

MODERN TRAINING STRATEGIES USED IN E-LEARNING*

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Abstract

The study focuses on the role of e-learning in the training process against the background of the digitalization of education. We aim to analyze the impact of e-learning on the school performance of the students. Starting from a comparative analysis between traditional learning and e-learning, we focus on the training strategies that capitalize on the new information and communication technologies. In the experimental part of the research, we will start from the suggestions offered by the students of the Faculty of Sciences, the University of Craiova (undergraduate cycle, year II) with the purpose to improve online instruction. In this regard, we will use a questionnaire. The designed training model, based on the proposals of the students, will include current training methods, modern instruments, leading to better results in the final evaluation. This aspect will be verified in the final part of the pedagogical experiment, in which we will follow the results of the exam and we will analyze the feedback provided by the students concerning the implementation of their proposals.

Key words: Digitization; E-learning; Training; Strategies; Students.

1. Introduction

The digital transformation, so much accelerated by the health crisis, emphasizes the relevance of the digital platforms as problem-solving tools focused on people and needs: real-time response, through intelligent design, to the needs and interests of people and organizations, with the help of science and technology. Digital technologies are smart technologies. Future higher education students belong to a generation that grew up with a PC mouse, a TV remote control, a mobile phone, an i-Pod and other electronic devices for communication and entertainment. They are part of the digital natives generation, who are better at multitasking (Prensky, 2001). We could talk about a special generation or, even more, about a Homo

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Zappiens (a generation that has experienced the flow of digital information and developed an exploratory learning to make sense of the multitude of information).

Digital technologies play a key role in the management of educational data and in the organization of classrooms and online courses (Burns & Gottschalk, 2019; Elliot, 2017; Tapscott, 2009). Seen as a major technological revolution, the digital revolution influences the educational paradigms. We believe that the educational software available in the virtual space provides the necessary means for an authentic education, in accordance with the requirements of the information society. It is appreciated „that the over-abundance of digital learning resources was often identified as a challenge. In many cases, curating the resources consisted in reducing their number and making sure that they were relevant to the curriculum and approaches taught by teachers” (Vincent-Lancrin *et al.*, 2022, p. 27). We believe that e-learning will gain more and more ground, given that artificial intelligence and genetic engineering will define what we become. We appreciate that no matter how advanced artificial intelligence is, it will not have the power to project itself on a historical and evolutionary scale. However, it will be able to produce paradigm shifts, to influence theory and practice in all areas of social life.

2. The relationship between technology and education

As the sum of multiple literacy (eg information literacy, technology literacy, multimedia literacy), digital literacy makes the transition from print to digital culture. The digitally literate person interacts with technologies and knows how to search, select, evaluate information, exchange with colleagues, always using different web resources and tools. The expectations of the society and educators have changed in recent years, and the digital environment favors the formation of new skills in students. One of the founders of the digital literacy approach was P. Gilster, who referred to “the ability to understand and use information in multiple formats, from a wide range of sources, when it is presented via computers” (1997, p. 33).

Oberläner *et al.* (2020, p. 11) highlighted the main skills related to digital literacy, highlighting a number of practical activities: the knowledge and comprehensive use of hardware components, the successful use of common applications, sharing and cooperating in the activity on the internet etc. Being facilitators of knowledge construction, teachers have the role of choosing the best training platform for students, in relation to the purpose, specific content, access to technology, age of students, etc.

Regarding the relationship between education and technology, the latter led to a rethinking of the educational strategy. By reference to e-learning, there are three types of tools (Oye *et al.*, 2012, p. 50): curriculum tools (provide a systematic and standard environment to support classroom learning), digital library tools (facilitate effective and efficient access to resources to support exploration and collection) and knowledge representation tools (focus on formulation and representation). The conclusion is that technology can be understood as an environment where the educational act can take place, but also as a resource for education.

Summarizing studies, research, literature reviews and meta-analysis to assess evidence of the effect technology has on student outcomes, W. Ng states that “innovative ideas flow when the educator is confident and knowledgeable about the tools that he or she is using as it enables him/ her to be flexible in the repurposing of the tools to bring about the best pedagogical outcomes” (2015, p. 22).

