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Online curricula –students' perception on the quality of digital tools (the online course and the educational websites)

Sofia Loredana Tudor[a], Claudiu Langa[a], Adriana Nicoleta Lazăr[a]*

[a] *University of Pitești, Faculty of Education, Social Sciences and Psychology, 11 Targu din Vale street, Pitești, 110440, Romania*

Abstract

During the last year, due to the evolution of the global pandemic, the educational system has been reorganized, and e-learning, with its adjacent forms of development, has been explored as the main means of organizing the educational process.
The purpose of this study is to analyze the digital curriculum from the perspective of integrating digital tools in the educational process at university level, while investigating two categories of online learning content /media - the online course and the educational website, all accessed by educational users (teachers and students in all academic specializations).

Keywords: e-learning; m-learning; u-learning; online curricula; digital tools

1. Introduction

Innovation in the education system through digitalization is a challenge defined in the European Commission's Digital Education Action Plan (2018) (European Commission, 2018, p. 1), which envisages the digital transformation of Europe by integrating technologies - artificial intelligence, robotics, cloud *computing* and *block chain* technologies.

The viability of technologies along with the phenomenon of globalization thus transforms university educational practices - the educational process, teaching methodology, methods and tools for assessing students' acquisitions /skills, research practices, directions of educational and /or scientific career development. (Mamedov, Lipatova, Korkiya, 2021)

In this process, it is necessary for university education to become receptive to the influences of technology and to integrate adjacent fields, to form interdisciplinary professional networks and to stimulate collaborative teaching, by diminishing the boundaries between specializations, disciplines or fields of knowledge. The development of online curricula adapted both to the training needs of students and training and professional insertion standards is possible if education will meet the challenges of computerization, also by creating multidisciplinary teams of specialists: the education specialist for curriculum development and methodological design, the engineering specialist for supporting software design and development processes, the digital content specialist for the digitization of scientific content, etc.

To meet students 'learning needs, the university curriculum must be designed by integrating digital tools. The phenomenon involves the transition from the teacher-centered to the student-centered approach to the teaching process and the organization of the digital learning environment. (Reiser and Gagne, 1983; Reiser, 2001) (Istenic, 2021)

Many studies have analyzed difficulties /obstacles in the use of digital tools in the educational process, from which the lack of skills for teachers and students in using electronic media or their attitude towards the insertion of technology in education and its reorganization from the perspective of computerization. (Otto, 2021) However,

* Corresponding author. Tel.: +40-759.143.862; fax: +40-0348.453.350
E-mail address: loredana.tudor@upit.ro, sofialoredanatudor@gmail.com
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recent studies highlight the advantages of its integration in terms of facilitating the learning process of students through digital tools such as chat, classroom response system, e-lectures and mobile virtual reality (Becker, Brown, Dahlstrom, Davis, DePaul, Diaz and Pomerantz, 2018). (Sprenger, Schwaninger, 2021)

Currently, the use of digital resources and tools in education is strongly evolving, and studies on the integration, adaptation and development of digital instruments production are deep and varied, if we are to analyze both the advantages and difficulties of an educational process dominated by digital tools, but especially its optimization through digitization. Thus, we mention here the analysis perspectives regarding the elaboration on measures to assess the quality of open textbooks. (Fischer et al., 2017) (Hongliang Ma, 2021) or to investigate the pedagogical implications of digitalization on educational practices (Paskevicius&Irvine 2019; Rolfe 2017). (Hongliang Ma, 2021)

1.1. A different educational reality: e-learning /m-learning /u-learning

E-learning designates the educational reality mediated by electronic networks, new communication and multimedia technologies, the semantic area of the concept being very wide and permissive - computer-assisted training, digital /online education, multimedia training, etc. The classic profile of e-learning built through educational platforms, web-based learning, simulations, games, fixed and mobile technologies, and aimed at delivering content (image, text, sound) has been permanently shaped by the insertion of technology, which is in continuous development. Currently, e-learning is defined by social networks Facebook, Twitter, Instagram, YouTube, LinkedIn), search engines (Google, Ask), smart digital devices and 3D technologies. (Ceobanu, 2016, pp. 100-101)

A recent approach defines e-learning as a learning ecosystem which lies on digital technologies and highlights the evolution in time of the terminology Computer Assisted Learning - CAL, Computer Based Learning - CBL, Technology Based Learning - TBL, Web Based Learning -WBL, Web-Based Teaching - WBT. These forms of e-learning are linked to other technology-based learning paradigms: open learning /m-learning, open education /open education) (open educational resources /OERs, massive open online courses /MOOC), Computer Support for Collaborative Learning - CSCL, video-based learning - VBL, ubiquitous learning /u-learning, smart learning, micro learning, Intelligent Computer Assisted Instruction - ICAI) (Crăciun, 2021) (Crăciun, Holătescu, Bran, Grosseck, 2021, p. 18)

To support the online educational process, digital tools - educational software and online applications have been developed.

