Sofia University “St. Kliment Ohridski”,
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Evaluation of the effectiveness of the remote online learning based on the perceptions of learners and trainers

Abstract of Ph. D. Thesis
of
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GENERAL CHARACTERISTICS OF THE THESIS

1. RELEVANCE OF THE PROBLEM

E-learning, is an educational activity that provides personalized, integrated, and dynamic learning content in real time, strengthening knowledge communities and connecting learners and instructors with experts. This process, which takes place through the use of internet technologies, assists learners in improving their knowledge and performance while also allowing them to tailor their experiences and meet their personal learning goals. E-learning can take place through the synchronous and asynchronous method.

Synchronous education requires the simultaneous participation of all educators and trainees. The interaction between instructor and learner takes place in "real time". Synchronous education can be achieved either by being in the same space (classroom, etc.) or by being interconnected through a network that allows the exchange of audio or video, while in addition there is the possibility of exchanging files and using an electronic board.

Asynchronous education does not require the real time participation of students and educators. The students do not need to be grouped together in the same place or at the same time. Instead, they can choose their own personal training time frame and collect the training material accordingly. Asynchronous education is more flexible than synchronous. This type of education includes self-teaching, semi-autonomous education, and collaborative education.

Current information and communication technology (ICT) can be used to support teaching and learning many of ways. In this regard, e-learning refers to learning that takes place in an online environment, and whether the course is designed in part or in full to take place online. Different technological solutions, such as mobile learning, have been developed in parallel with e-learning, which usually takes place on a computer. Mobile learning refers to the use of smartphones and their applications in teaching and learning in different learning environments. Indeed, the use of versatile educational material, such as video, allows teaching to reach a wider range of students as well as students of all ages.

The outbreak of COVID -19 has caused a particular upheaval in the field of education over the last two years. In most countries, live lessons were discontinued in favor of online courses. The new educational landscape and the needs brought on by large-scale online education have been a challenge for the global educational community. This had to have an impact on vocational education, which, like the rest of Greece's educational levels, adapted its educational plans to the needs of distance education. Although online teaching is not a new

pedagogical method, it has never been used on such a large scale and has not been adequately evaluated for its effectiveness in meeting educational objectives. For more than a decade, numerous studies have shown that online learning techniques are effective in the case of vocational education, as well as increasing student satisfaction rates through interaction. Although the literature provides a multitude of articles in relation to the distance education process provided by vocational schools during the outbreak of the pandemic, there has been no systematic study concerning the case of Greece.

The current study aims to assess the experience of distance-learning that was provided by Public Institutes of Vocational Training (PIVT), during the pandemic CovidCOVID-19 crisis and to investigate the correlations between the independent variables of the research and the degree of vocational student satisfaction with the distance education process. Additionally, the current study aims to investigate the degree of satisfaction of students at vocational schools in Greece with the process of online education, as well as the extent to which the set educational goals and the challenges posed by the pandemic.

2. OBJECT AND SUBJECT OF THE RESEARCH

The **objects** of study in this doctoral thesis are:

1. Students at the PIVT's of Greece
2. Professors at the PIVT's of Greece
3. The Greek PIVT's

The **subjects** of the study are:

1. Students' views on distance education during the pandemic
2. Teachers' views on distance education during the pandemic
3. The skills of teachers in new technologies and in particular in modern and asynchronous tele-education platforms
4. The pre-existing familiarity of students with new technologies and in particular with modern and asynchronous distance learning platforms
5. Learning outcomes from the implementation of asynchronous education during the pandemic period
6. The consequences of distance learning in the psychological field of students

3. RESEARCH QUESTIONS

The research questions of this study are:

1. How do the vocational students evaluate the online e-learning platforms they used?
2. How effective do they consider e-learning compared to traditional class?
3. What do they think needs to be improved in both the platform architecture and the use of in-platform tools?
4. How do the teachers of PIVT's evaluate the online e-learning platforms they used?

4. HYPOTHESIS

The hypotheses of this study are:

1. PIVTs were not ready to support distance education on such a large scale during the pandemic.
2. The quality of the vocational education services provided was limited during the distance education process.
3. There was a portion of teachers who did not have the appropriate know-how to support distance learning.
4. The distance learning process during the pandemic had a significant psychological and educational impact on students.
5. Individuals with a lower educational level and older age encountered more difficulty in adapting to the new educational environment resulting from the pandemic.

5. OBJECTIVES

The **objectives** of the research are:

1. To collect data to record the problems presented during the distance education process and to evaluate the level of vocational education services provided during the pandemic.
2. To investigate the social and psychological effects that distance education had on PIVT's students.
3. To evaluate the level and adequacy of the technological equipment of PIVT's for the provision of distance vocational education

4. To investigate the independent factors (such as age, educational level, etc.) that possibly influence the opinions of students regarding the evaluation of distance education during the pandemic.
5. To record teachers and student's proposals for improving the quality of distance vocational education services from PIVT's.