3. Traditional learning versus e-learning

The computerization of education involves the use of the computer as an educational resource in order to achieve the goals of education. The potential of new information and communication technologies encourages innovation in the approach to teaching, learning and assessment and thus becomes an essential solution to the problems of the traditional educational environment. However, evidence suggests that practitioners are still unclear about how to use technology appropriately, and its application is often based on common sense rather than being theoretically informed by pedagogical theory (Conole *et al.*, 2004).

Technology is increasingly used to facilitate active and collaborative learning, to better engage students and to accompany them in various learning experiences, to meet the needs and expectations of learners from different cultural backgrounds, with different learning styles. The lack of involvement and disengagement is considered the main predictive factor for student dropout, both in formal and non-formal education (Furlong & Christenson, 2008; Newmann *et al.*, 1992; Steinberg *et al.*, 1996; Taylor & Parsons, 2011). Existing and emerging Web2.0 technologies offer new opportunities, enabling them to have more control over learning and supporting them to become active, self-regulated and autonomous (Bernacki *et al.*, 2011; Chatti *et al.*, 2010; Kassens-Noor *et al.*, 2020; Ni, 2020).

Most students today are younger than Google and have developed their first school project on Wikipedia. Therefore, we believe that the current generation of students requires advanced interactive approaches, based on the use of technology. Because screens are the tools of everyday life, educators can turn them into learning tools. Many teachers use smartphones that prove useful in the classroom, helping students increase their productivity, vocabulary, and communication (Bromley, 2012; Fan & Yang, 2020). E-learning is a learning ecosystem based on digital technologies. D. G. Oblinger and B. L. Hawkins (2005) noted that e-learning has transformed from a fully-online course to using technology to deliver part or all of a course independent of permanent time and place.

There are a number of differences between traditional learning and e-learning. The first refers to a linear and predefined organization of the pedagogical path and does not have an immediate connection with the operational activities; the second aims at a progression adaptable to each of us, depending on the situation being also integrated into the operational activities. It is estimated that “in traditional learning the results are the ones that matter, while in e-learning the interaction process is considered more important than the results” (Dillenbourg, 1999; Merce & Howe, 2012). The first encourages competition more; the second is more collaborative, supported by mobile technologies and tools (eg Moodle). If the aspects related to

planning, monitoring and evaluation are the prerogative of the teacher in traditional learning, in e-learning they also include the student, and can be seen as part of their socio-emotional development (Volet *et al.*, 2009). If before the content was important, now it is a pretext for training.

4. Training strategies based on learning models that capitalize on the new technologies

The variety of training models results from the emphasis on one or another of the elements of the educational process. In the conditions of the digitalization of education, e-learning solutions do not completely eliminate the classic ways of teaching, but make them more efficient, being much more attractive (through images, animation and videos). Training strategies, depending on their degree of including online components, are classified into: traditional (do not contain online components); web-oriented, blended learning and online.

The relationship between education and technology generates a series of theories and educational models. For example, the central element of the cognitive theory of multimedia learning (TCIM) is that the computer and multimedia learner will try to build a series of logical connections between words and images. Born in the late 1980s, under the name of “model of meaningful learning” (Mayer, 1989), the theory has consolidated over time, being found under several names. The individualization of the technology-mediated learning model has a series of characteristics that bring technology to the center of attention. In fact, “while technologies have been represented as a singular entity, in reality it is often a suite of technologies that are used in combination across a network, each with their different affordances, in order to mediate learning” (Bower, 2019, p. 1042). Also important are the educational models of resource selection. These have led to reinterpretations of the educational theory and the emergence of “the digital pedagogy”.

G. Conole, M. Dyke, M. Oliver and J. Seale developed a model based on the mapping of digital tools in order to achieve an effective design of learning. They analyzed the potential of e-learning applications in relation to the main theories and models of learning (behaviorism, cognitive, constructivist, activity-based, socially situated learning, experiential, systems theory) and focused on certain “toolkits” understood as decision-making systems based on expert models: “Toolkits are decision-making systems based on expert models, filling a role between that of wizards and conceptual frameworks. A wizard is taken to be a software tool that makes decisions on behalf of the user, based on solicited information and drawing on pre-defined templates” (Conole *et al.*, 2004, p. 22).

