



USE OF WEB PAGES IN ENVIRONMENTAL EDUCATION

Preferences of Primary Education teachers in the selection of content

USO DE PÁGINAS WE EN EDUCACION AMBIENTAL.
Preferencias del profesorado de Educación Primaria en la selección de contenido

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ABSTRACT

Primary Education is the ideal time to instill proactive behaviors in young people around current environmental challenges. Analyzing the benefits of using Environmental Education websites, this research addresses the characteristics that these sites must have to fulfill their didactic function based on the needs shown by a sample of teachers from the Community of Madrid (Spain) from of an ad hoc questionnaire. The results show that the study objectives, motivation and activities proposed to students on websites are the most important aspects in the selection of resources for teachers.

PALABRAS CLAVE

*Técnicas de enseñanza
Tecnologías de la Información y la
Comunicación
Educación Ambiental
Enseñanza Primaria
Habilidades de información*

RESUMEN

La Educación Primaria es el momento ideal para inculcar conductas proactivas en los jóvenes en torno a los actuales desafíos ambientales. Analizando los beneficios que supone el uso de sitios web de Educación Ambiental, esta investigación aborda las características que deben tener estos sitios para cumplir su función didáctica a partir de las necesidades mostradas por una muestra de docentes de la Comunidad de Madrid (España) a partir de un cuestionario elaborado ad hoc. Los resultados muestran que los objetivos de estudio, la motivación y las actividades que se proponen a los estudiantes en los sitios web son los aspectos más importantes en la selección de recursos para los docentes.

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1. Introduction

Sustainable Development Goals (SDG), as defined in the 2030 Agenda for Sustainable Development, and adopted by all United Nations Member States in 2015, are evidence of a growing recognition of the importance of sustainability in recent times. The UNESCO World Conference on Education for Sustainable Development (ESD) organized in 2014 celebrated the UN Decade of Education for Sustainable Development, where one of the main guidelines were to reorient Education to build a better future for all, addressing how ESD can help move Sustainable Development policies to meet different global, regional, national, and local needs. Thus, Environmental Education (EE) and schools are the ideal scenario to begin instilling environmental values in young people. Although Spanish Education Authorities make no specific mention of Environmental Education, it is implicit in the goals of the Primary Education curricula to incorporate issues related to the environment and sustainability, considering these as multidisciplinary values within a so-called “education in values” (García & De las Heras, 2014; Vázquez & Porto, 2020).

There is a wide number of possible teaching methodologies and strategies to address Environmental Education, which range from traditional use of textbooks (Mayer, 1998) and mind maps (Novak, 1991; Guruceaga & González, 2004), to activities which aim at developing critical arguments as a way to compare and contrast knowledge and opinions (Campaner & De Loghi, 2007), or the application of other technological methods as gamification (Ibanez, Di-Serio and Delgado-Kloos, 2014) and simulators (Kramer, 2002; Mateos, Bejarano and Moreno, 2014) that provide a practical learning perspective by generating different scenarios. More recently, Internet is facilitating the increasing use of other online tools such as blogs to publish information (Kahraman, 2021), virtual classrooms to exchange information and experiences (Rao, Eady and Edelen-Smith 2011; Bettinger et al., 2017), or virtual learning communities with forums, chats and mailing lists (Lewis and Allan, 2005) as a meeting point for initiatives, projects, environmental professionals, and educators (Ojeda, Perales and Gutiérrez, 2009). Thus, computing technologies and Internet are playing an increasingly important role in education, specifically with respect to new innovative educational practices.

However, according to the experience of the authors as educators, educational and training centres have not developed adequate capabilities to incorporate these new teaching methodologies. This has become an important shortcoming, especially for experienced and aged professors who are not familiar with Information Technology (Pontes, 2005; Hung & Hsu, 2007; Salido-López and Maeso-Rubio, 2015). An increased use of Information and Communication Technology (ICT) in the classroom requires a reassessment of teaching methodologies, as well as a methodological, didactic, and pedagogical adaptation of teachers (Altuna, Martínez de Morentin and Amenabar, 2017).

2. Objectives

In order to identify appropriate solutions to this problem, our research tries to identify and rank teachers' preferences in the search and use of ICT and Learning and Education Technologies (EdTec), when choosing websites on Environmental Education for use in the Primary Education classroom.

