

Impact of Introducing E-learning in Secondary Education During Pandemic

Case study of a tutoring school in Northeast Greece - Teachers' perspective

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Abstract — Covid-19 pandemic affected educational organizations to adopt new educational delivery models. The use of digital tools has been common in universities and in adult education. However, the adoption of e-learning in secondary education for minors has been a new phenomenon. This article intends to elicit information about the challenges that students, teachers and organizations faced during the pandemic, when e-learning was introduced as the only means to teaching minors. The challenges were investigated by performing an exploratory case study at a European School. The findings were classified into three categories: students' challenges, teachers' challenges, and organizational challenges. Furthermore, the positive and the negative effects of the introduction of e-learning were investigated.

Keywords - E-learning; Secondary Education; Organizational learning

I. INTRODUCTION

Information Technology is influencing every aspect of modern life and the way organizations operate and interact with their stakeholders. Due to the Covid-19 pandemic there was a significant increase in the demand for e-learning tools to facilitate the teaching procedures during the school closures [1]. During the pandemic 90% of the education ministries globally implemented some form of e-learning, involving the internet and in some cases the television and the radio. Approximately, 1.2 billion children in 186 countries were affected by school closures between 2020 and 2021 [2].

This research explores the challenges and the impact of e-learning introduced in secondary education during the pandemic. The study is based on the experiences of e-learning from the perspective of teachers. The study is conducted at a tutoring school named "Orosimo 2001" in northeastern Greece. The courses offered are Mathematics, Physics, Chemistry, Economics, Informatics, Business Administration, History, Ancient Greek language, Modern Greek language, and Latin language. The organization also offers vocational guidance and psychological support services to students. During the academic year 2020-2021, which is the time period under investigation, there were 23 teachers and 250 students.

Following research questions are explored in this study: 1) What were the challenges faced by students, teachers, and the organization in introducing e-learning

during the pandemic, according to teachers' opinion? 2) What was the impact of the introduction of e-learning after the return to face-to-face teaching?

The rest of the article is arranged as follows: Section 2 presents literature review, Section 3 portrays methodology, Section 4 describes findings, Section 5 discusses the results and concludes the article with further research suggestions.

II. LITERATURE REVIEW

A literature review was conducted using Scopus and IEEE Xplore. The keywords were "e-learning" AND "impact" OR "challenges" OR "obstacles" OR "barriers". The articles were limited to those published between 2015 and 2022, while the first 5 pages of each database were examined, containing 10 articles each. Inclusion criteria were based on selecting articles about the impact and the challenges faced when introducing e-learning during the pandemic. Findings were evaluated by title and abstract relevance. E-learning challenges were categorized into those related to students, those related to teachers and those related to educational organizations (Table 1).

TABLE 1: SUMMARIZED LITERATURE REVIEW FINDINGS

Students' challenges	Teachers' challenges	Organizational challenges
Poor internet coverage	Lack of training in ICT technologies	Culture reluctant to changes
Poor internet speed	Reluctance to change	Lack of financial sources
Limited internet data packages	Lack of online time management skills	Electricity shortages
Lack of electronic devices	Low motivation	Issues with the internet connection coverage and speed
Lack of ICT knowledge	Feeling of loneliness	Inadequate coordination
Variation of different educational platforms	Maintain the balance between the working and the personal life	Lack of digital skills by the staff
Lack of technical support	Maintain students' attention and engagement	Resolve members' technical issues
Lack of sense of learning community	Conducting online assessments	Distribute information about e-learning to staff
Absence of physical presence of the	Observing the students	Choosing software application

teacher		
Low motivation and ineffective communication	Higher workload	
Anxiety and depression caused by the pandemic	Development of course content & learning activities	
Time waste due to technical issues	Adopt online pedagogical approaches to students' demands	

A. Students' challenges

Major issues for students when using e-learning environments are those related to technical infrastructure and internet connectivity [3]-[5]. In many cases, students do not possess the essential devices in order to have access to the internet [3]-[5]. Other barriers are related to the lack of ICT knowledge and the variation of the different online platforms that students have to use, as they find it confusing to adapt to different electronic environments [3]. Many students do not have essential technical support, due to lack of resources [6]-[8]. In addition, the time that students devote to technical issues limits the learning processes [9]. Other challenges are related to English language skills, which in some cases are essential in order to operate e-learning applications [10]. Students who are not familiar with e-learning applications are unlikely to engage in activities and can easily drop out [11].