The theory based on “conversational framework” (Laurillard, 2012) addresses learning technologies as an integral part of the academic life and focuses on six types of learning: Acquisition, Collaboration, Discussion, Inquiry/Investigation, Practice, Production.

Starting from an x-ray of the relationship between the use of technology in education and its implications on educational strategy, we find the role of

multicontextual uninterrupted learning (Looi *et al.*, 2019). It is marked by the continuity of the learning experience, following various scenarios or contexts, being supported by mobile digital devices.

Digital tools can be classified into educational software and online applications. They can be used in individual as well as social learning.

Organizing the activity in the online class (Class Notebook)	Customize online training (Screencastify, Live Worksheet)	Content creation and customization (Xerte, Wakelet, Animaker, Biteable)	Organizing and presenting information (PowerPoint, Prezi, MindMup, Slowmotion)
Creating and presenting interactive content (Genial.ly, PearDeck)	Making comparisons, micro-research (Diffen, Trello, GanttPro)	Creating digital books (Flipsnack, Storybook)	Making digital panels for reflection and creative thinking (Padlet)
Creating concept maps or mind maps (Trading Card, Bubbl.us)	Elaboration of argumentative essays (Persuasion Map)	Making animated digital collages (Canva, FotoJet, Renderforest, Jitter, FotoPeach)	Photo editing that creates sound animations from a photo or image (Blabberize)
Using interactive whiteboards online (Miro, Jamboard, Whiteboard, Lino, OpenBoard, IDroo,)	Interactive exercises, creating online games (Crossword Labs, ClassTools, WordWall)	Interactive simulation and posters (PhET, ThingLink)	Group discussions, stimulating communication (FlipGrid, Chat rooms)
Slideshow and interactive videos (NearPod, MozaBook)	Collaboration and socio-emotional development (VoiceThreat, Flinga, Blogging)	Individual/ collaborative questionnaires, surveys (Mentimeter, Test Triventy)	Assessment (Google Forms, Quizlet, Quizizz, Kahoot, Testmoz)

Figure 1. Tools/applications used in the instructive-educational activity

No matter if teachers choose working with the whole class, in groups or individually, the computer is used as the main teaching tool. Digital tools give teaching strategies a modern character. They are used to achieve various didactic purposes.

5. Design of research

5.1. The research organization

Taking into account the growing interest in e-learning, but also the specifics of the growing generation in the digital age, we start thinking about adapting the educational offer to the demand of the digital natives. The questions we start with are: “Is e-learning superior to traditional learning?”, “To what extent do students understand the difference between the two forms or types of learning?”, “How can we implement a training program that capitalizes on e-learning strategies?” and “What are the training strategies that students like?”.

The duration of the research coincides with the first semester of the academic year 2021-2022, during which the teaching activities took place online (synchronous and asynchronous), on the Google Classroom platform. The research sample includes the second year students from the Bachelor's cycle, who follow the psychopedagogical module at the Teaching Training Department of the University of Craiova, in order to initially train them as teachers (Table 1). They were informed about the purpose, duration and specificity of the research they participated in and agreed on the centralization of the answers, the processing and interpretation of their results.

Table 1. The specialization of the participants in the research

Faculty	Sciences Faculty									
	Chemistry		Physics		Geography		Informatics		Mathematics	
Department	N	%	N	%	N	%	N	%	N	%
No. of subjects	8	7.77	13	12.62	42	40.78	19	18.44	21	20.39

The students have been grouped in two different online classes since the first year of study, which allows us to work separately with the two groups. The previous assessments (the exam at the end of year I) ensured the equivalence of the groups.

The students who formed the control group (G2) are students from the Department of Physics and the Department of Geography. The experimental group (G1) consisted of students from the Department of Chemistry, the Department of Computer Science and the Department of Mathematics. The independent variable introduced in the experimental group consists in the use of a varied offer of digital instruments, as part of the training model.

5.2. The purpose, objectives and hypotheses of the research

The purpose of this research is to improve online teaching, which is based on a training model focused on digital tools.