Educational software includes electronic materials on electronic media, such as: maps, dictionaries, encyclopaedias, movies, presentations in various formats, e-books, tutorials, simulations, etc. (Cucoș, 2020) (Ceobanu, Cucoș, Istrate, Pânișoară, 2020, p. 259), being built as a pedagogical structure for educational purposes, adapted to the different curricula and learning levels of the students. (Crăciun, 2021) (Crăciun, Holătescu, Bran, Grosseck, 2021, p. 23)

Online applications are cloud tools, independent of curricular content, that can be used in a teaching activity designed by the teacher (electronic presentations - PowerPoint, Prezi; virtual notes - Padlet; creating videos, cartoons, comics - Voki,WeVideo; making concept maps - Coggle, MindMeister; making of word clouds - Wordle; making of educational games and interactive exercises - ClassTools; making of assessment tools - Google Forms, Kahoot etc. (Crăciun, 2021) (Crăciun, Holătescu, Bran, Grosseck, 2021, pp. 24-26)

The evolution of the electronic education system in various stages - from traditional learning to distance learning /d-learning, e-learning /e-learning (integration of electronic networks in education, as a digital interface between teacher, student - learning task and computer), learning mobile /m-learning (integration of mobile technologies, such as mobile phones, smart phones, PDAs, MP3 /MP4 players,

portable gaming devices, mobile PCs, notebooks, etc.), ubiquitous learning /u-learning (learning mediated by devices and sensors that can identify the learning context - cloud + mobile + ubiquitous computing) - is supported by the development of the system of mobile devices and connectivity, facilitating the continuity of the educational process through locations, time, technologies, in various social contexts (seamless learning, Wong, 2015) (Ceobanu, Cucoș, Istrate, Pânișoară, 2020, pp. 176-185)

Among the most explored and accessed ways to integrate e-learning in the educational process are learning platforms /online sites and open educational resources (OERs - learning, teaching and research materials, available in any format, from the public domain or under open licenses and which allow free access, reuse, adaptation and redistribution). (UNESCO, 2019) Types of OERs adapted to the educational process are: school programs, tests, audio /video clips, animations, images, online courses, open digital textbooks, massive open online courses – MOOC.

Nowadays, the offer of OERs and MOOCs available on the Internet is varied, covering various scientific and academic fields, some of which offer certifications: a. Textbook collections - Open textbooks Collections: OpenStax, open textbook library - Open textbooks Library, College Open Textbooks, College Suny Textbooks, The global Text Project, Textbooks Revolution, Academic Pub, LibreText, TU Delft University library, Discovery Education, Chine Open Resources for Education - CORE; b) Open Courseware: MITOpen Courseware, Open Culture, Class Central, Merlot, The John Hopkins Open Courseware, Alison. (Duse, 2019) (Crețu, 2019, pp. 131-135)

1.2. Online curricula and digital tools

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The link of the Internet to the educational environment has led to changes in the curriculum. The curriculum delivered by the internet is extremely dynamic. Therefore, in the development of the electronic curriculum, skills for designing the content and training tasks are required, the mode of interaction between teacher and student being defined by immediate interaction, online communication, organization and management of the virtual classroom.

The results of studies on the integration of digital learning materials at the academic level highlight, on the one hand, correlations between variables such as age or gender of learners and the use of digital materials. Other research studies show that there are no significant differences between users of traditional materials and digital materials, considering the disadvantages or limitations of the use of the latter in the educational process. However, there are numerous studies that have concluded that the richness of the electronic interface and the potential offered by it favors the increase of the academic performances of the students (Vernon, 2006; Bierman et al, 2010; O´Donnell&Sharp, 2012; Feldstein, 2013; Terpend, 2014). (Sîrghea, 2018, pp. 35-38)

When investigating online learning media, in terms of online courses /MOOC, recent research studies analyze the factors and conditions of their use from different perspectives: some studies investigate on their effectiveness in relation to student performance, others quantify access rates to online courses of students, by considering demographic issues; many other studies are made from the perspective of the profitability of using online courses. (Alshehri, Alamri, Cristea, Stewart, 2021)

