
SCIENTIFIC INFORMATION AND THE INTERNET IN THE MODERN EDUCATIONAL CONTEXT

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Abstract

The Internet is an indispensable component of contemporary society. It plays an important role in everyday life by offering information and communication methods that it makes available to all those interested, especially the younger generation. Unavoidable, the educational field has taken advantage of these newly developed facilities and skills of students and teachers, promoting active mediated learning through state-of-the-art technologies. Information is the main vector of these transformations' dynamics, changing mentalities, amplifying possibilities and developing new types of educational interpersonal cohesion. Also, keeping boundaries and managing the risks of increasing information consumption becomes an increasingly difficult challenge to manage. Starting from these considerations, the research presented in this paper aimed at the relationship between the student and the scientific information that can be accessed on the Internet. The research results indicate the advantages and disadvantages arising from this interaction. That is by analyzing the relationship to parameters such as user profile, technologies used, sites accessed and how to use and capitalize the information.

Keywords

university education, Internet, scientific information, management

JEL Classification

I2, M15, L86

Introduction

Today's society is an ongoing challenge for education. Globalization and modern technologies change the pattern of teaching and learning, and the complex dynamics of interpersonal relationships and the diversity of everyday problems require the university educational process to rethink the socio-cultural paradigms according to which it works. Education

trainers speculated on the student's increasing predisposition to the virtual environment and the use of multimedia elements and developed projects and programs to obtain the advantages offered by the possibility of continuous, interactive training. In universities, traditional methods of education are undergoing rapid and profound changes. They have been gradually complemented, sometimes even replaced, by methods based on modern technologies that offer a wide range of applications and new perspectives for educational practice.

The e-learning environment capitalizes on the desire of Generation Z (those born between 1995-2010 as they are called by Seemiller and Grace, 2006) to accumulate knowledge quickly, through individual work, without significant effort. The variety of sources that allow fast access of information, simultaneously, by a large number of students can lead to an increase in the rate of knowledge acquisition for them, leading to benefits for the educational institution as well. However, the large flow of information available in the virtual environment, the ongoing updates and their fast wear and tear require careful manipulation of information. Selecting the correct information is a process that requires constant effort and collaboration of all people involved in the educational process. In this context, universities must take measures to ensure the correct management of data used by students through coherent rules and regulations or even by introducing courses on information culture.

The use of the Internet has become an increasingly used alternative for searching scientific information needed for teaching and research, not only for students but also for teachers. University teachers are stimulated and motivated by the possibility of accessing fresh scientific information resources, through open communication with researchers from around the world, by acquiring low-cost educational concepts and techniques, but also by increasing participation and interaction with their own students. The Internet becomes an important element of the modernization of university education because it has the real capacity and power in substantiating and consolidating the evolution of this system and the general socio-economic development (Figure no. 1).

An open university educational space offers many beneficial perspectives - easy, fast and cheap access to learning materials, new information, offers the student the opportunity to choose the content and tools appropriate to their interests. Therefore, the management of the selection and capitalization of information, as the main force of the new education, must be integrated into the instructive-educational process to cope competently with change and all the elements that accompany it - uncertainty, adaptation and innovation.

The Internet has become the great scene of scientific debate. The fall of geographical and communication barriers has led to its transformation into the largest market for scientific information. Research and education institutions, publishing organizations, scientific societies and independent researchers overcrowd daily, through the huge amount of information released, this space - specialized sites, with databases, portals, forums, blogs, transforming the user, one by one, in creator and consumer. This continuous oscillation, often imperceptible, creates, through the multitude of directions of choice and the desire for visibility, ambiguity. Thus, in terms of quality and validity, it is difficult to select the information needed for a particular context, and managing and controlling a huge daily flow requires new skills and responsibilities.

The importance of selecting and capitalizing on scientific information that appeared in the online environment in the process of university education, in its multitude of forms and with its various purposes and missions, appears more and more strongly in the literature. Thus, we mention some recent achievements that are either the subject of open educational practice by developing e-learning programs adapted to the specifics of disciplines (e.g. Open Access Publishing, Free and Open Source Software), where scientific information is controlled (Lane and McAndrew, 2010; Scanlon et al., 2015; Vilceanu et al., 2019; Mayer, 2019), or the problems of frequent and uncontrolled use of information on cognitive ability or the process of accumulation and transmission of acquired knowledge (Buff and Burr, 2018; Carbonell et

al., 2018; Seemiller and Grace, 2016, 2017, 2019; Feng et al., 2019) or how to combine traditional with online resources taking in consideration the students' adaptation to new socio-economic conditions (Lyons, J. 2019; Mata, 2019; Stan, 2019).