The objectives of the research are the following:

O₁: The presentation of the advantages of e-learning on the background of the relationship between technology and education;

O₂: The identification of some learning models in the context of the digitalization of education;

O₃: The implementation of a training model that emphasizes the online training tools proposed by the students;

O₄: The analysis of the efficiency of the proposed model and its evaluation from the perspective of students' performance and feedback at the final evaluations.

The research hypothesis highlights the relationship between modern strategies, based on the new digital technologies, and the performance of the students. We start from the idea that if we use in training digital tools/ applications proposed by the students, then they will get higher results in the final assessment.

We believe that when the teacher takes into account, in the design of training, the needs, requirements and suggestions of the students and manages to implement them in practice in a creative, flexible and adapted way, the proposed objectives are achieved and the results of the students are improving.

5.3. The research methodology

At the beginning of the training program, we used the questionnaire to obtain information about the needs, expectations and proposals of the students as part of the online teaching activity.

It contains 7 items (closed, multiple-choice and open-ended questions) about the following indicators: the degree of effectiveness of online training for the students, the benefits of online training, the types of learning they would like to access more often in training, the digital tools/ resources they prefer in training, the type of training strategies that students consider effective, the extent to which technology has helped them during the Covid-19 pandemic, the proposals of the students for streamlining online training.

In the implementation of the modern teaching strategies, as part of the training model, we started from the interpretation of the students' answers to the items of the questionnaire applied at the beginning of the training program. Thus, we found the following:

1) It is observed that the majority of the students (89.3%) consider that online training is effective and very effective, which means that it is an alternative to classical training, with several positive effects and one which students prefer.

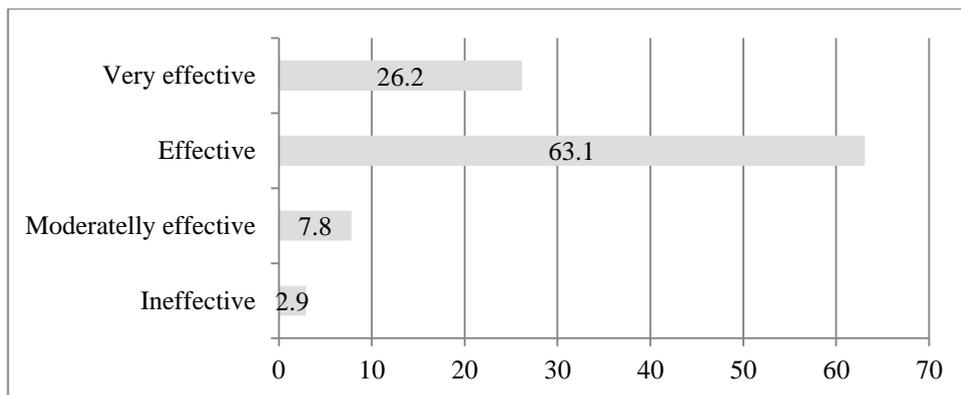


Figure 2. The efficiency of online training

2) From all the advantages of online training, the respondents chose the accessibility and mobility of certain training programs in proportion of almost 30% (27.2%). If we add the other two advantages that recorded higher percentages (fast access to information – 22.3% and the saving of time and money (18.4%), we find that these characteristics best express the specifics of the 21st century: one of speed, mobility and flexibility, of rational reporting to resources. Self-management registers a lower percentage, which forces us to design work tasks that contribute to the formation of this capacity.