Regarding the online applications used to create various categories of resources in digital format and to carry out activities in the online environment, we find recent classifications of the most used applications in the educational environment, in the first places being YouTube, PowerPoint, Zoom, Google Docs &Drive, Word, Google Search, Google Classroom, Microsoft Teems, Google Meet. (Results of the 14th Annual Survey published 1 September 2020)

On the other hand, specialists speak of ensuring a continuum of the learning process by moving from traditional learning to learning exclusively in the online environment, thus defining a continuum of learning based on technology; it is estimated that online education should be provided by content delivered via the web (1-29%), in blended format (30-79%) and online course (>80%), (Allen&Seaman, 2015; Bates, Poole, 2003). (Crăciun, Holătescu, Bran, Grosseck, 2021, p. 19)

Although there is a clear need to train the digital skills of teachers and learners, the integration of digital technologies into education must be addressed in the sense of "using new technologies to learn". (Manolescu, Frunzeanu, 2016, p. 223)

Through a metaphorical pedagogical expression - the pedagogical horse must be placed before the technological chariot (Sankey, 2020) (Tsui; Tavares, 2021) the need for a pedagogical approach in the technological educational process is argued. In order to maintain quality in online education, teachers will adhere to the fundamental principle: "pedagogy is the engine and technology is the accelerator". (Tsui; Tavares, 2021) The pedagogical approach must be respected with the same rigor in the online education process, namely teachers should decide on the pedagogical approaches they want to adopt and, implicitly, to select optimal digital tools for the didactic process.

2. Methodology

2.1. Objective

The aim of this study is to investigate the digital curricula from the perspective of pedagogical functions of the educational means: of communication (they convey knowledge), motivational (they stimulate learning), instrumental (organizes and influences learning), and formative (contributes to intellect and personality development).

The present study aims to identify students' perceptions of the quality of online learning materials and digital tools used in the online educational environment.

2.2. Participants

The respondents were 125 educational users - students in study programs in the field of education sciences, who, from March 2020 until now, follow the courses of the study programs in which they are enrolled in the online scenario.

2.3. Instrument

In conducting the study, we considered that the development of digital tools or the selection of computer applications for educational purposes must comply with quality criteria /benchmarks defined in psycho-pedagogical terms.

In this regard, we evaluated the possible directions of analysis of online learning media; we opted for two digital tools, which are frequently accessed by educational users, the online course and the educational website.

The quality criteria subject to analysis for each of the two instruments were assessed on a 3-level scale (Sufficient, Good, and Excellent). These have been evaluated by 125 educational users - students in study programs in the field of education sciences.

The instruments were sent to students using email during the first semester of the 2020-2021 academic year.

2.4. Procedure

"Online schooling", as it had been redefined in the last year, involved changing the conceptions and attitudes of teachers and students on the curriculum and learning materials. The teachers organized the pedagogical approach with free online tools, insufficiently known and adapted along the way from the point of view of optimal integration in the teaching process; trainees - pupils, students, etc. - were challenged to deal with the online teaching process, thus assuming responsibility for the computer-mediated learning process.

The scientific and certified value of books, dictionaries, encyclopedias, course materials, etc. is strongly competing with materials with media accessible through online resources.

Beyond advantages such as unlimited availability of time, space, etc., the quality of learning materials available online is not entirely valid in relation to the training needs of different categories of students (defined by variables such as level of schooling - preschool, primary, secondary, high school, university, adult education - or the specialization in which they are trained - philological, humanistic, technical, educational, etc.).

The quality of learning materials available online – the online curricula - and the pedagogical adaptability of digital tools must be thoroughly analyzed, from the perspective of pedagogical, aesthetic, functional criteria, etc.

2.5. Data analysis

We used SPSS for the statistical analysis of the data, we processed and interpreted the results of the questionnaires using the statistical descriptive analysis.

3. Results

For the online course, an evaluation grid was developed, based on evaluation criteria of the online course proposed in the pedagogical literature (Ceobanu, Cucoș, Istrate, Pânișoară, 2020, pp. 266-267), distributed on the following dimensions:

- how to design the course (information about the course, description of learning outcomes, use of appropriate teaching strategies for the course and learning outcomes);
- resources provided to the learner (quality and volume of learning materials provided);
- how to use technologies (quality of the technologies used in progress and indications on its use);
- the way of organizing and presenting the content (structure, visual presentation, navigation facilities).
- The recommended principles for developing an online course were also evaluated:
- facilitating teacher-student interactions;
- supporting student collaboration;
- promoting dynamic learning;
- the presence of quick feedback elements;
- management of time for learning activities;
- how to communicate learning outcomes;
- compliance to the diversity of talents and learning methods.

