums as a support in shaping competences of the future in the context of educational level.

On the other hand, the use of e-books as support in creating a sustainable teaching process depends on the school's location. E-books are most helpful to teachers working at village schools—the lowest number of teachers have indicated that e-books are 'not helpful', and the highest number consider them 'very helpful'. In towns and cities, a similar number consider e-books 'not helpful' (over 50% of surveyed teachers; in the case of village schools—ca. 30%). In towns and cities e-books are significantly more helpful to 5% and 8% of teachers, respectively. Figure 5 shows teachers' declarations about using e-books as a support in implementing the sustainable teaching process in the context of location of schools.

Chi-square tests

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	20.657 ^a	6	0.002
Credibility quotient	21.130	6	0.002
Linear relationship test	17.268	1	0.000
N Valid observations	332		

^a Expected size is less than 5 in 0.0% cells (0). Minimum expected size is 9.42.

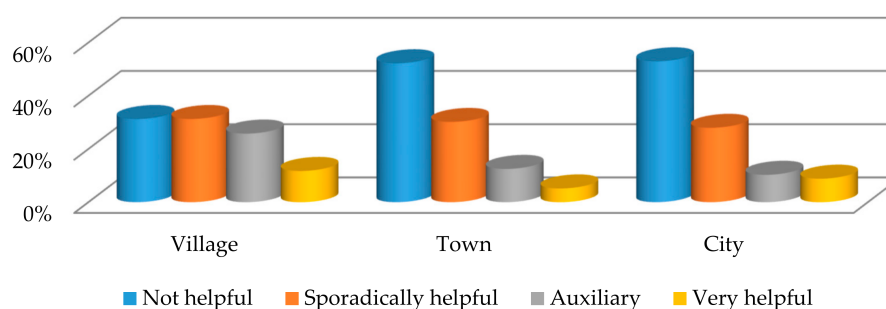


Figure 5. E-books as support in implementing the sustainable teaching process in the context of location of schools.

The surveyed teachers were also asked to indicate which media they use in their work as teaching aids. It should be noted that, when designing a sustainable teaching-learning process, teachers cannot dismiss shaping a responsible attitude of their students towards the omnipresent media. Moreover, the use of media is necessary to shape the capability to critically evaluate the information provided by the media, to develop creativity and inventiveness of young people. The school, whose purpose is to form active members of the future society, cannot renounce new technologies. Teachers should therefore use new media in a responsible and effective manner during their lessons.

The surveyed teachers most often use computer equipment with Internet access and multimedia presentations—they are used by 48.1% and 47.8% of teachers, respectively. Films are also a popular teaching aid. Almost 30% of the surveyed teachers use them ‘very often’, and 50.7% ‘from time to time’.

A relatively large group of surveyed teachers use journals and mobile phone applications. Approximately 70% of teachers use them, most of them from time to time (journals) or sporadically (telephones). A detailed account of the media used by teachers is presented in Table 5 and Figure 6.

Table 5. Media used by teachers as teaching aids supporting the implementation of objectives of education for sustainable development.

Media Used as Teaching Aids	Never		Sporadically		From Time to Time		Very Often		Total	
	N	%	N	%	N	%	N	%	N	%
Films	39	11.57%	27	8.01%	171	50.74%	100	29.67%	337	100%
Mobile phones/smartphones and applications	100	29.67%	128	37.98%	83	24.63%	26	7.72%	337	100%
Computers/laptops with Internet access	36	10.68%	33	9.79%	106	31.45%	162	48.07%	337	100%
Computers/laptops without Internet access	136	40.36%	76	22.55%	71	21.07%	54	16.02%	337	100%
Multimedia presentations	28	8.31%	17	5.04%	131	38.87%	161	47.77%	337	100%
Tablets	186	55.19%	93	27.60%	44	13.06%	14	4.15%	337	100%
E-books/e-textbooks	147	43.62%	53	15.73%	83	24.63%	54	16.02%	337	100%
Discussion forums	185	54.90%	72	21.36%	60	17.80%	20	5.93%	337	100%
Social media	193	57.27%	68	20.18%	51	15.13%	25	7.42%	337	100%
Journals/online issues of journals	106	31.45%	40	11.87%	139	41.25%	52	15.43%	337	100%
Computer/interactive games	173	51.34%	75	22.26%	72	21.36%	17	5.04%	337	100%
Digital photography	175	51.93%	43	12.76%	72	21.36%	47	13.95%	337	100%
Podcasts	250	74.18%	55	16.32%	26	7.72%	6	1.78%	337	100%