6. TASKS

To achieve the purpose of the dissertation, the research was based on the following tasks:

1. Creation of a questionnaire for the evaluation of the distance education process by the students. This questionnaire records:

- Their views on asynchronous and asynchronous learning platforms and their evaluation of them in terms of ease, functionality and educational tools provided.
- Their assessment of the level of preparedness and the ability of teachers for the new educational needs created by the pandemic.
- Their views on the infrastructure provided by the PIVT's to support distance education.
- The effect that prolonged distance education has on the psychological and social level both on themselves and on their environment.
- The investigation of the independent factors (such as age, educational level, etc.) that possibly influence the opinions of students regarding the evaluation of distance education during the pandemic.

2. Creation of a questionnaire for the evaluation of the distance education process by the teachers. This questionnaire records:

- Their views on modern and asynchronous learning platforms and their evaluation of them in terms of ease, functionality and educational tools provided.
- Their assessment of their level of readiness for the new educational needs created by the pandemic.
- Their views on the logistical infrastructure provided by the PIVT's to support distance education.
- Their views on the support in resources and training they received from the PIVT's managements for the implementation of distance education.

3. Carrying out semi-structured interviews with teachers and students of PIVT's in order to answer the following research questions:
   • How effective do they consider e-learning compared to the traditional classroom?
   • How do vocational students rate the online e-learning platforms they used?
   • What do they think needs to be improved in both the architecture of the platform and the use of tools within the platform?

7. RESEARCH METHODS AND TOOLS

1. **Literature review for the following**

Conducting an extensive literature review on the following:

- The study of the history of the structures and applications of distance education, mainly with regard to the part of the evaluation of learning results.
- the study of modern synchronous and asynchronous education platforms as well as the educational tools they offer.
- Investigation of the international experience of the application of distance education in professional education.
- Evaluation of the results of the mass use of distance education during the pandemic at all levels of education.
- Evaluation of the results of the mass use of distance education during the pandemic in the case of vocational education.

2. **Student questionnaire.**

- Design of a questionnaire to record the opinions of PIVT's students on the process of distance professional education during the pandemic and to investigate the research hypothesis.
- Data collection
- Statistical analysis and inference of students' views on the distance education process, evaluation of learning outcomes and identification of factors (such as gender, age, etc.) that may influence their views.

3. **Student interviews.**

- Design of a semi-structured interview to record the opinions of PIVT students on the process of distance professional education during the pandemic and to record the problems they faced as well as possible suggestions for improving educational results.
- Data collection – Qualitative Analysis

4. **Teacher questionnaire.**

- Design of a questionnaire to record the opinions of PIVT's teacher on the process of distance professional education during the pandemic and to investigate the research hypothesis.
- Data collection
- Statistical analysis and inference of students' views on the distance education process, evaluation of learning outcomes and identification of factors (such as gender, age, years of professional experience,etc.) that may influence their views.

5. **Teacher interviews.**

- Design of a semi-structured interview to identify the opinions of PIVT teachers on the process of distance professional education during the pandemic and to record the problems they faced in the implementation of the educational programs, the indication of technical deficiencies or procedural failures as well as the recording of possible proposals for improving educational outcomes.
- Data collection – Qualitative Analysis

STRUCTURE AND CONTENT OF THE PHD. THESIS

The content is structured in 6 chapters:

- Chapter 1. Overview of Distance education and the role of ICT in distance education.
- Chapter 2. Non-Formal Education, Vocational Education and training.
- Chapter 3. Empirical study on the perceptions of Vocational Training Institute students towards remote online e-learning
- Chapter 4. Results
- Chapter 5. Conclusion and Discussion

CHAPTER 1. OVERVIEW OF DISTANCE EDUCATION AND THE ROLE OF ICT IN DISTANCE EDUCATION.

The chapter presents a literature review on distance education the role that ICT plays in distance education. It contains a systematic analysis of the evolution of Distance learning process, as well as the impact that the rapid development of information technology and the Internet in the last decade has had on distance education.

The popularity and effectiveness of many of ICT innovative approaches have led to the creation and development of a demand for educational technology that continues to thrive to this day. As a result, such technologies tend to become a critical element of student education from kindergarten to university. These and other synchronous educational technologies have influenced traditional concepts of education in various ways, such as:

- Extension of learning at home.
- Complement traditional school education with targeted content tailored to the needs of children of a particular age or demographic group.
- The production and wide dissemination of interactive educational content.
- Increased experimentation among teachers on how to use technology in the classroom and how to improve the tools students use at home.
- The above led to the creation of a market for educational technologies, which provoked healthy competition and strong innovation.