In the search for appropriate online resources for students, the starting point of our research has been the classification of technical, didactic and psycho-pedagogical criteria based on that carried out by Torres (2005). As ICT and EdTec are tools to develop autonomous student learning and digital competences, the challenge for a teacher today is to find the appropriate software and digital contents that fully meet the needs of the whole class (Oñorbe, 2014). Thus, the principal objective of this study is to identify teacher preferences in the use of ICT in their teaching practice, understanding the characteristics that a website should have in order to be effective in EdTec when teaching experimental sciences in general and Environmental Education in particular.

3. Literature review

The nature of Environmental Education itself requires a multidisciplinary approach across those subjects in the curriculum which are essential to the understanding of environmental phenomena (Espinosa, 2008) and which can be achieved through ICT. Contrarily, Louv (2008, in Chuivienco and Martín, 2015) raises the issue of the “Nature-deficit disorder” as a problem for children who are forced to substitute direct contact with nature with technology and virtual reality. However, the reality is that children tend to spend most of their time at school and activities there should be the principal source of learning about and for the natural environment (Novo, 2012). The possibilities offered by the internet to access scientific-technological information (Marco-Stiefel, 2000) and for dynamic and participative communication makes it an indispensable tool for Environmental Education.

The UNESCO Institute for Statistics (UIS) is the official source of international comparable data on education, science, culture, and communication. In their 2009 report, UIS identifies that the two key aspects that should be considered when using ICT and EdTec in the classroom are, first the type of use made of ICT, which in turn depends on the pedagogical approach of the teacher; and second, the time dedicated to the specific use of ICT, which is directly related to the success achieved in terms of educational outcomes.

It is clear that ICT has transformed the way we communicate, work, socialise and learn (Clarke, 2005; Chigona et al., 2011; Annansingh and Veli, 2016; Castañeda, Esteve, Adell, 2018). The use of digital technologies in the classroom is indispensable but positive results in terms of learning outcomes have yet to be demonstrated (Trucano, 2005; Area, Gutierrez and Vidal, 2012; Rodríguez de las Heras, 2015; Jiménez, 2015). This appears to be due to the absence of any change in teacher methodologies, since the teaching style of most teachers does not change when they make use of ICT, as opposed to when they teach without ICT (Sigalés et al., 2008; Area & Sanabria, 2014). Since technology was introduced in teaching methodology, there has been more emphasis on EdTec than ICT (Lozano, 2011). Moreover, according to Sancho (2008), ICT must be transformed into EdTec in order to prove effective in the educational context.

The real issue when addressing the question of teaching innovation is not technology itself, but a change in methodology, one where learning activities focus on the needs and interests of the student, while at the same time using the codes, languages, and tools available the moment (Adell, 2013; Abongdia, Mafumo and Foncha, 2016; Córdoba et al., 2017)). In this regard, there may be several reasons why innovation in education is not being achieved: lack of training, lack of time, lack of technological resources in schools, lack of sufficient acquaintance with the use of ICT in teaching, lack of quality teaching materials, etc. (Marqués, 2013). Furthermore, we cannot assume that students' use of information technologies also makes them competent for their educational use. The goals of students in using technology are very different from those of the teacher, which are essentially the processing of information and its transformation into knowledge (Badía, 2009). Information Technology will only achieve educational purposes through the application of appropriate teaching methodologies and activities specifically designed for ICT (Area, 2007), transforming an instrument designed to collect information into a tool to develop basic cognitive skills (Padilla, 2005; Sancho, 2008; Martínez, Naranjo and Sánchez, 2014). The teacher must be proficient in the use these technologies both technically and pedagogically (Bravo, 2004; Jovanovic, Devedzic and Gasevic, 2007; Burden and Kearney, 2017). The inclusion of ICT into the classroom requires rigorous planning of objectives and of the needs to be covered and can only be successfully achieved if it is fully integrated into the teaching-learning process (Alonso, 2000; García-Valcarcel, 2010; Peña-López, 2013; Pandian, Tan and Abdul Malik Mohamed Ismail, 2014 and Lawrence and Tar, 2018 among many others). In the ongoing discussion about education and ICT, there is a risk of focussing exclusively on the Internet, overlooking the fact that ICT encompasses other tools which offer interesting pedagogical possibilities.