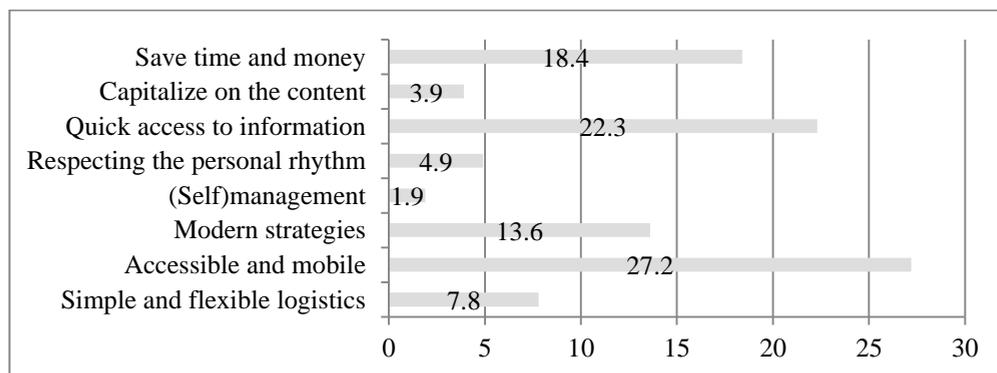


Figure 3. The advantages of online training

3) Regarding the types of learning that the students prefer, we found that many of them prefer creative learning (33.9%), but acquisition learning also has a high percentage (30.1%) in their choices. The last choice is production learning (4.9%), which, from a pedagogical point of view, raises some questions about the causes that generate these limited options. A plausible explanation refers to the restrictions on the use of laboratories or workshops (against the background of generalized online training in the context of the Covid-19 pandemic), but other

variables intervene here (eg effort, working time, the existence of skills, the specifics of the educational discipline).

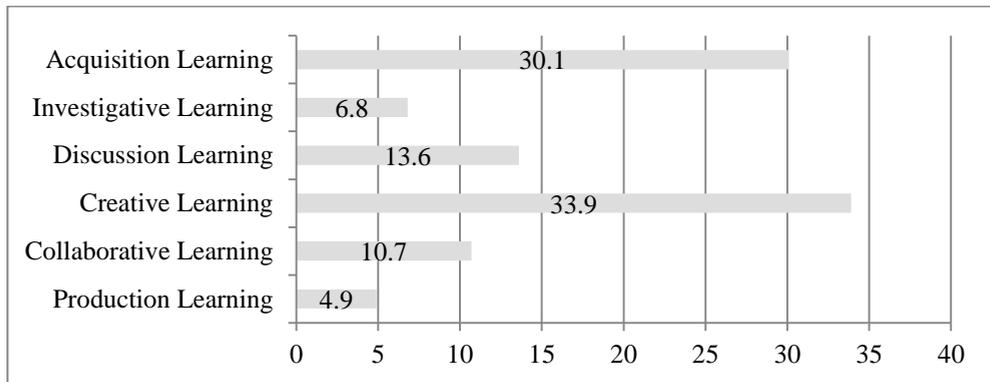


Figure 4. The students' preference for different types of learning

4) Reading some websites, which is capitalizing on digital documents, is at the top of the preferences of the surveyed students (50.50%). This is followed by the elaboration of projects (13.60%) and the search for information related to the topics specific of the school curriculum (10.70%). We believe that these tools need to be harmoniously combined so as to encourage all types of learning.

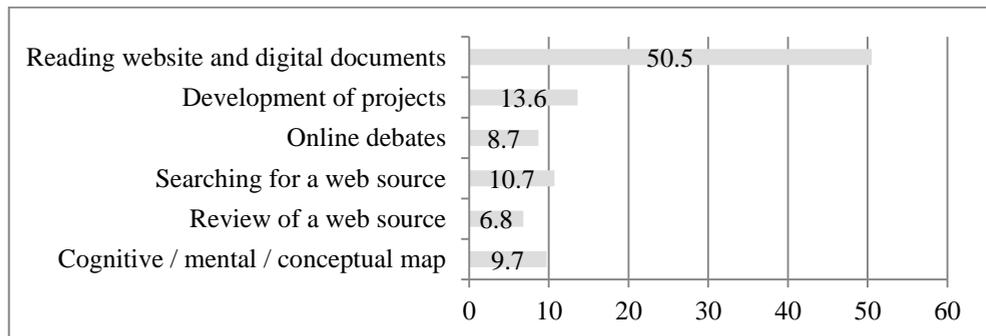


Figure 5. Tools used in learning

5) Item 5 aimed to identify the types of teaching strategies preferred by the students in relation to their forms of organization in training. The graph below shows similar percentages in terms of online training strategies: individual (42.70%) and group (38.80%), which suggests the need for independent study (which can be very well exploited from adolescence) and the need for group or team activity (emphasizing the role of social learning).