It is well known that, using computers in education, controversial critiques have been created that have influenced public opinion. Globally, the

research community has accurately measured and endorsed the benefits of technology in education and have locate the benefits of integrating technology tools into everyday learning experience. The benefits of ICT include:

- The use of technology in the classroom allows the teacher to experiment with new ways of teaching. Especially with disabilities, these new achievements have helped the course to be performed more efficiently.
- Education and learning can be a lot more interesting and exciting because of the use of technological resources. New technological tools are increasingly changing the form of traditional teaching methods.
- Technology is a useful tool in the hands of the teacher in routine tasks. Importantly, there is a set of tools that can automate the student assessment process to enable better and more accurate monitoring of student performance.
- Students have the opportunity to develop their skills through the technology and resources offered to them. Thus, through various and varied searches, students learn to distinguish reliable from unreliable Internet sources.

The weaknesses of ICT include:

- New technological advances lead to the distraction of the student.
- Many educators and other scientists are skeptical of technology and its implications for students in the event of alienation from society.
- Students do not have equal access and opportunities in technology resources, as there are even today students who do not have access to computers.

Distance learning is a form of education in which participants in the educational process, the teacher and students are in a different physical space and communicate in real or different time.

From this definition we can isolate the main characteristics of distance education:

- Separation of teacher and students in space or time.
- Changes the interaction between teacher, students, and educational content.
- Gives the ability of two - way communication between teacher and students.
- The control of the learning process is on students and not on the teacher.

Examining the nature of distance education, we can identify its special features, which distinguish it from traditional education:

- It is social education - distance education meets the ever-changing needs of society for trained staff in various fields of human activities.
- Flexibility and independence - distance education provides an opportunity to learn independently at students' preferred time and place.
- Can provide personalized education - the teacher can specialize the courses of distance education according to the characteristics of students. It is also possible to select the appropriate technologies for distance education.
- Participants in distance education are the teachers, the students, and the learning content.

Teachers have a new role in distance education. Unlike traditional education where the teacher is a key factor in education, where do lectures and controls the degree of assimilation of content, distance education participation limited to being a consultant management and coordinator through the learning process. Control of the educational process is shared between teachers and students.

As a result, students have a new role. From being passive participants in the education process, students taking a central position in distance learning. Students are the ones who determine the speed of learning and preparation. Self-monitoring and self-assessment are very important processes.

Distance learning requires interaction between participants in the learning process. The interaction determines to some extent the effectiveness of distance education.

According to some scientists, the use of new information and communication technologies in distance education is associated with the emergence of a new type of interaction between student and technology. They note that this interaction is an important element that affects the effectiveness of education. Communication between participants in distance learning can be either synchronous or asynchronous:

- In synchronous distance education, where participants are at the same time in their own space, and with the help of software and telecommunications, they participate in a "virtual classroom".
- In asynchronous distance education, where learners can work with the available educational material anywhere and anytime.

One of the most prevalent forms of distance education can be e-learning. E-Learning is generally defined as the type of learning supported by the Information and Communication Technology (ICT), which improve the quality of teaching and learning.

Through e-learning many opportunities are given to the trainees. Many of the benefits that e-learning can offer are:

- distance learning is allowed.
- provide access to and search for updated electronic resources, images, audio documents, videos and interactive educational materials are provided, which can support the learner even in difficult subjects.
- communication between both individuals and groups is supported.
- there is flexibility in learning time, as the trainer and learners can communicate in real time (synchronous training) or when they have time available (asynchronous training).
- trainees can communicate with specialist experts as well as with each other.
- opportunities are provided for the development of skills, which are necessary for the identification and evaluation of information for the planning and scheduling of tasks;
- provides ways for effective and immediate feedback, which helps identify training needs;
- enriches existing knowledge through an autonomous learning process;
- gives the opportunity for discussions and cooperation through online media;
- gives access to high quality education is provided for students who are unable to attend university courses

CHAPTER 2. NON-FORMAL EDUCATION, VOCATIONAL EDUCATION AND TRAINING (VET)

This chapter presents the framework of Non-Formal and vocational education and learning. Non-formal learning is defined as any organized educational activity outside the formal education system that targets specific learners and has specific learning objectives. In Greece, according to Law, as non-formal education is considered "education provided in an organized educational framework outside the formal education system and can lead to the acquisition of certificates recognized nationally. It includes the initial vocational training, the continuing vocational training and the general adult education".