The Internet is an interactive technological resource for education (Figure 1) and an ideal instrument in achieving a global view of Environmental Education (Sureda and Calvo, 1998; Marco-Stiefel, 2000; Meira, 2001; Ojeda, Gutierrez and Perales, 2011; Matarrita et al., 2012; Fernández, Camargo and Nascimento, 2019). On many occasions it is physically impossible to have access the natural environment, and in these cases the Internet completes students' knowledge and furthers their awareness of real problems beyond the confines of the school itself (Jerez and Sánchez, 2004; Payne, 2003; Tan & Pedretti, 2010), creating spaces for encounter, exchange, communication, and inter-relation (Barrón, Muñoz and Pérez, 2008). Cañal, Ballesteros and López (2000) mention the dimensions and scope that Environmental Education can acquire using the Internet, such as consulting libraries, virtual visits to national and natural parks, virtual participation in laboratories, three-dimensional viewing of natural phenomena, visits to organisations and institutions in other countries, participation in conferences and congresses, cooperative projects and sharing information. Finally, Ojeda, Gutierrez and Perales (2011) also mention that while the Internet has definitively become an educational tool within the area of Environmental Education, doubts about its pedagogical effectiveness still persist, because most of the web pages dedicated to Environmental Education lack a clear didactic purpose, they do not have clearly defined addressees and therefore the educational context to which they are destined remains unclear (Ojeda, Perales and Gutiérrez-Pérez, 2012).

Figure 1. Types of educational resources.

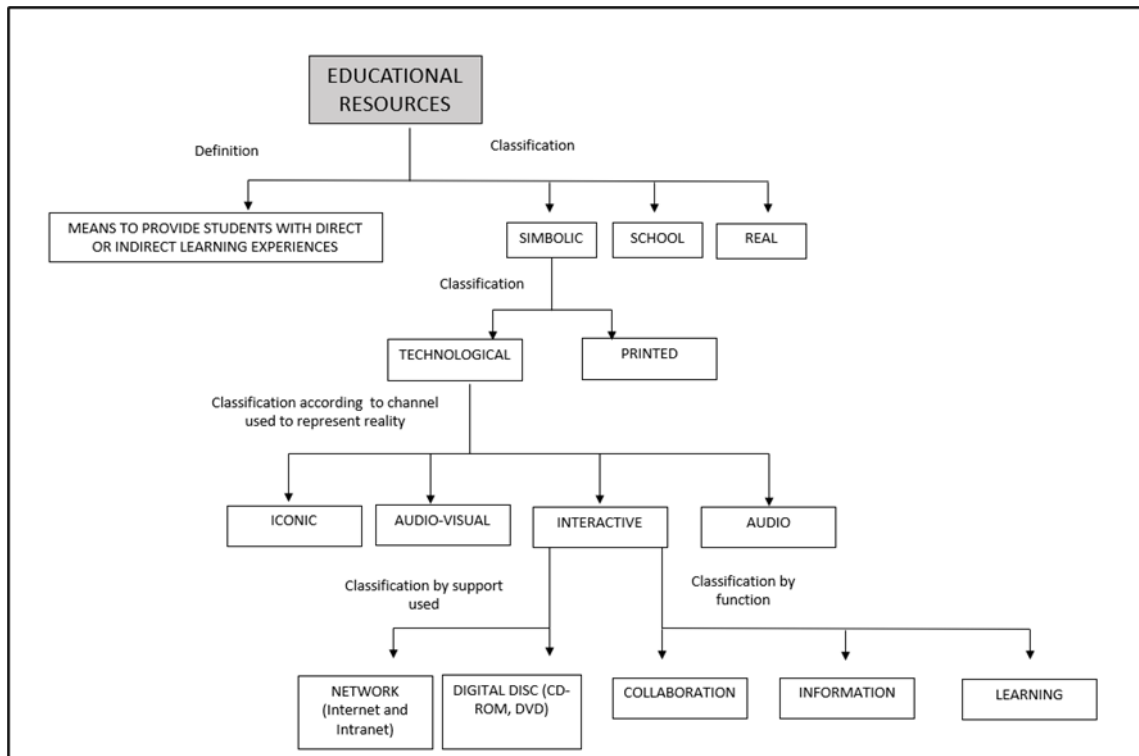


Chart designed by the authors, based on Area (2009), Blázquez & Lucero (2009) and Cacheiro (2011).