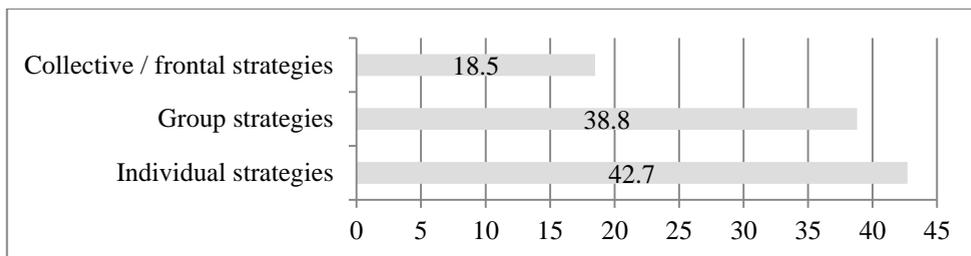


Figure 6. Types of online training strategies

6) We were interested in finding out to what extent technology has helped students to better respond to learning tasks (eg homework, application work). In a proportion of 97.10% the answers were positive, which determines us to think not so much about its role in the educational process, but, rather, about how we can make better use of it.

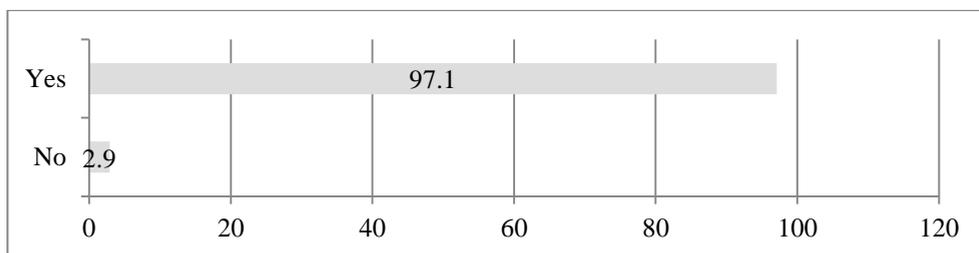


Figure 7. Technology in relation to the learning requirements

7) The last item aims at the free response of the students in relation to the efficiency of online training. Their proposals include the following:

- Emphasis on collaborative learning and creative learning;
- Improving the exposure of the content by the teacher by using Power Point presentation, Prezi, podcasts, videos, websites;
- The attractiveness of the work tasks proposed to the students by watching some webinars and following some educational links on the YouTube channel.

Depending on the answers received from the students, we designed the training model, capitalizing on their proposals, the experimental factor being online training strategies (which include various digital tools/ applications, in order to encourage different types of learning).

We alternated the frontal strategies with those on groups or teams of students and with the independent-individual or individual ones with support (Figure 8).