The VET system in Greece was based on the two subsystems of initial vocational training and lifelong vocational training. The legal framework for providing VET in Greece was defined by different laws governing initial vocational training and continuing vocational training separately. , the initial vocational training provides basic professional knowledge, skills and abilities in specialized fields for the integration, reintegration, professional flexibility and the promotion of human resources in the labor market, while the continuing professional training updates or upgrades the knowledge, skills and competencies acquired from vocational education systems and initial vocational training, or vocational experience to integrate or reintegrate into the labor market, ensuring employment and professional and personal development. In addition, formal education leads to the acquisition of nationally recognized certificates by public authorities. Non-formal education is provided in an organized context outside the formal education system, which can lead to nationally recognized qualifications and includes initial vocational training, lifelong vocational training and adult education.

The operational framework of PVTIs dates back to the 1990s, when there was established as a structure of the VET system. The organizational framework of operation of PVTIs consists of five sections:

1. The Educational framework
2. Quality assurance
3. the study
4. the trainers
5. the phase of organization and administrative operation.

School development is defined as a continuous, deliberate, and planned change at all levels of a school that requires the involvement of all school stakeholders. Relevant activities can focus on three dimensions: teaching (e.g., education and training), staff development (e.g., supervision, mentoring) and organizational development (e.g., school as an organization). But not all forms of education have the same requirements. The development of vocational training institutions includes additional key parameters, such as cooperation between companies and vocational schools. In addition, training in vocational training structures focuses on workplace-related learning rather than general knowledge, thus requiring different skills on the part of teachers.

In the synchronous work environment, digital skills have become increasingly important for all professions. Vocational education institutions should include in the curriculum the increasing digitization of their students' workplaces, such as

fully automated factories. As a result, digitization has begun to play an important role in school curricula and development processes.

CHAPTER 3. EMPIRICAL STUDY ON THE PERCEPTIONS OF VOCATIONAL TRAINING INSTITUTE STUDENTS TOWARDS REMOTE ONLINE E-LEARNING

Chapter 3 aims to document the need to strengthen the literature on the effect of distance education during the pandemic on learning objectives with the present empirical study, as well as to present the tools used to implement the empirical study.

The outbreak of COVID -19 has caused a particular disruption in the field of education over the pandemic. In most countries, live lessons were discontinued in favor of online courses. The new educational landscape and the needs brought on by large-scale online education have been a challenge for the global educational community. This had to have an impact on vocational education, which, like the rest of Greece's educational levels, adapted its educational plans to the needs of distance education. Although online teaching is not a new pedagogical method, it has never been used on such a large scale and has not been adequately evaluated for its effectiveness in meeting educational objectives. Although online education had not been used on a large scale prior to the pandemic's outbreak, there had been some studies in the literature evaluating the distance education process.

Numerous studies have shown that online learning techniques are effective in the case of vocational education, as well as increasing student satisfaction rates through interaction. Although the literature provides a multitude of articles in relation to the distance education process provided by vocational schools during the outbreak of the pandemic, there has been no systematic study concerning the case of Greece. The current study aims to assess the experience of distance-learning that was provided by Public Institutes of Vocational Training (PIVT), during the pandemic COVID-19 crisis and to investigate the correlations between the independent variables of the research and the degree of vocational student satisfaction with the distance education process. Additionally, the current study aims to investigate the degree of satisfaction of students at vocational schools in Greece with the process of online education, as well as the extent to which the set educational goals and the challenges posed by the pandemic.

The main research tool that will be used is the questionnaire, which will contain closed-type questions, but also interviews will take place through a guide with open-ended questions (semi-structured) to a sample of students of Vocational

Training Institutes in Greece. Therefore, the study has a mixed methodological approach, and will contain both quantitative and qualitative characteristics.

The questionnaire consisted of 28 questions, including both closed-ended and open-ended questions in order to facilitate the evaluation of the experience earned by distance learning, in a more holistic way.

Specifically, the majority of questions, 23 out of 28, are closed-ended questions, of which 5 questions are about the attendants' demographic characteristics, 2 questions were about the by public Institutes of Vocational Training, 4 about the exploitation of asynchronous education platforms, 4 about the exploitation of synchronous education platforms, 2 about their general usage, and finally 6 of them were about the evaluation of the total experience of distance-learning with a five-point Likert scale from "disagree" to "strongly agree".

On the other hand, the remaining 5 open-ended questions exhorted attendants to write down their opinions suggesting methods to optimize the efficiency of distance-learning.

All the answers given by the 774 attendants were selected, processed, and statistically analyzed, exploiting the IBM SPSS STATISTICS v24.0 statistical software. Aiming to investigate the existence of statistical differences across the variables, the statistical test of Pearson Chi-square is employed. Specifically, Chi-square is chosen to examine the differences between categorical variables from a random sample in order to evaluate goodness of fit between expected and observed results.