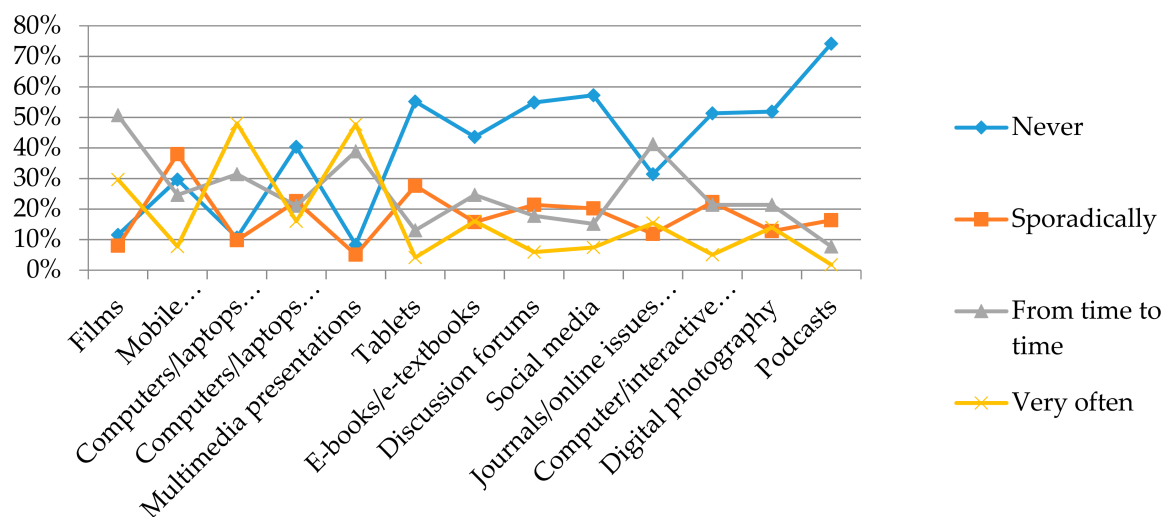


Figure 6. Use of media as teaching aids.

An analysis of the collected data allows to put forward a hypothesis that teachers are more willing to use technical tools that have been popular for many years—such as presentations, films, or computers with Internet access—as teaching aids when implementing objectives of education for sustainable development, with the exclusion of the most recent inventions. Students may nevertheless be bored by the former; more and more digital tools appear on the market, new media with which students work daily. In order to use them effectively and efficiently, as well as safely, and to implement complex teaching goals related to education for sustainable development, students should use latest technologies also in their schoolwork. Teachers should show their students how to use the media responsibly, developing skills and acquiring new competences. Teachers do not use games that may incite critical thinking, anticipation, creativity and inventiveness, as well as the capability to cooperate. It seems surprising that tablets and e-books/e-textbooks promoted by the Polish Ministry of National Education are not popular among teachers. The survey has also shown that teachers are reluctant to use mobile phones/smartphones and applications installed on them, but use them more often than tablets or e-textbooks. Sporadic use of phones or abandoning them altogether may be explained by the fact that not all teachers know how to use that tool. Moreover, professors may fear that this may lead to students competing between themselves, boasting the possession of more advanced devices.

The study has also revealed that only a small percentage of teachers sporadically use social media in their work to shape key competences for sustainable development. Teachers should be acquainted with the virtual environment in which their students spend their time and show them how to fully benefit from it in their personal development, which is the goal of an efficient education for sustainable development.

An analysis of research results has shown that there are statistically significant correlations between the use of specific media and the variables selected for the study.