4. Methodology and datasheet

The present study collected a representative sample of teachers in the Region of Madrid (CAM) and sent them a data collection questionnaire. The random sample group consisted of 74 teachers in the area of Natural Sciences (in Spanish and English) at various levels of Primary education. The teachers were from public (31), private (25) and charter (8) schools of the CAM out of a total of 1,367 schools imparting Primary Education, for a total sample size of 5.4%.

A questionnaire was developed (Figure 2) to collect information about the way teachers of Primary Education in the CAM make use of ICT in general and the internet in particular, as part of their teaching practices when working on content related to Environmental Education.

The responses to the questions are on a Likert-type scale from 1 (strongly disagree) to 6 (fully agree). The results were tabulated on a spreadsheet for statistical analysis. An analysis was made of the frequency and normalised percentages for the questions and were classified according to age, centre, qualifications, speciality, teaching experience and education level being taught.

Figure 2. Questionnaire sent to teachers

Instrument to identify teacher preferences in ICT/EdTec

School.....

Type: Public Private Charter

Gender..... Age: Qualifications and speciality.....

Years of teaching experience: 1° cycle PE..... 2° cycle PE..... 3° cycle PE.....

Current area of teaching..... Current education level.....

BLOCK I

Evaluate the following statements on a scale of 1 to 6, where 1 represents “*STRONGLY DISAGREE*” and 6 “*FULLY AGREE*”.

Regarding the use of ICT/EdTec:		1	2	3	4	5	6
1	I am familiar with ICT/EdTec						
2	I have sufficient training to work with ICT/EDTec in the classroom						
3	My knowledge of ICT is entirely self-taught						
4	My school has a specific classroom for using ICT/EdTec						
5	My school has PCs in most classrooms						
6	My school has PCs in classrooms with internet connection						
7	My students study using electronic devices (1)						
8	I generally use the internet as a source to prepare my classes						
9	I ask my students to use the internet for classroom work						
10	I ask my students to use the internet for homework						
11	I use Google as my main search engine (2)						
12	When I use a search engine I choose from the top three results						

(1) Indicate which. (2) In the case of others, indicate which.

Fuente: Zambrana, 2016.

5. Results: analysis and discussion

With regards to the use of ICT in general and the internet in particular, the responses from teachers participating in the study show they believe they have sufficient preparation in this area and that they have the technical means to work with ICT in the classroom.

Table 1 provides the average scores for the various questions in the survey. For a better understanding and analysis of the answers, these are provided on a scale of 1 to 10 while the questionnaire used a modified Likert-type scale to avoid an average mid-range answer, using a scale of 1 to 6.

Table 1 Results of the survey on the use of ICT.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGIES	Original average score	Average score out of 10
1. I am familiar with ict	5.48	9.13
2. I have training in using ICT in the classroom	4.42	7.37
3. My knowledge of ICT is entirely self-taught	3.43	5.72
4. My school has a specific classroom for using ICT	5.05	8.42
5. My school has PCs in the majority of classrooms	5.60	9.33
6. My school has PCs in classrooms with internet connection	5.52	9.20
7. My students study using electronic devices	2.77	4.62
8. I generally use the internet as a source of information to prepare my classes	4.35	7.25
9. I ask my students to use the internet in classroom work	2.85	4.75
10. I ask my students to use the internet for homework	3.77	6.28
11. I use google as my main search engine	5.54	9.23
12. When I use a search engine I choose from the top three results	3.81	6.35

Fuente: Zambrana, 2016.

The results show that teachers are highly aware of the various ICT tools available (9.13) and consider themselves well prepared to make use of them (7.37), although they admit these skills are largely self-taught (5.72). A similar study by SclarTic (2018) of the Fundación Telefónica to evaluate the implementation of ICT in the classroom obtained similar results. This study shows that over 55% of Spanish teachers lack sufficient training in the use of ICT in their teaching practice, confirming our view that these skills are largely self-taught and that they should receive more support to acquire them, finding evidence that teachers' practical skills in the use of new technologies are acquired by experience rather than training.