The combination of qualitative and quantitative methodology in research design is used to increase the validity of measurement tools both at the level of exploring theoretical concepts and at the level of constructing empirical indicators that represent these concepts. For the collection of data through personal semi-structured interviews, a special guide was developed for the purpose of the study.

Data was collected over a six-month period in 2021. Semi-structured interviews and field notes were initially used as data collection strategies. Purposeful sampling was continued until saturation, which meant that no additional data on the topics of interest were obtained. Each interview lasted 45 minutes on average. All interviews were recorded with a voice recorder and transcribed (verbatim) immediately following their completion. A list of general questions was included in the interview guide. The lead researcher listened to the interviews multiple times to get a sense of the data. Ambiguities were resolved by reviewing the transcripts with the participants immediately following or during the interview. After that, the units of meaning that were directly related to the research question were highlighted and chosen. Subsequent analysis was carried

out. Data collection and analysis were carried out concurrently during the study period, as in other qualitative studies.

The semi-structured interaction with the students consisted of 3 axes

General Axis

The first part of the interview contained questions about the changes brought about by the SARS-CoV2 - COVID -19 coronavirus pandemic and how they affected the Public Institutes of Vocational Training (PIVT) educational community

Psychological/Spiritual/Social Axis

The second axis of the interview explores the psychological, spiritual and social ramifications of the pandemic caused by the COVID-19 virus in the PIVT educational community.

Learning Axis

The last part of the interview contained questions asked to the participants concern the learning axis and aim to explore the views of the students on the educational policies and practices implemented by the PIVT during the period of the pandemic caused by the COVID-19 virus.

CHAPTER 4. RESULTS

This Chapter presents the most important results of the quantitative and qualitative analysis described in chapter 3.

Quantitative Analysis

A Chi-square test of independence was performed to examine the relation between gender and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you believe that the application is used by the educational staff to organize the courses and for the communication between professor and student?". The relation between these variables was significant, (x^2 (4)=30.565, p-value=0.000<0.05). Women appear to have a more positive view than men.

Similarly, a Chi-square test of independence was performed to examine the relation between gender and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you think that the information provided by the application are adequate?]". The relation between these variables was significant, (x^2 (4)=13.048, p-value=0.011<0.05). Women appear to have a more positive view than men.

Additionally, a Chi-square test of independence was performed to examine the relation between gender and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you look educational material into the E-Class application?]". The relation between these variables was significant, ($x^2(4)=34.004$, p-value=0.001<0.05). Women appear to have a more positive view than men.

Similarly, a Chi-square test of independence was performed to examine the relation between gender and the opinion of responders in the question "*Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you believe that the E-Class application has made your information updating, more validated?]*". The relation between these variables was significant, (x^2 (4)=28.711, p-value=0.000<0.05). Women appear to have a more positive view than men.

Furthermore, a Chi-square test of independence was performed to examine the relation between gender and the opinion of responders in the question "*Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you believe that this application has contributed to the optimization of the educational quality provided by the information management department?]*". The relation between these variables was significant, ($x^2(4)=12.082$, p-value=0.017<0.05). Women appear to have a more positive view than men.

Additionally, a Chi-square test of independence was performed to examine the relation between gender and the opinion of responders in the question "*Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you believe that if this application be fully exploited is going to contribute to the optimization of educational quality?]*". The relation between these variables was significant, (x^2 (4)=13.197, p-value=0.010<0.05). Women appear to have a more positive view than men.

Additionally, a Chi-square test of independence was performed to examine the relation between gender and the opinion of responders in the question "*Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you believe that the application is easy to use?]*". The relation between these variables was significant, ($x^2(4)=12.269$, p-value=0.015<0.05). Women appear to have a more positive view than men.

A Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "*In what extent do you believe that your need to enhance your skills (adaptation to new reality, cooperation, optimal problem-solving, new responsibilities, increase of*

creativeness) useful for solving your daily problems, was satisfied by your studies?". The relation between these variables was significant, ($x^2(16)=41.780$, p-value=0.000<0.05). Participants aged 36-45 appear to have a more positive view of the need to enhance their skills than people in other age groups.

Additionally, a Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you believe that the application is used by the educational staff to organize the courses and for the communication between professor and student?]". The relation between these variables was significant, ($x^2(16)=32.860$, p-value=0.008<0.05). Participants of 55 plus age group appear to have a more positive view than people in other age groups.

In addition, Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you think that the information provided by the application are adequate?]". The relation between these variables was significant, ($x^2(16)=27.027$, p-value=0.041<0.05). Participants of 18-25 age group appear to have a more negative view than people in other age groups.