The use of films as teaching aids in the process of education for sustainable future depends on the subject taught and the professional rank of the teacher. In Figure 7 the correlation between the usage of films as teaching aids to support competences of the future, and subject taught are presented.

Chi-square tests			
	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	51.290 ^a	12	0.000
Credibility quotient	42.610	12	0.000
Linear relationship test	1.663	1	0.197
N Valid observations	323		

^a Expected size is less than 5 in 10.0% cells (2). Minimum expected size is 3.01.

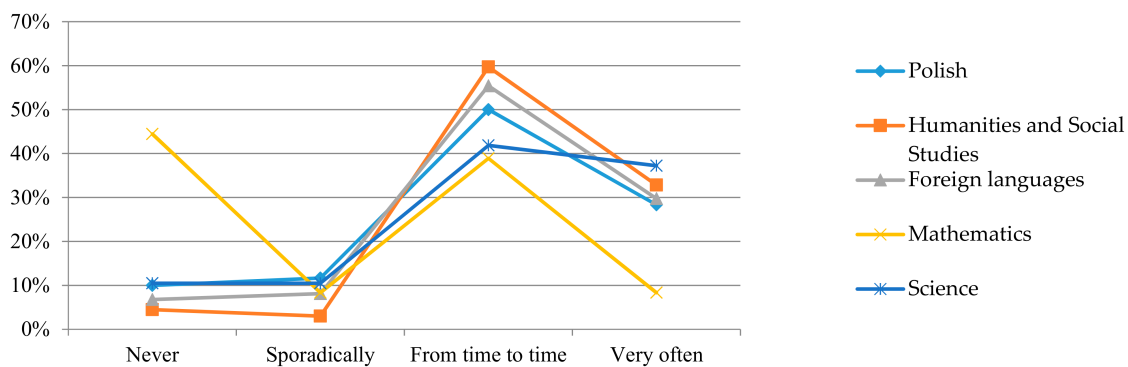


Figure 7. Use of films as teaching aids to support competences of the future in the context of the subject taught.

Films are least useful to teachers of Mathematics, and most useful to teachers of Humanities and Social Studies. Also, science professors use those teaching aids willingly. This relationship may be explained by the specificity of the subjects taught.

Taking into account the teachers' professional rank, the group using films most often during their lessons are contract teachers (more than 40%—very often; more than 20%—often). Also, teachers with shortest seniority, at the lowest professional rank (intern teachers) are willing to use films to support the key competences for sustainable development. Figure 8 shows the correlation between the usage of films as teaching aids, and the level of teachers' professional rank.

Chi-square tests			
	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	21.271 ^a	9	0.011
Credibility quotient	22.040	9	0.009
Linear relationship test	0.270	1	0.603
N Valid observations	336		

^a Expected size is less than 5 in 25.0% cells (4). Minimum expected size is 1.01.

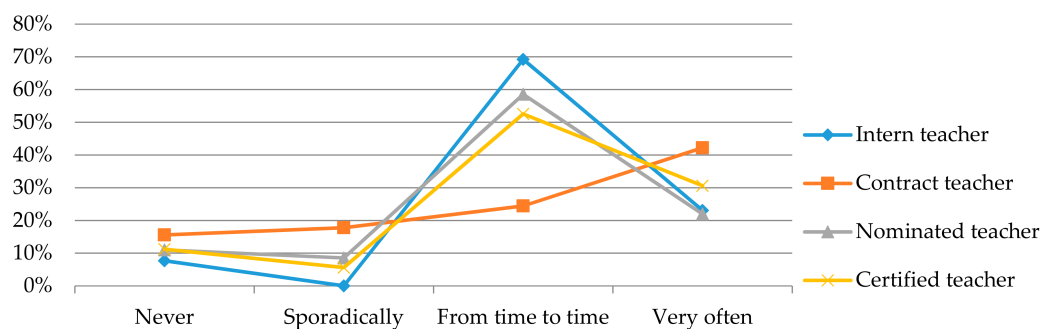


Figure 8. Use of films as teaching aids in the context of teachers' professional rank.