In this context, the approach to the issue of correct selection and use of scientific information taken from the Internet is currently regarding the socio-economic period we are going through, in which the reconceptualization of the education system is no longer a desideratum, but a certainty.

Research methodology

The field of natural sciences generally aims at learning through exploration and application. Observing and researching the environment, the phenomena and processes that define its components involves a multidimensional approach of which the most important part is the application (eg, collection of samples-fossils, minerals; measurements-topographic, meteorological, hydrographic; useful mineral substances, tracking processes with slow or rapid evolution -landslides, volcanic eruptions, tsunamis, rock falls, earthquakes, extreme weather and hydrological phenomena and establishing their effects on nature and population). Specific tools are used. Thus, the use of scientific information on the Internet must be done by relating it to the natural environment, by direct observation. Often this cannot be done, checking the information in printed texts or assumed by well-known specialized authors is mandatory.

The purpose of the research and the working hypotheses

The purpose of the research was to identify the way the student reports to the information accessed on the Internet and capitalized in the academic training process.

H1. Students access the Internet more than 75% of the information needed to complete an academic program;

H2. Selection, as a stage in the process of acquiring information accessed on the Internet, does not exist.

H3. Students are open to active education and are aware of the benefits of a secure information environment on the Internet (eg online libraries, specialist websites, magazines and teaching materials).

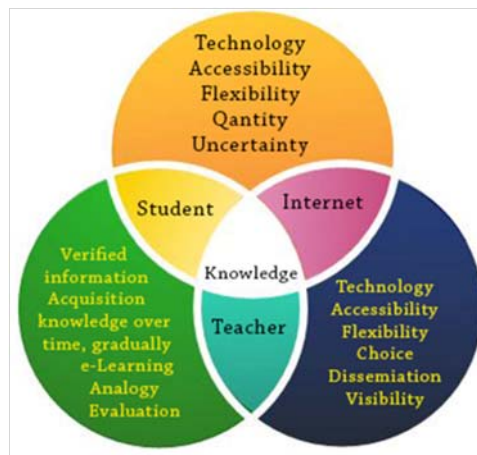


Fig. no.1 The relationship between Internet-Student-Teacher and Knowledge/ Scientific Information

Source: Authors

Data collection was carried out between May-July and November-December 2019. The questionnaire was used as a tool. It included 12 questions grouped into 4 broad categories and aimed at:

- the type of technologies used, their frequency of use, the main purpose of use, the motivation of use;
- the type of information sought, the form in which they are used, how to capitalize on them, verification and selection;
- knowledge of specialized sites, frequency of accessing them, academic ethics in using information;
- use of educational platforms, enrolment in online courses, attitude towards active education.

Participants

The research is part of a much more complex study aimed at new learning techniques in university education. For the segment presented in this paper, 337 students from specializations in the field of natural sciences were interviewed, from several university centres in Romania (Bucharest, Targoviste, Ploiesti). They are from all the years of study of the two cycles of education, bachelor and master. They are between 19-27 years old (the range 19-22 has the highest share - 71%), and as a gender distribution 32% boys and 68% girls.

Results and discussions

1. Technique and technology

Technological development has allowed, more and more, the opening of the general public to the resources offered by www through the internet. Through increased connection stability, the new generation of information technology allows simultaneous access to an increasing number of users, and through text and video communication applications (eg e-mail, discussion forums, hypertext, video streaming, video conferencing, multiplayer online games) social interactions take place in a much more popular and animated virtual world. The great variety in the use of technology also affects the educational field. Modern methodologies based on these technologies are emerging that change the teaching-learning educational practice. The tools used (e.g. ERP, CRM, Microsoft Office Applications, Google Applications, Google Docs) are increasingly performing and allow complex applications. The equipment (computers, tablets and smartphones) is widespread and easy to handle.

Analysing the data extracted from the answers received, it is found that 92% of respondents use at least one mobile device (98% smartphone and 86% tablet/laptop) with which they have an Internet connection. They also use it in college and at home, although 61% of them also have a computer. It is mainly used for social networking (87%), they are familiar with Facebook, Google+, Twitter, Instagram, studentie.ro, linkedin.com, etwinning.net, iTeach.ro etc. None of them could specify exactly how many hours, is estimated, on average 6 hours. It is used both during classes or seminars, often unrelated to their content (23%) and during school hours, in public transport (69%), during relaxation or solving study topics (67%). 54% check the phone at the same time as another device on which they carry out a professional activity. Seemiller and Grace (2016) consider that the excessive use of smartphones is reflected in the low ability to concentrate and attention is due, in their case-generation Z, to the phenomenon known as Fear of Missing Out (FOMO). 85% consider that one of the main advantages of communication is the knowledge that results in obtaining a large amount of information necessary for the learning activity.