Similarly, a Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you think that the information provided by the application are adequate?]". The relation between these variables was significant, ($x^2(16)=31.587$, p-value=0.008<0.05). Participants of 55 plus age group appear to have a more negative view than people in other age groups.

Additionally, a Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that [Do you believe that the E-Class application has made your information updating, easiest?]". The relation between these variables was significant, ($\chi 2(16)=30.975$, p-value=0.014<0.05). Participants of 36-45 and 46-55 age groups appear to have a more negative view than people in other age groups.

Similarly, a Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you think that the E-Class application contributes to a better personal time and schedule organization?]". The relation between these variables was significant, ($x^2(16)=37.451$, p-

value=0.002<0.05). Participants of 36-45 and 46-55 age groups appear to have a more positive view than people in other age groups.

Furthermore, a Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "Regarding to the exploitation of asynchronous education platforms in what extend to do you believe that: [Do you believe that if this application be fully exploited is going to contribute to the optimization of educational quality?]". The relation between these variables was significant, ($x^2(16) = 27.877$, p-value=0.033<0.05). Participants of 55 plus age group appear to have a more positive view than people in other age groups.

In addition a Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "How positive was the experience that you obtained by the exploitation of the e -learning synchronous platforms?" The relation between these variables was significant, ($x^2(16)=48.418$, p-value=0.000<0.05). Participants of 36-45 age group appear to have a more positive view about the experience that obtained by the exploitation of the e -learning synchronous platforms than people in other age groups.

Similarly, a Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "*How often did you use the below mentioned educational platforms before the pandemic of COVID-19: [asynchronous educational platforms]*". The relation between these variables was significant, ($x^2(16)=32.404$, p-value=0.009<0.05). Participants in the age group 55 plus appear to have used asynchronous education platforms more than people in other age group.

A Chi-square test of independence was performed to examine the relation between age group and the opinion of responders in the question "*In a scale, ranging from 1 to 5, in which point would you place yourself regarding the exploitation of e-learning educational platforms, before the pandemic COVID-19 crisis?*". The relation between these variables was significant, ($x^2(16)=52.379$, p-value=0.000<0.05). Participants in the age groups 18-25 and 26-35 appear to have used educational platforms more than other age groups before the outbreak of the COVID-19 pandemic.

in order to evaluate the relations between variables and track how one variable is behaving when another changes correlations tests were carried out. The tests are executed in couples of variables. The outcome of each test is the correlation coefficient that is presented on the following table.

Table 1 - Correlations between key variables

A	B1	B2	B3	C1	C2	D	D5	D6
A	0,265**	0,173**	0,478**	0,177**	0,194**	0,120*	0,084	0,228**
B1	1	0,492**	0,345**	0,408**	0,280**	0,034	-0,016	0,157**
B2		1	0,389**	0,355**	0,397**	-0,002	0,053	0,208**
B3			1	0,243**	0,243**	0,133*	0,047	0,321**
C1				1	0,526**	-0,057	-0,008	0,213**
C2					1	-0,069	0,029	0,248**
D						1	0,324**	0,134*
D5							1	0,250**
D6								1

A: total assessment of the PVTI, B1: use of synchronous platforms, B2: assessment of synchronous platforms, B3: total evaluation synchronous platforms, C1: use of non-synchronous platforms, C2: assessment of non-synchronous platforms, D: frequency of use, D5: Familiarity before pandemic,D6: Familiarity after pandemic.

Qualitative Analysis

In case of students, there were 17 interviews in total, with 9 men and 8 women ranging in age from 18 to 26 years. Similarly, in case of teachers 17 participants (10 males and 7 females) selected using the purposive sampling method.

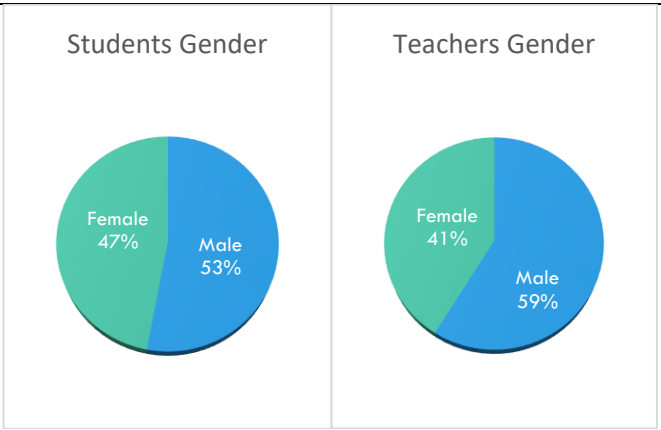

Figure 1. Gender of participants to qualitative analysis

The age range for the participant teachers was from 35 to 62 years. Regarding the participants' profession - specialty, there is diversity, since we find one participant each with the specialty of Economics, Lawyer, Chemist and Philologist. In addition, five (5) participants with the specialty of Cook, one (1) Medical Doctor, four (4) Trainers and one (1) Engineer participated in the interview.