Although the use of mobile phones and smartphones during schoolwork is not popular, there is a statistically significant correlation between the use of that medium and the teachers' seniority, which is presented in the chart. The correlation is showed in Figure 9.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	17.064 ^a	9	0.048
Credibility quotient	17.172	9	0.046
Linear relationship test	5.457	1	0.019
N Valid observations	337		

^a Expected size is less than 5 in 12.5% cells (2). Minimum expected size is 2.78.

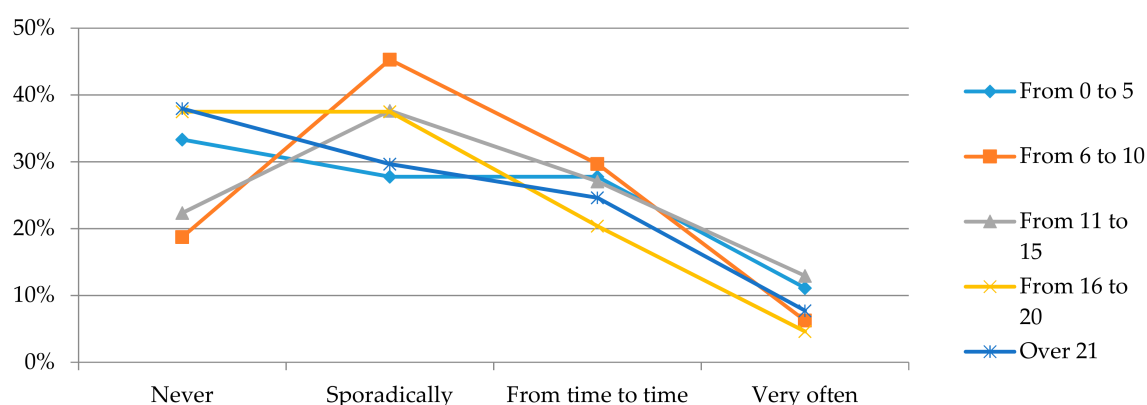


Figure 9. Use of mobile phones/smartphones as teaching aids in the context of teachers' seniority.

As can be seen from the analysis of the collected data, teachers with shortest seniority most often use mobile phones and smartphones along with applications installed on them. This correlation is not surprising—younger teachers handle new technologies better, therefore they are more willing to use such tools.

An analysis of the research results has shown that seniority also determines the use of computers/laptops with Internet access. Teachers in higher professional ranks are decidedly less willing to use this medium. What may seem surprising is that the highest number of declarations concerning using computer with Internet access 'very often' appeared in the group of teachers who have worked from 16 to 20 years. Also, teachers with lowest seniority find computers useful during lessons. It should be noted that if a school is well equipped with modern devices, all teachers may use computer rooms during their courses (see Figure 10).

Chi-square tests			
	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	21.081 ^a	9	0.012
Credibility quotient	19.728	9	0.020
Linear relationship test	2.115	1	0.146
N Valid observations	337		

^a Expected size is less than 5 in 12.5% cells (2). Minimum expected size is 3.53.