Lack of sense of the learning community is an emotion that makes it difficult for students to participate in e-learning, while the absence of physical presence of the teacher is another barrier [8][12]. Low motivation and ineffective communication with other students and the management staff are some more obstacles [7][12]. Other challenges are related to the anxiety and the depression caused by the sudden change and the uncertainty during the pandemic [13]. Especially, children whose family income and living standards are dropped due to Covid-19 are found likely to suffer from anxiety and stress, which in turn affects dropout rates [13].

B. Teachers' challenges

Moving on to teachers, a main challenge is the lack of proper training in ICT, as the instructors' teaching skills are usually limited to face-to-face classroom experiences. Moreover, they may feel that e-learning environments are psychologically unsafe [14]. Many times, they have a strong will to stay in the comfort zone, while factors, such as the age, might enhance the reluctance to change [15]. Lack of online time management skills is another barrier, while low motivation and the feeling of loneliness are common among the instructors [4][12]. Another crucial factor is the difficulty to maintain the balance between working and personal life [4].

Teachers find it challenging to maintain students' attention and engagement during the lesson [4][12]. More instructional time is needed in order to effectively teach the students, explain their questions, and guide them through their assignments. Conducting online assessments

might be a challenging task for instructors, particularly on how to avoid plagiarism during the exams [12]. The workload is much higher, as teachers have to build new e-learning teaching material [12]. Moreover, there are issues regarding the arrangement of online classes and the selection of the online platform [16]. Challenges related to the development of course content and learning activities are common among the instructors. Course design challenges consist of issues concerning online curriculum, subject content, teaching and learning activities, localization of the content, pedagogical model and flexibility [15]. Instructors may fail to provide differentiated e-learning environments, adapt their pedagogical approaches to students' demands, localize the content to local cultures and explore new teaching methods for their courses [11].

C. Institutions' challenges

Implementation of e-learning initiatives is related to organizational challenges and the relationship between teachers, students, and educational organizations [11]. Challenges faced by educational organizations have a significant impact on users' interaction with technology and their struggle to adapt with new electronic environments [11]. Stakeholders without essential digital skills might doubt the benefits of e-learning which causes unwillingness to use electronic tools [17]. Furthermore, organizations may lack the financial resources in order to upgrade the technical infrastructure, the internet connection, and to upskill their staff [6]. Organizations might face electricity shortages and issues with the internet connection coverage and speed [10]. A major obstacle to implementing e-learning initiatives is the inadequate coordination between organizations, students, and teachers [10]. Unclear plan of e-learning implementation negatively affects educational services [17]. Furthermore, the administration should support instructors to overcome technological problems [10]. However, the support should not be centered only on technical aspects of e-learning, but it should also consider course design issues and information distribution [11].

Existing culture and educational policy are key challenges [18]. The cultural aspects influencing e-learning environments can be measured by the attitudes, beliefs, and roles of organization's members [18]. Many attempts to adopt e-learning solutions could fail because learning and teaching settings are not contextualized [11]. Choosing a software application with the appropriate learning system and interface design is another issue for educational organizations [15]. E-learning applications should guarantee the privacy and the security of the participants, while access should be given only to authorized users [19].

D. Theoretical Framework

Additionally, a theoretical framework was developed to assess organizational learning. Argyris and Schon [21]

made a distinction between two different types of learning: a) the single-loop learning, which relates to changing theories of action by refining them, and b) the double-loop learning, which relates to changing theories of action by questioning the shared beliefs, norms, and assumptions to reach a new set of theories-in-use. Single-loop learning is the way of learning that it is adopted when following specific instructions faithfully, without further examining the procedures and the causes of problems [21]. These processes are repetitive routine behaviours and involve adapting to the circumstances, without worrying about long-term solutions. They solve the problems without altering the organization’s fundamental processes and nature [21]. Double-loop learning is the procedure of comparing the norm with the situation, questioning the appropriation of the norm, and justifying whether the selected method is the best way of doing things [21]. New set of norms are established to adapt to the environment, which means that an organization might change its policies and its objectives [21]. Figure 1 depicts the usage of Single-Loop and Double-Loop Learning in this article.