From the qualitative analysis of the interviews with students and teachers, the following conclusions emerged:

a) The students faced significant difficulties in adapting to the new educational environment as well as technical difficulties that were mainly related to lack of logistical infrastructure but also to connectivity problems

b) The students, despite the technical difficulties they encountered, recognize the efforts of the teachers to cope adequately with the demands of distance education

c) The intense psychological effects that the prolonged distance education had on students with intense anxiety and a feeling of isolation are highlighted

d) Teachers highlight the lack of logistical infrastructure that existed at the beginning of the pandemic and made it difficult to implement distance education, but nevertheless their overall assessment of the results of distance education is generally positive

e) The teachers point out the importance of their continuous training in new technologies as well as the need to implement simulations that can be a reliable

tool for the remote teaching of laboratory courses in conditions similar to those created during the pandemic.

CHAPTER 5. CONCLUSION AND DISCUSSION

The Chapter 5 aims to sum up the conclusions of all previous chapters and summarize the answers to the research questions.

The results of this study, show that the implementation of distance learning during the pandemic provides many and significant benefits to a large percentage of participants. Learners' perceptions of it are influenced by demographic factors such as age and gender. In general, it appears that older participants, although they encountered greater difficulties in adapting to the new educational reality, appear to have a more positive attitude towards distance education. On the other hand, people of younger age and with a higher educational level, although they appear to have a greater ability to adapt and more skills in relation to new technologies, seem to have a more critical attitude towards the benefits of distance education. Regarding the gender of the participants, the research shows that women show a more positive attitude towards the provision of distance education compared to men. This may be due to the fact that women are more organized, which enables them to respond better to an organized environment such as that provided by synchronous and asynchronous training platforms. Results showed not statistically significance for gender, for most of the variables. This means that both men and women of the sample evaluate similarly the key variables of the study. Regarding age groups, there are statistically significant differences in use of synchronous, asynchronous platforms and familiarity before pandemic. The younger age group shows significantly lower use of synchronous platforms, the older age group shows significantly higher use of asynchronous platforms. Concerning the familiarity of using these platforms before the pandemic, the 46-55 age group reported significantly lower mean score. In addition, although high levels of stress were observed during distance learning, no statistically significant differences were observed between the groups examined. In summary, we can say that older people faced a greater percentage of problems related to both connectivity and technical issues, people of intermediate age groups faced problems with the lack of suitable equipment. Something like this might be expected since older people are not particularly familiar with technology and especially with online applications. On the other hand, younger participants appear to mainly have more difficulty than other age groups in adapting to the new education process. In general, participants in the 36-45 age group appear to have a more positive attitude towards the new educational reality both in the field of asynchronous and in the field of synchronous education. This may be due to the fact that this particular age group

is on the cutting edge of bridging the technology gap between younger and older participants. The results were based on the analysis of a questionnaire made by students who underwent the experiment.

The majority of the participants mentioned the difficulties they encountered during the teaching of the laboratory courses, due to the lack of appropriate and synchronous equipment by the teachers and students and the limited knowledge of the latter in New Technologies and their applications.

The students of PIVT, although they mentioned the difficulties they were asked to face during distance teaching, characterized the policies implemented by the educational unit of PIVT during the pandemic as satisfactory, without the absence of negative opinions.

Analyzing the responses of the students, the majority considers that the pandemic and the universal application of distance education affected the development of interpersonal social relationships between students and teachers. They report that the relationships became impersonal, weakened as a result of the educational process being a personal process and not a collaborative process, based on dialogue and interaction.

In addition, the students with their answers seemed to agree with the view that the pandemic caused by the COVID-19 virus, mandatory confinement and distance education were the main causes of stress for students, that although the time to get used to the new given the distance education, he was quite fast, despite these anxiety rates, they were at particularly high levels and therefore their poor performance.

The previous experience of the teachers in the implementation of distance education and the technological tools required, according to the teachers' responses, is characterized as Moderate, which undoubtedly affects the quality of training of distance education services. According to reports in the global literature, instructors should have the ability to promote and develop basic skills and competencies, alongside the teaching of up-to-date professional, prior experience is a key factor in this endeavor and in promoting learning.

The suggestions of the lecturers concerning the improvements that should be implemented by the administration and management of the educational institutions of the PIVTs, in order for the implementation of distance learning to be carried out without problems and to bring about the maximum possible educational results, focus on two major issues, the equipping of the educational institutions with synchronous material and technical equipment, including the updating and renewal of the study guides and the training of the lecturers.