The technical element is the most difficult to master. Compatibility or connection issues being among the most mentioned (87%).

The emergence of information technologies has favored the development of active e-Learning projects, being one of the main educational tools to support.

The Internet is an inexhaustible source of information. All the subjects are covered. Anyone can publish and use anything. But navigating this ever-expanding information environment is a challenge that not all of us can respond to promptly and effectively. Curiosity leads to continuous search, pushes the limits of demand, and leads to changed perceptions of reality. But this is specific to the information society in which we live. In this context, education refreshes your foundations based on this huge amount of information that changes the world (Grigorescu et al, 2016). The university is a space for the development and training of the people of the future. How does the student relate to information? How does he use or capitalize on it? Does it give him advantages or not?

The student benefits from multiple advantages by using the information on the Internet. For the respondents these were: accessibility (89%) - meaning the possibility to access numerous sites from where to obtain information, sometimes in real time, in the comfort (85%) offered by the home-without running through libraries, but on the day and time he needs -flexibility (79%).

2. Knowledge/Information

The Internet promotes easy access and review of data and allows information formats that are not suitable for print media, including high-resolution images, moving video, animations, simulations, and the program's source code (Dellavalle et al., 2003). The respondents of our study state in a proportion of 96% that they use www to find the information necessary for the academic and professional training process. Look for information for consolidation (after hearing a course) 53%, for completion - 49% or because they need - 72%. Everyone considers that the information sought in these contexts is scientific information, even if it is accessed from news sites, blogs, vlogs or published on social networks. The study shows that her students are looking for materials in Romanian (79%), even though there are numerous translation programs. The specifics of the disciplines lead to accessing, in particular, the sites where there is also graphic material (68%). Lack of practice in making graphic materials (e.g. maps, sketches, profiles), inability to photograph something real (e.g. a volcano during the eruption, a plant that grows in the specific Arctic ecosystem, changing a landscape as a result of a tsunami) or the visual aesthetic impact, directs the search for information posted by specialists in the field or, in any case, people who have a touch with the earth's sciences. And there comes the slight relaxation regarding the correctness of the data used by the student. However, many of the respondents are not guided by the one who assumes the information (23%), but by the quality of the materials in terms of image or the development of an accessible discourse in the presentation of the topic (77%). The use of information is generally done for the realization of topics in courses or seminars/practical works (for example, ppt. Presentations, papers, projects) - 92%, or for dissertations (bachelor, master) - 43%. Most of the time, the information is used in the form in which it is found, unprocessed by a personal filter (74%) or verified by searching the primary source and tracking logic of the scientific approach (91%).

Critical information analysis-qualitative assessment of information sources and an assessment of sources' relevance for information requirements is unimportant for many (73%). 72% do not think about what type of information is (eg primary, secondary, general, scientific), nor whether it is relevant to what they are looking for, even if the context-source in which it is found concerns the subject sought (81%), nor who is the author (79%), the date of publication (83%) or the target group for which the text is written (93%). It is therefore observed that the authenticity of the information is not a priority for the student. However, critical evaluation of information before use requires all the skills it forms over time and the user's ability to discern is difficult to test by the multitude of information sources

3. Sources of information

Access to scientific information in the online environment is considered an advantage for students. The science community understood the opportunity offered by the Internet and adopted new technologies in the process of research, communication and information transmission. The classic way of publishing, accessing and disseminating scientific information has changed. All journals, scientific or popular, now have sections for digital publication, conferences and symposia make public the debates in the online environment, and the results of research contracts are posted on the official pages of the institutions. But not all of them are free. Much of the information costs, however, for students it can be covered by university subscriptions, grants or other forms of funding. Supporting the way of capitalization on the Internet appeared the form of Open Access through which information became a common good of all users, obviously under certain conditions imposed by ethics and copyright. *"Free access has a future. Introducing research results into the public sphere is beneficial to science and strengthens our knowledge-based economy."* (Máire Geoghegan-Quinn, European Commissioner for Research, Innovation and Science, 2014). The internet user can find a substantial amount of work data for any subject, the numerous specialized sites being the guarantor of correct and quality information. Among the best known: Public Library of Science (PloS) which offers free access to its journals (information can be used under the Creative Commons Attribution License); PNAS (Proceedings of the National Academy of Sciences of the United States of America) which, based on a subscription, allows access to advanced research reports, colloquium papers, scientific materials of the US National Academy of Sciences; BioMed Central provides free access to scientific articles from the 241 journals it sponsors; science.gov is the gateway to over 2100 other scientific sites in addition to numerous databases and millions of pages of information. Alongside these are the websites of research and educational institutions, libraries, professional scientific organizations, publishing houses and personal blogs (for example, UCS, AAAS, IEEE, IEEE, NESTA, AIBS, AIP). There are academic communication networks such as Academia.edu, Researchgate where researchers from around the world disseminate the results of their research.