According to a study carried out by the Fundación Telefónica (2012) lack of training is the primary reason why teachers do not make more use of the Internet in the classroom. Data compiled by the same foundation in 2020 reveals that during the general confinement in Spain, students found some difficulties to take advantage of ICT to continue with school learning; teachers also reported shortcomings in their technology skills (Fundación Telefónica, 2021). It appears this lack of training leads to uncertainty among teachers, inhibiting a more regular use. This conclusion differs from our study, which did not find any lack of confidence on the part of teachers but rather a preference to make use of classroom time for other activities, leaving the use of these tools for homework (6.3 out of 10). But according to the data provided by the PISA report of the year 2018, there is a school gap in terms of the preparation of teachers for the use of digital tools (Gortazar, Moreno y Zubillaga, 2020).

Similarly, a study by the OCDE (2015) on the use of computers in learning affirms that the use of the Internet in the classroom leads to better academic results, but only up to a critical point (based in number of hours dedicated to internet-based work) beyond which results not only fail to improve but decline. In fact, according to this study, countries with the best academic outcomes are those which initially develop technological competences, such as internet search, using traditional techniques, and only then, when these skills have been acquired, do students put them into practice on-line. This result may show how to overcome the pedagogical pessimism mentioned by Pedró (2011), according to which a large part of the teachers avoids using educational technology in general and the Internet in particular, due to its distracting effects on students, as well as by the expense in time and money that the investment in this technology needed.

The evaluation students make of Internet usage for classroom work is 4.75 compared to 6.28 for work done at home. This indicates that with regards to tasks which require the use of the Internet, most teachers believe its use is more appropriate at home than in the classroom. This result is likely to the one shown by Ojeda, Gutiérrez and Perales (2011), which also found evidence of scarcity in technological equipment for teaching practice for environmental education.

It is important to consider that in 2018, 13.6% of Spanish households do not have internet access (INE, 2018). In the recent times, it has been done a great effort on this field and this figure has been reduced to 5.8% in the 2021 survey (INE, 2021). However, Zubillaga y Gortazar (2020) notice the importance of paying attention to the digital divide that can be established if we forget the poorest sectors of society. Thus, limiting the use of Internet to homework assignments related to subjects dealt with in the classroom, or to preparation for classroom work,

runs the risk of excluding those students with fewer technological or economic resources (Area, Cepeda and Feliciano, 2018).

Given that the basic aim of Environmental Education is to give students the capacity to provide solutions to environmental problems by helping students to reflect upon them and that the Internet is an ideal vehicle to disseminate scientific knowledge and possible solutions, it is important to keep in mind that the digital divide will essentially affect it. Furthermore, the digital divide also affects the production of knowledge. There is a risk that those who may have a great deal to contribute to education in this area are marginalised and silenced as the divide becomes wider (Cabero, 2004; Paredes, 2006).

Therefore, Calaffell, Banqué and Grau (2019) warn of the risk involved in continuing with the current strategies, which do not develop effective environmental projects because they lack the necessary critical spirit that an environmental education firmly rooted in real problems should have. In the eyes of these authors, classroom activities stay away from reality, and propose stereotyped environmental problems with which students cannot understand the importance of their responsible role in said phenomena. To meet the SDGs, it is necessary to make students understand their leading role in each of the environmental challenges, and this can only be achieved through personal reflection and individualized work.

Addressing environmental problems is a joint task, which is why it is necessary to develop the competence of critical thinking throughout society, described by UNESCO in 2017 as “the ability to question norms, practices and opinions, reflect on one’s own values, perceptions and actions and adopt a position in the discourse of sustainability “ (p.10). Therefore, a work of personal reflection should be fostered at the school level in which the teacher formulates challenges, concepts, and ideas through which the student, sometimes in a group with their classmates, but often individually as a complementary task that will frequently have to be solved at home, propose solutions that demonstrate the achievement of said competence. One aspect to consider is the way we make students work on that personal reflection when it is guided by the Internet: frequently the work is excessive, and more time and effort is required than when working without the Internet. It is therefore necessary, as proposed by Sangrá (2020), to know the students and their working conditions, both intellectually and materially.