Among the quality criteria evaluated by the subjects, the highest averages were quantified as follows: the quality of the learning materials offered (M = 2.82) and the visual presentation of the course (M = 2.79). (Table 1a) 82.4% of subjects appreciate with Excellent the quality of the learning materials offered in the online course (Table 2a), and 80% of them appreciate with Excellent the visual presentation of the online course. (Table 2b)

Subjects appreciate that a quality online course is supported by favouring teacher-student interactions (M = 2.78). 79.2% appreciate with Excellent the interactive character of the course which favours the teacher-student interactions.(Table 1b)

Table 1a. Evaluation criteria of the online course

		quality of learning materials offered	volume of learning materials offered	information about the course	description of learning outcomes	use of appropriate learning strategies	quality of technologies used in course	guidelines provided to students for the use of current technologies	course structure	visual presentation of the course	facilities for navigating the course
N	Valid	125	125	125	125	125	125	125	125	125	125
	Missing	0	0	0	0	0	0	0	0	0	0
Mean		2.8240	2.7360	2.7280	2.6400	2.7280	2.7280	2.6560	2.7680	2.7920	2.7200

Table 1b. Evaluation principles of the online course

	facilitating teacher-student interactions	supporting student collaboration	Fostering dynamic learning	providing quick feedback	maximizing time for learning activities	communication by the teacher of the expected learning outcomes	compliance to the diversity of talents and learning methods
Valid	125	125	125	125	125	125	125
Missing	0	0	0	0	0	0	0
Mean	2.7840	2.7280	2.7120	2.7680	2.7600	2.7360	2.6880

Table 2a. Quality of materials offered

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	*B*	22	17.6	17.6	17.6
	E	103	82.4	82.4	100.0
	Total	125	100.0	100.0	

Table 2b. Visual presentation of the course

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	*S*	1	.8	.8	.8
	B	24	19.2	19.2	20.0
	E	100	80.0	80.0	100.0
	Total	125	100.0	100.0	

For the educational website, we used the evaluation criteria proposed by Perrot (2005) (Ceobanu, Cucoș, Istrate, Pânișoară, 2020, pp. 268-270):

- the presentation of the site (name, address, target audience);
- site interface language (one /more site presentation languages);
- suggested activities (exercises, games, links, chat, forum, sound, video, text, hypertext, upload);
- site content (explicit homepage, defined pedagogical objective, organization of content on the site, relevance of resources, language quality, logic of organizing

the activity, clearly defined notes, quality of illustrations, readability of texts, quality of images, relevant links in the site);
- facilities for navigating the site (ease of navigation, comprehension of buttons, ease of finding the information indicated on the page, speed of loading, loading of adjacent programs);
- pedagogical analysis - structural exercises and playful activities offered by the site.

For the criteria related to the size of the presentation of the site, the highest averages were quantified as follows: text (M = 2.81), exercises (M = 2.80), video (M = 2.78). (Table 3) 84.8% of subjects appreciate with Excellent the text offered by the site; 81.6% appreciate with Excellent the exercises offered by the site; 79.2% appreciate with Excellent the exercises offered by the site. (Table 4a,b,c)

Table 3. Evaluation criteria of the *educational website – the size of the presentation*

	presentation of the site	Only one language of presentation of the site	More languages of presentation of the site	exercises	games	links	chat,	forum	sound	video	text	hypertext	uploading
Valid	125	125	125	125	125	125	125	125	125	125	125	125	125
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	2.9520	2.5040	2.6320	2.8080	2.6320	2.6000	2.6640	2.6080	2.7600	2.7840	2.8160	2.6320	2.7440

Table 4a. Text

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	S	4	3.2	3.2	3.2
	B	15	12.0	12.0	15.2
	E	106	84.8	84.8	100.0
	Total	125	100.0	100.0	

Table 4b. Exercises

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	S	1	.8	.8	.8
	B	22	17.6	17.6	18.4
	E	102	81.6	81.6	100.0
	Total	125	100.0	100.0	

Table 4c. Video

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	S	1	.8	.8	.8
	B	25	20.0	20.0	20.8
	E	99	79.2	79.2	100.0
	Total	125	100.0	100.0	

For the criteria related to the size of the content of the educational website, the highest averages were quantified as follows: image quality (M = 2.89), language quality (M = 2.88), logic of organizing the activity (M = 2.88). (Table 5) 90.4% of subjects appreciate with Excellent the quality of the images and the language offered

by the site; 88.8% appreciate with Excellent the logic of organizing the activity on the site. (Table 6a,b,c)