Asked if information from this type of site is used, 38% of students answered positively. The others (62%), although they knew them, motivated the lack of interest in these sites by the fact that the material contained in them is too scientific, rigid, often super specialized. They preferred (71%), for example, the Internet sections of channels such as National Geographic, Nat Geo Wild, Discovery, Nova, and Animal Planet. They mentioned (87%) that the teachers directed their use to specialized sites, but they were only used occasionally (only when the exact name of the article was requested and indicated, the researcher, the journal, not the general topic). 63% did not know the research of their faculty teachers posted on the Internet. Each research article presents the status of the research at that time and generates multiple directions of documentation. A large amount of information that can be accessed leads to new research generates, in a very short time, other information. The information is perishable, and the warranty period is getting shorter. Under these conditions, returning to primary sources is increasingly difficult and leads to wrong citations. On the other hand, the increased dynamics of research and assertion generate inappropriate ethical behavior.

The respondents of this study acknowledge the use and capitalization of information without respecting the rules of academic ethics (78%). They do this either out of ignorance or because the information is not assumed by anyone. Plagiarism is not a concrete notion for them (87%), even if everyone, generically, knows what it entails. 84% consider that the information accessed from www is free, and therefore can be used in the same way and 72% believe that plagiarism can be reported only in published (and printed !!!) works such as articles, books, doctoral papers, dissertation or license. The students in the first and second year, as well as the ones in the final years of studying in-depth, at the master, approached the same way the

use of information, although our expectations were different (we consider that going through an academic cycle is a plus responsibility for the use of scientific information).

4. Active education

The expansion of information and communication technologies has led to the extension of learning environments in universities. Distance education, e-learning and virtual universities are the new results of the application of technologies in the educational process. E-Learning is the new educational environment, modern and collaborative, which combines traditional teaching methods with those based on IT. The distance delivery of education, the creation of communities with an already increased appetite for online networking, low costs and freedom of action, diversification are the main advantages of this modern type of learning.

Beneficiaries of some of them, students are aware (91%) of the influence of technology in all academic and professional activities. They appreciate communication (82%), the possibility to choose the type of device used (87%), interactivity and course dynamics (77%), virtual communities (74%), evaluation method (72%). Educational platforms offer an interactive and integrated, learning-centred environment developed for the benefit of both the teacher and the student. Universities have adopted various models (e.g. Teams, Moodle, LearningON) or developed their own models. In the three universities there are learning on distance (DL) departments that successfully use this type of learning.

As the chosen target group consisted predominantly of full-time students, only 29% of them constantly mentioned the use of an educational platform. The need for niche specializations in the chosen field or part-time work in another field during college made a percentage of 31% of students to participate in online courses 21% in podcasts and university lectures, 23% in webinars. Overall, the attitude of students towards this type of teaching-learning was favorable (94%) by being aware of the benefits of a secure information framework.

Analysing all four points we validate the working hypotheses. Students use a large amount of information obtained from the Internet, unselected, use it in academic training, but are aware of the risks and benefits of this process, which, with the development of technology and equipment, has become a part of life.

Conclusions

The information explosion has completely changed the way we perceive and relate to the world. Information is the mobile of these transformations, and the Internet is the main source where it is found. The natural sciences have a growing presence in the huge field of information stored in this space. Sites, discussion groups and education programs invite knowledge and development, so the consumption of information. Searching the www is not without difficulties neither for students nor for teachers. The selection and correct use of information obtained from this environment have gaps in the algorithms it imposes, and this leads to certain uncertainties, especially in scientific capitalization. Scientific information needs to be evaluated, but this depends on everyone's ability to counterbalance easy access to information and the uncertainty given by the speed of transmission of the new and wide variety of sources available to us.

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