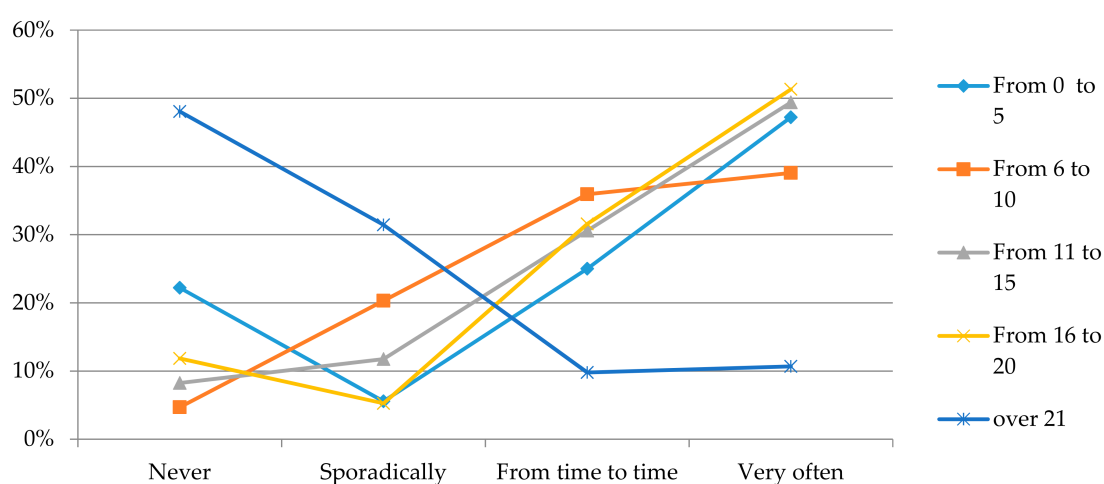


Figure 10. Use of computers as teaching aids supporting the development of key competences of sustainable development in the context of seniority.

4. Conclusions

An important task is now before all teachers: to implement objectives of an education that is designed to change the world, directing it towards a sustainable future. Implementation of objectives of the ESD requires effort from teachers, seeking sources, ideas, and innovative solutions. Media may support them in this process, as they are an invaluable source of information and knowledge, also as concerns sustainable development and educational concepts relating to it. Thanks to modern media, such as social media or discussion forums, teachers may exchange ideas, use tools created by other teachers from other parts of the world. In other words, the media give teachers opportunities they have never had before—thanks to them, time and space limits are no longer an obstacle, and educational resources become more interesting, supporting versatile development of students. It should be noted that, according to the paradigm of connectivism, very much sought after in the 21st century, teachers should use the media also during lessons. When working with digital natives [42], teachers cannot underestimate the fact that today's students are surrounded with media almost since birth—shaping their opinions, influencing their view of the world, their values, habits, studying methods, and schoolwork. Therefore, teachers should use those media, also new ones, in the teaching process.

It is surprising that teachers very rarely and—probably—reluctantly use smartphones to develop students' knowledge in the field of sustainable development. For young people today, the virtual learning environment is the primary, the first to reach. Ignoring this environment, teachers show students that they will not find anything valuable and worth noting in it. As a result, students are more likely to use new technologies for entertainment and not for learning and developing their competencies (including competencies for sustainable development).

Media as films, television, have been present in Polish educational system for many years. But as a results show, they are not often used by teachers to promote sustainability.

Presently, new media such as social media, are used as learning aids all over the world [43–46]. Polish teachers, however, are not enthusiastic towards this particular media type—they do not consider it useful when implementing objectives of education for sustainable development, nor do they use them too often during lessons. It is worth mentioning that new media are the main source of information and knowledge on sustainable development and methods of implementation of a sustainable teaching process. What's more, thanks to new media, like social media, teachers can shape key competences for sustainable development among students. To renounce their use—means losing the opportunity to effectively implement the objectives of education for sustainable development, and consequently—lower awareness of students and lower impact on their opinions, attitudes, and values, that should strive for a balanced development. The research problem is innovative and has not been widely discussed in scientific papers. Although teachers are considered as the promoters of the change and their role in implementation of sustainable solutions is stressed, they do not often participate in empirical research. It may be due to teachers' reluctance to take part in scientific research, lack of time, etc. Therefore, the presented research has a unique value. The presented study was explorative and descriptive in nature, and may constitute an initial/preparatory stage for a more in-depth study, that could be carried out using the participant observation method. An analysis of research results has shown that modern media, especially interactive ones, are not considered very helpful by teachers, which may cause low efficiency of education for sustainable development. Therefore, research conclusions should be used when planning teaching, improvement and teacher training, with emphasis being placed on their awareness, knowledge, skills and attitudes towards application of media in the teaching process.

Further research should concentrate on the factors determining the choice of specific media for achieving education goals for sustainable development and what are the causes of avoiding some of them. It would also be useful to design and carry out comparative studies that would allow for determining which media are used by teachers in their work for sustainable development in countries involved in building a sustainable social, economic and environmental model on different levels.

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