Regarding material and technological resources, the participants in our study affirm that their school has sufficient means to use ICT with their students in the classroom. The valuation of specific classrooms to work with ICT is 8.42 and the majority report they have PCs in their classrooms (9.33). Finally, the evaluation of the quality of Internet connection is slightly lower, 7.9 out of 10. However, the study by ScolaTIC (2018) found that 52% of teachers report technical and infrastructure problems and with more recent data it can be affirmed that the technical difficulties persist, since during the general confinement due to the pandemic about 59.7% of the users had technical difficulties due to poor connectivity (Fundación Telefónica, 2021). The fact that our study was largely centred in urban areas should be considered, as the digital divide in urban areas may be less of an inhibiting or exclusionary factor than elsewhere.

Closely related to this is the evaluation of study using electronic devices, which scored a mere 4.62 out of 10. This score is very low if we consider that ICT can facilitate the understanding of difficult, abstract concepts thanks to the use of images and videos (Matarrita et al., 2012).

Data shows that the internet is an important source of information for class preparation, scoring 7.25 out of 10, with Google being the primary search engine, scoring 9.23. These results are in line with those of Ojeda (2008). Thus, it can be affirmed that, for the purposes of this study, that Google is the de facto source of information from the Internet. However, with regards to the search results provided by Google, the score on the likelihood of finding adequate information among the top three results drops to 6.35 out of 10. This figure indicates that teachers tend to search beyond the top three search results until they find their preferred resources. At this point, it is important to remind teachers that for effective use of the Internet in the development of academic skills in general and the development of skills associated with environmental education in particular, it is necessary that the internet sources chosen meet certain criteria of quality, which are collected by Romero (2020): reliability of the information, appropriateness of the language, validity of the content, quality of the design and possibility of interaction.

6. Conclusions

This study provides evidence necessary to answer the two questions initially laid out, that is, what are the preferences of teachers when using ICT in the classroom; and secondly, what characteristics should a website have in order to be effective in teaching Environmental Education.

First, the study shows that 9 out of 10 of teachers surveyed are familiar with ICT and their use, although these skills are largely self-taught. However, these skills are considered insufficient and additional training is necessary. The use made of ICT is largely for support tasks outside the classroom (7 out of 10). Moreover, Google is still the principal search engine and the first search results (9 out of 10) are usually the ones used. In this sense, the training of teachers is of vital importance because without clear criteria consistent with the nature of environmental education, the information provided by the internet may not be the most appropriate to meet the

proposed sustainability objectives., but without sufficient training to extract the most appropriate information, the result of the searches runs the risk of not meeting the necessary requirements for effective learning that allows the real objectives of environmental education to be met.

These answers respond to the interest shown by the scientific community in bringing to the area of sustainability and environmental education, the content and values which permeate the curricula at all levels. Primary Education is a key period in the acquisition of responsible environmental behaviours and attitudes, and it is especially important that these values be acquired and reinforced at an early stage, using attractive tools such as ICT. Teaching methodologies which use and are supported by Internet content are ideal means for environmental education in Primary schools. Internet-based content allows schools and teachers to engage students in their own reality and to develop basic thinking skills and competences; thus, the use of this familiar and commonly used tool can help generate and coordinate responses from students.

Regarding the second objective of the research, evidence was found showing that, in the eyes of the participating teachers, didactic and psycho-pedagogical criteria are most important in evaluating website content for the EA. Of these objectives, those aspects related to student motivation and activities are the most important issues in considering the classroom use of a website. Thus, we can recommend that website designers take these preferences into account, focus their efforts on improving these aspects and therefore create educational websites and content which meets the real needs of the class. Furthermore, the nature of Environmental Education is such that it requires a greater development of psycho-pedagogical aspects such as motivation, interactivity, or creativity.

Concerning possible future lines of research, it should be noted that teachers do not currently have tools which prioritise the search for information based on the criteria presented herein. Page Rank by Google is used to rank websites by their popularity rather than by specific didactic criteria. Thus, further research is recommended into these teaching priorities to generate tools to complement those currently available, permitting teachers to better identify quality content for environmental education.

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