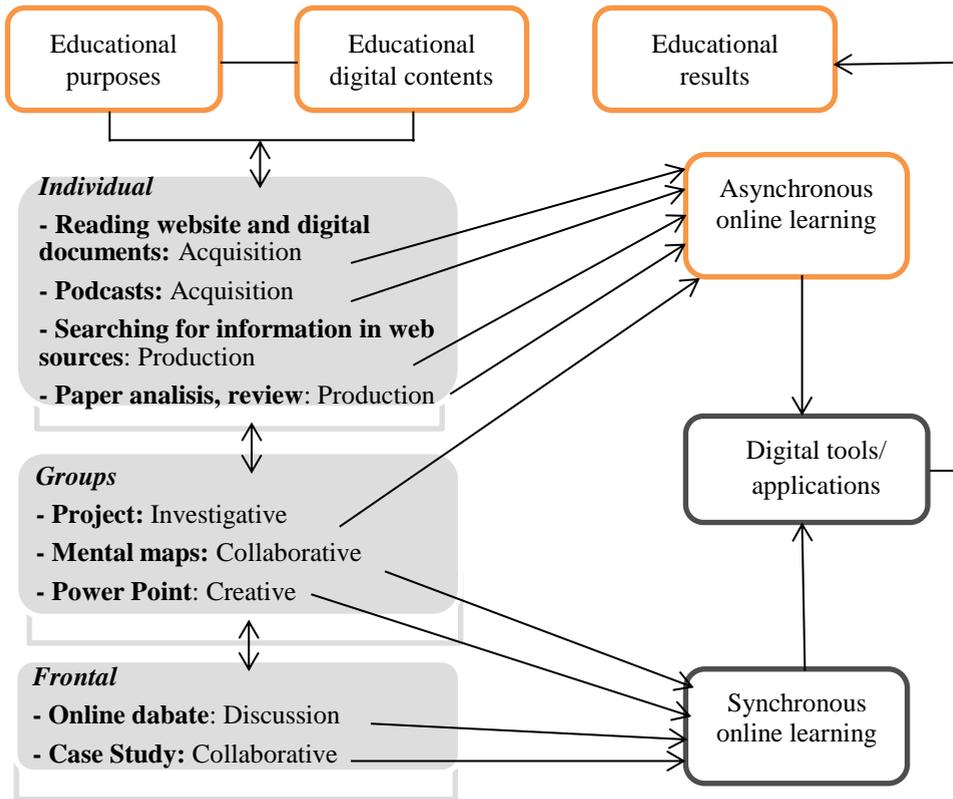


Figure 8. The training model based on modern strategies

We used these digital tools during the training program conducted with the students from the experimental group and we found that, compared to those in the control group, they solved the work tasks and the docimological test introduced in the formative assessment better. If in the progress evaluation the differences between the results of the two groups were not significant, in the final evaluation the students in the experimental group obtained several good and very good grades.

Given that 97 students participated in the final exam ($G1 = 46$ and $G2 = 51$), the results obtained by the students of the two groups are the following:

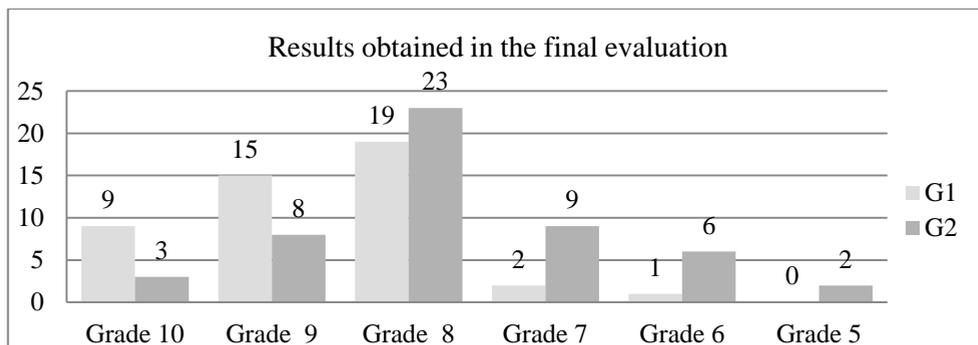


Figure 9. Comparison of the results obtained by the subjects of the two groups in the final evaluation

6. Discussions

Following the implementation of the tools, various digital resources in the experimental group, we compared the results of the students from the two groups (experimental – G1 and control – G2) in the final exam, held at the end of the training program. If the percentage of students who obtained good grades (grade 8 and grade 9) is 73.90% in G1, it is 60.80% in G2. If the students in group G1 obtained the maximum grade in percentage of 19.57%, the students in group G2 obtained the maximum grade in percentage of 5.88%. We find that the results of the students from the experimental group are superior to those from the control group, which confirms that the use of digital tools/ applications in training leads to the students obtaining superior results in the final evaluation.

The students in group G1 (experimental group) obtained higher grades (Figure 9), which is due to the experimental factor. The hypothesis we started from is confirmed, strengthening the idea that new information and communication technologies facilitate learning in students, being a solid point of support. Certainly the problem that arises is not related to whether digital technologies influence learning, but to how, the way this phenomenon occurs. In addition, it is not just about the fact that technologies develop and enhance new categories of skills, but, moreover, they substantially “reconstruct” them and put in a new light those that we already own or value at social level.

We noticed that the use of digital technologies influenced some students more, others less, and others not at all. Out of a total of 46 subjects in the experimental group, over 50% were active in synchronous online activities and used the proposed tools and applications. Although we found difficulties in using them by students, we appreciated the involvement, collaborative learning and we monitored the number of interventions in solving work tasks. Students who had more than 50% attendance and were involved in synchronous online activities scored 9 or 10.