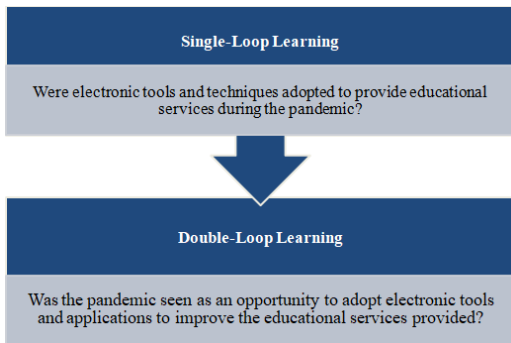


Figure 1. Applying Single-Loop and Double-Loop Learning

III. METHODOLOGY

Following qualitative research methodology, Semi-structured interviews were selected, as they provide a wealth of information, while the data can be compared more easily [22]. The interviews were conducted in the organization, while the snowball sampling was selected. In total, 9 teachers participated in the interviews. Each interview lasted for approximately 30 minutes. Interviews were recorded in Greek and later transcribed to English. Teachers were asked about their experience in e-learning during the academic year 2020-2021. Two of these teachers were also the administrators of the organization, so the input was valuable in order to investigate the organizational challenges from a broader scope.

Thematic analysis was utilized to analyze the collected data [22]. Thematic analysis consists of the systematic identification, organization and understanding of repetitive patterns within data. In the first step the researcher becomes familiar with the data, identifies, and collects excerpts corresponding to each research question. The next stage is the interpretation of the data, which is called

coding. Then, the transition from codes to themes takes place. Themes are more abstract and conceptual constructions generated from codes, and finally the findings are presented [22].

IV. FINDINGS

The following are the themes that emerged through the thematic analysis of the interviews:

- The adaptation procedures to e-learning
- Students’ challenges in e-learning according to teachers’ perspective
- Teachers’ challenges in e-learning
- Organizational challenges in e-learning according to teachers’ perspective
- Impacts of e-learning

The findings are summarized in table 2.

TABLE II: SUMMARIZED INTERVIEW FINDINGS ABOUT E-LEARNINGS CHALLENGES

Students’ challenges	Teachers’ challenges	Organizational challenges
Poor internet connection	Poor internet connection	Technological upgrade
Lack of electronic devices	Lack of electronic devices	Additional financial cost
Lack of sociability	Lack of sociability	Solve students’ and teachers’ technological issues
E-learning did not give them any pleasure	Need to adopt new educational approaches	Coordinating the educational processes
Difficulty to understand the content of the course	Motivating the students	The reluctance to adopt e-learning by a portion of the members of the organization
Sense of indifference	Supervising children	The pricing of e-learning services
	Physical fatigue	

A. The adaptation procedures to e-learning

The first theme describes the adaptation procedures to e-learning. To facilitate adaptation to e-learning during the pandemic the Greek Ministry of Education and the organization provided the children with tablets and laptops in order to participate in electronic lessons. Although the curriculum remained the same, the teachers had to digitize the teaching material and to adapt their teaching in order to be able to distribute it electronically to their students.

B. Students’ challenges in e-learning according to teachers’ perspective

The second theme consists of students’ challenges in e-learning. Students faced several technical, emotional, and cognitive challenges. The pandemic reduced the social relations among the children. Students could not meet their friends and participate in their hobbies. E-learning classes did not provide them with the opportunity to socialize, a fact that enhanced the feeling of loneliness.

Attending face-to-face lessons was more enjoyable, as it was a chance to meet their friends and contact with the teachers. Furthermore, it was difficult for the students to understand the content of the course in e-learning environments, a fact that reduced their performance. Moreover, they felt indifferent about their homework obligations, and referred to technological issues to avoid participating in e-classes.

C. Teachers' challenges in e-learning

The third theme is related to teachers' challenges in e-learning. The teachers faced challenges similar to the students. The teachers needed to find new educational approaches in order to teach into electronic environments. They had to obtain new skills in order to motivate the students to participate, keep their interest and explain the course content. Moreover, supervising students was a challenge for the teachers, as it was difficult to know what the children had written and felt insecure about what children had really learnt. Furthermore, the teachers felt physical fatigue when working long hours on computer.