Table 5. Evaluation criteria of the *educational website - content*

		explicit homepage	clearly defined pedagogical objective	the logic of organizing the activity	relevance of resources	quality of language	the logic of organizing the activity	clearly defined records	relevant illustration	readability of texts	quality of images	relevant links
N	Valid	125	125	125	125	125	125	125	125	125	125	125
	Missing	0	0	0	0	0	0	0	0	0	0	0
Mean		2.7760	2.8320	2.8480	2.8080	2.8880	2.8880	2.8720	2.7600	2.8640	2.8960	2.7920

Table 6a. Quality of images

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	S	1	.8	.8	.8
	B	11	8.8	8.8	9.6
	E	113	90.4	90.4	100.0
	Total	125	100.0	100.0	

Table 6b. Quality of language

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	S	2	1.6	1.6	1.6
	B	10	8.0	8.0	9.6
	E	113	90.4	90.4	100.0
	Total	125	100.0	100.0	

Table 6c. Logic of organizing the activity

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	B	14	11.2	11.2	11.2
	E	111	88.8	88.8	100.0
	Total	125	100.0	100.0	

For the criteria related to the size of the facilities for navigating the website, the highest average was quantified for the criterion of ease of navigation (M = 2.81). (Table 7) 83.2% of subjects appreciate the excellent ease with which they can navigate the site. (Table 8)

Table 7. Evaluation criteria of the *educational website* - the *facilities for navigating the website*

		ease of navigation	comprehension of buttons	facilitating the finding of the information indicated on the page	coherent table of contents and structure	loading speed	loading of adjacent programs
N	Valid	125	125	125	125	125	125
	Missing	0	0	0	0	0	0
Mean		2.8160	2.7680	2.7520	2.7200	2.7200	2.5520

Table 8. Ease of navigation

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	S	2	1.6	1.6	1.6
	B	19	15.2	15.2	16.8
	E	104	83.2	83.2	100.0
	Total	125	100.0	100.0	

For the criteria related to the size of the pedagogical analysis of the website, the highest averages were quantified as follows: interest in the site (M = 2.88), ease of approach to the site (M = 2.84), diversity of exercises offered (M = 2.83). (Table 9) 88% of subjects appreciate with Excellent the interest in the site; 84.8% appreciate with Excellent the ease of approaching the site, 84% appreciate with Excellent the diversity of exercises offered on the site. (Table 10a,b,c)

Table 9. Evaluation criteria of the *educational website* - the *pedagogical analysis of the website*

	how to solve errors	diversity of exercises	relevance of exercises	ease of approach	clear records	add-ons (sound, video, etc.)	interest	loading of adjacent programs	ease of approach	clear records
Valid	125	125	125	125	125	125	125	125	125	125
Missing	0	0	0	0	0	0	0	0	0	0
Mean	2.6560	2.8320	2.8080	2.7760	2.8000	2.7360	2.8800	2.5520	2.8480	2.7840

Table 10a. Interest

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	B	15	12.0	12.0	12.0
	E	110	88.0	88.0	100.0
	Total	125	100.0	100.0	

Table 10b. Ease of approach

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	B	19	15.2	15.2	15.2
	E	106	84.8	84.8	100.0
	Total	125	100.0	100.0	

Table 10c. Diversity of exercises

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	S	1	.8	.8	.8
	B	19	15.2	15.2	16.0
	E	105	84.0	84.0	100.0
	Total	125	100.0	100.0	

4. Discussions

Validation of online learning content and media is a key milestone in online curriculum development. We appreciate that the data quantified in this study are a starting point for further complex investigations on the quality of learning materials and the quality of students' learning process when the educational process is developed in the online system.

An online or hybrid course used as a learning aid in the online educational process will support the learning activity of educational users as long as it falls within the

spectrum of quality criteria. Among them, students appreciate first of all the quality of the course content, i.e. the resources that support the student's learning process, but also the way it is structured, with emphasis on visual presentation through the presence of iconographic elements.

The educational website used as a learning aid in the online educational process encourages students' learning activity through the content it offers –quality of images, quality of language and the logic of organizing the activity. Also, the pedagogical analysis of the site is an essential criterion, with emphasis on the playful activities that it offers and through which it ensures the increase of the interest for the site of the educational users.

The points of view of the specialists in the educational field are unitary in terms of approaching the education process. Regardless of the evolution of the pandemic phenomenon, it is obvious that education will respond to the challenges related to educational content, but especially the way they are provided and will develop the online curriculum by integrating different forms of e-learning.

Moreover, multidisciplinary teams of specialists (educational specialists, engineers, web-designers, computer scientists, software developers, digital content specialists, etc.) will collaborate to develop online curricula adapted to the training needs of the students enrolled in various university specializations in education, engineering, computer science etc.

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