In the experimental group, we were interested to find out to what extent the students who were present and participated in the synchronous online activities obtained higher results than those who did not participate involved. Out of a total of

46 subjects in the experimental group, 29 (63.04%) were present at all synchronous online activities, using various digital applications and tools (eg Class Notebook, Power Point, MindMup, Genial.ly, Miro, Jamboard).

Table 2. Scores obtained in the final evaluation by the subjects of the experimental group who participated in the synchronous online activities

Participants in synchronous online activities	Nr. attendance (Total: 14)		Interventions	Nr. interventions	Grade (final assessment)
	N	%	Yes / No		
S ₁	12	85.71	Yes	8	9
S ₂	11	78.57	No	-	9
S ₃	14	100	Yes	11	10
S ₄	13	92.86	Yes	9	9
S ₅	8	57.14	No	-	8
S ₆	14	100	Yes	12	10
S ₇	14	100	Yes	11	9
S ₈	14	100	Yes	9	9
S ₉	5	35.71	No	-	8
S ₁₀	7	50.0	No	-	8
S ₁₁	14	100	Yes	12	10
S ₁₂	8	57.14	No	-	8
S ₁₃	14	100	Yes	11	10
S ₁₄	10	71.42	No	-	9
S ₁₅	14	100	Yes	10	10
S ₁₆	12	85.71	Yes	8	9
S ₁₇	10	71.42	No	-	9
S ₁₈	14	100	Yes	9	10

S ₁₉	12	85.71	Yes	9	9
S ₂₀	11	78.57	No	-	9
S ₂₁	14	100	Yes	11	10
S ₂₂	14	100	Yes	12	10
S ₂₃	9	64.28	Yes	7	9
S ₂₄	11	78.57	No	-	9
S ₂₅	13	92.86	Yes	10	9
S ₂₆	12	85.71	Yes	8	9
S ₂₇	14	100	Yes	12	10
S ₂₈	14	100	No	-	9
S ₂₉	6	42.86	No	-	8

In order to establish the connection between the interventions of the students from the experimental group within the synchronous online activities, based on the strategies that capitalize on the digital applications, and the results at the final evaluation, we calculated the Pearson coefficient (0.74). It indicates a high link between these two variables. The high link between active student participation through digital tools and results reinforces the idea that technology-based teaching strategies encourage e-learning.

As a limitation of the research, we specify the small number of students who provided feedback after the final evaluation. Out of the total 103 participants in the exam, only 27 (26.21%) gave feedback. Although it is 92.59% positive, we cannot generalize, especially since those who responded to the request scored 9 and 10. We were interested in the students' performance, but also in the way digital tools facilitate learning. The results we analyzed are obtained from the activity with young students, which does not mean that the hypothesis is confirmed in the activity with the students in pre-university education. The option for certain digital tools depends on the age of the students, the learning style, but also the specifics of the educational discipline.

7. Conclusions

The effective incorporation of digital tools still remains an unequal process given the digital competencies of students and teachers. There are a number of gaps between schools, with resistance to change being one of the most obvious justifications for this phenomenon. We are seeing a reduction in digital lag. The first,

which refers to access to computer resources (networks, hardware and software) tends to be solved gradually by implementing new technologies. The second, which deals with the development of the digital skills needed to use IT resources, is related to the desire of social actors (teachers and students) to go beyond digital literacy and reach digital maturity.

Many times, students prefer to limit themselves to surfing the Internet. However, if they are stimulated to access web resources for teaching purposes, if there is a diversity of tools/applications they are encouraged to use, then they can access quality training. The effect of digital technology on students depends largely on how these technologies are integrated into the classroom to facilitate the teaching-learning-assessment process. From the perspective of the paradigm of complexity and integrativity, the theory and methodology of training is able to find new strategies and ways to establish relationships with the other components of the educational process. We believe that, in a period of profound transformations, there is a need to clarify the pedagogical specifics of the tools used in training, and our research sheds light on the varied methodological arsenal generated by the new information and communication technologies.

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