D. Organizational challenges in e-learning according to teachers' perspective

The fourth theme is about organizational challenges. These challenges were related to the technological upgrade, the financial costs, the coordination of the educational procedures and the reluctance to adopt the e-learning tools by some members of the organization.

E. Impact of e-learning

The fifth theme is related to the impacts of e-learning introduction. The interviewees found that e-learning had some positive impacts on the educational processes. The organization reached new customers and its members became more adaptable. The financial procedures were digitized and children with special needs benefited from e-learning applications. However, there were some negative aspects of the e-learning introduction during the pandemic. E-learning had a negative impact on students' social skills and on their interest to learning processes.

V. DISCUSSION AND FURTHER RESEARCH

The research questions are answered in this section to discuss the results of the study.

A. The challenges faced by students, teachers and the organization in introducing e-learning during the pandemic, according to teachers' opinion

Regarding the students, technical issues were major challenges for them. Many children had poor internet connection at home, and they lacked the essential electronic devices in order to participate in lessons. Especially families with many children did not have enough devices for every child to participate in the learning processes. According to the interviewees, the pandemic reduced the social relations among the students.

Students could not meet their friends and participate in their hobbies. E-learning classes did not provide the students with the opportunity to socialize, a fact that enhanced the feeling of "loneliness". Attending face-to-face lessons was more enjoyable for children, as it was a chance to meet their friends and contact with the teachers. A new challenge that emerged from the interviews and was not mentioned in the literature review was the difficulty for the students to understand the content of the course in e-learning environments, which reduced their performance. Moreover, the students felt indifferent about their homework obligations, and referred to technological issues to avoid participating in e-classes.

Regarding the teachers, they faced difficulties in using the new electronic tools and applications to deliver the lessons. Moreover, the poor internet connection and the lack of the essential electronic devices to deliver the lessons were some technical challenges they faced initially. The teachers needed to find new educational approaches to teach in new electronic environments. They had to obtain new skills in order to motivate the students to participate, keep their interest and explain the course content. Moreover, supervising students was a challenge, as teachers could not know what the children had written and felt insecure about what children had really learnt. Additionally, the interviews showed that the feeling of "loneliness" and "the lack of sociability" during the lockdowns had a negative impact on teachers' psychological mood. A new challenge that emerged from the interviews was the "physical fatigue" that teachers felt when working long hours on computer.

Moving on to the educational organization, there was a need to buy new technological devices due to the growing demand for laptops and tablets, as many teachers used organization's classrooms to deliver the lessons. Furthermore, the organization had to upgrade the internet connection. These needs brought additional financial costs to the tutoring school. A major challenge for organization was the coordination of the learning processes. The secretariat had to organize e-classes in Skype, handle information about students' absences and grades, scheduling the exams and receive payment of the tuition fees. Furthermore, the secretariat had to give instructions to students and teachers about how to overcome the technological issues that they faced.

Another challenge for the organization was that a portion of the teachers was reluctant to adopt e-learning during the pandemic. However, the young teachers and the board were supportive in adopting e-learning tools. There was a new challenge that emerged during the interviews. The School had to decide whether it should continue to charge the parents the same amount for e-learning services. The parents might have not realized the value of e-learning and the effort made by the organization and the teachers. However, the organization chose to keep the amount at the same level, as it continued to pay the teachers regularly.

B. The impact of the introduction of e-learning after the return to face-to-face teaching, according to teachers' opinion

According to the interview findings, teachers and students became more adaptable to the environmental changes gradually. While many instructors transformed the way they delivered their lessons. The organization continues to use electronic tools that have brought some benefits in the delivery of educational services even after the return to face-to-face teaching. With the use of electronic tools children do not miss lessons, even if for some reason they cannot attend face-to-face classes. The learning experience is enhanced even more, as the lessons can be recorded and watched whenever and wherever the students want to. In e-learning, the lessons are delivered regardless time and place. Hence, students and parents can save time and money from the trip to educational facilities, while the organization can save money from operational costs. Many interviewees mentioned that they continue to use PowerPoint and projectors to present teaching materials in a more interactive way. Videos, interactive maps, and digitally enriched material are used to make the lessons more student-centered. Furthermore, during the pandemic the teaching staff digitized the educational material, while the organization and the parents digitized the payment transactions. After the return to face-to-face teaching, the students continued to use online messaging tools to keep in touch with the teaching staff and solve questions about the lessons.

Finally, there were some positive impacts and opportunities in e-learning regarding secondary education which were not mentioned in the literature review. Students with special needs are benefited as e-learning environments provide their users with audio media interactive systems and visual stimuli. Furthermore, by using e-learning tools the educational organizations can approach new clients, as students from different places can attend online courses. In addition, an important element that emerged from the interviews is that e-learning is just as effective as face-to-face teaching if the students are willing to participate.

On the other hand, some teachers did not continue to use electronic tools after the return to face-to-face teaching, remaining unaffected by the changes brought by e-learning during the pandemic. Moreover, the adoption of e-learning tools had a negative impact on some aspects of educational processes. E-learning had a negative impact on students' social skills, as the children lost significant time from their adolescence. The students did not come in real life contact with their friends, teachers, did not participate in social activities, sports, hobbies, which is devastating for the behavior and social life. In addition, during the pandemic, many students felt indifferent to e-learning, and this attitude continues into the current academic year. The children are less committed to their lessons, they participate less, their

effort is reduced, and they consider the learning processes as something not important. In addition, the use of e-learning as the main tool for teaching delivery has created many learning gaps, which is an obstacle in dealing with new educational material. Finally, children who had significant problems with e-learning felt disadvantaged, an emotion that negatively affects them.

C. Using the theory of organizational learning to assess the impact of e-learning on the educational organization

According to the interviews, the organization was ready to adopt electronic tools, as from the third day of the national lockdown. The school provided e-learning services to the students. The electronic rooms that included the students from each class were already organized before the school closures, while the organization provided additional electronic devices to teachers and students, who were in need. The internet connection was also upgraded as many of the organization's teachers continued to use the school classrooms to deliver their lessons. Tuition payments were digitized, a fact that facilitates financial transactions even today. The organization also adopted electronic tools, such as video calls for students to attend the lesson, in case for some reason they could not attend face-to-face teaching.

The organization provided complete freedom in the choice of teaching methods and tools to teachers. Thus, the teachers had the opportunity to choose whether to continue using e-learning tools after the return to face-to-face teaching. The teachers that teach mathematics, physics and chemistry adopted e-learning tools during the pandemic, while after the school closures did not continue to use them. During the present academic year these teachers continue to teach in the way they did before the school closures. They use just some social media platforms to communicate with children and inform them about the schedule and solve potential questions about the lessons. According to organizational learning theory, these teachers adopted specific tools, without worrying for long-term solutions. They did not perceive the pandemic as an opportunity to reflect and transform their educational methods, by using the electronic tools for the enrichment of their teaching. As Argyris and Schon [22] mentioned, the adopted activities solved the problems without altering the fundamental processes. Therefore, these teachers fall into the category of Single-loop learning.

On the other hand, the philologists who teach Ancient Greek, Latin, Modern Greek Language, History and Literature adopted the use of electronic tools even after returning to face-to-face teaching. These teachers continue to use chat applications to communicate with students, but they also use electronic tools, such as PowerPoint, video, and other multimedia, to make their lessons more interactive and student-centered. The pandemic crisis was seen by philologists as an opportunity to adopt electronic tools and enrich their teaching. The members understood the problem, changed their attitude, and chose the

appropriate strategy for long-term solutions. Therefore, these teachers fall into the category of Double-loop learning.

The research aimed to investigate the challenges faced by students, teachers, and organizations in introducing e-learning in secondary education during the pandemic, an area of concern that lacked sufficient prior studies. The findings were classified into three categories: students' challenges, teachers' challenges, and organizational challenges. In addition, the positive and negative effects of the introduction of e-learning were investigated. In this study organizational learning theory was utilized in order to examine whether the introduction of e-learning during the pandemic was the occasion for the teachers of "Orosimo 2001" to transform their educational practices. This research work contributes to the existing literature by describing the challenges and impact of e-learning in secondary education during the pandemic, a topic that has not been sufficiently investigated. The findings of the research can be used as a tool for educational organizations in order to mitigate the negative impact of e-learning. Furthermore, the data of this study can be used in order to define the training needs of the teaching staff and structure training programs.

As a suggestion for future research, it would be useful to explore the views of students and other members of educational organizations about the challenges they faced during the pandemic. This could help identify differences and discrepancies with teachers' views.

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