In conclusion, this study shows that the participants in a large percentage find many and significant benefits from the implementation of distance learning during the pandemic. Learners' views of it are influenced both by demographic characteristics such as age and gender as well as by their level of education.

Future efforts could investigate the effect of other factors such as the economic background of the participants and the type of institution that provides the training. At the same time, it would be useful to make use of both the proposals of the participants for the improvement of the provided distance education, as well as to implement proposals that have emerged from corresponding studies of the international literature. More specifically, educational institutions, even in periods of normality, such as the current period, to implement synchronous and asynchronous distance education programs using videotaped lectures and multimedia supporting material. This material should be evaluated by the trainees and constantly improved based on their feedback and suggestions. In addition, as indicated by the participants, many of the laboratory lessons can be conducted through simulations. At this point artificial intelligence could have a special role, a field that is particularly flourishing at this time and could be used to create automatic presentations and simulations that would be particularly friendly and attractive to user-students. Finally, artificial intelligence could find application in the process of synchronous and asynchronous education and in theoretical courses through applications of augmented reality.

1. SCIENTIFIC AND APPLIED CONTRIBUTIONS

Scientific contributions

Distance education, although it existed for a number of years as an auxiliary tool at all levels of education, acquired a dominant importance during the period of the pandemic. The scientific contributions of this doctoral thesis are the following:

1. The effectiveness of distance education in the Greek PIVT was investigated for the first time, since while in the global literature there was a multitude of studies that studied the quality and usefulness of distance education during the pandemic, there was no corresponding study on distance professional education in Greece during the pandemic.

2. A questionnaire was developed to investigate the attitude and opinions of both PVIT students and teachers in them.

3. A statistical analysis was carried out to draw conclusions in relation to the views of students and teachers on the distance learning process and also to record the possible problems they encountered during the distance learning process

4. A qualitative analysis was carried out which recorded both the views of the teachers and professors involved in distance education as well as their suggestions for improving the educational services provided

5. The effect of the electronic process on the quality of the provided educational services was recorded.

6. The psychological effect that distance education had on both students and teachers was studied. These psychological effects may also appear in other branches that during the pandemic had to work remotely.

Scientific-Applied contributions

The conclusions of this doctoral thesis had the following scientifically valid contribution

1. They pointed out the technical inadequacies that existed before the pandemic that made the distance learning process difficult. Addressing and

correcting the technical difficulties could make a potential future backlash for mass distance education smoother.

2. It indicated the organizational failures of the PIVTs in managing the need for distance education, a fact that may lead to the organizational reformation and restructuring of the PIVTs to be able to adequately manage corresponding emergency educational situations.

3. It highlighted the need for training of educational staff in new IT technologies to be able to adequately cope with their educational tasks in situations similar to those created during the pandemic

4. They demonstrated the need to develop new educational platforms that can simultaneously cover both modern and asynchronous student education

5. They indicate the need to create a wide range of simulations that adequately cover the laboratory training of students in cases where their live training will not be possible.

6. The results of the thesis indicate the increased importance of the recent emergence of artificial intelligence in the development of educational tools that will make more accessible and simple the theoretical and laboratory training of students in PIVTs in emergency educational situations similar to those that appeared during period of the pandemic

2. LIST OF AUTHOR'S PUBLICATIONS, RELATED TO THE TOPIC OF THE PHD THESIS

- Panagiotis Anagnostou, Nikolina Nikolova , **Evaluation of experience of distance-learning that was provided by Greek Public Institutes of Vocational Training (PIVT) during the Models pandemic COVID-19 crisis,**YEARBOOK of Sofia University "St. Kliment Ohridski". Faculty of Mathematics and Informatics, vol:108, 2023, pages:5-15, ISSN (print):1313-9215, ISSN (online):2603-5529, doi:https://doi.org/10.60063/gsu. fmi.108.5-15, Ref, etc. (The National Reference List of Modern Bulgarians), PhD
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- P. Anagnostou, N. Nikolova , **Perceptions of Vocational Training Institute Students Towards Elearning Platforms During the Pandemic**, EDULEARN22 Proceedings, Publisher:IATED, 2022, pages:4412-4418, ISSN (online):2340-1117, ISBN:978-84 -09-42484-9, doi:10.21125/edulearn.2022, International, PhD
- P. Anagnostou, N. Nikolova , **Investigation of the Vocational Rehabilitation of the Graduates of Public Vocational Schools in Greece**, ICERI2021 Proceedings, 2021, pages:2519-2525, ISBN:978-84-09-34549-6, doi:10.21125/ iceri.2021, PhD

- P. Anagnostou, A. Grigorov , **Building a Digital Repository for Learning Resources**, Proceedings of ICERI2014 Conference, 17th-19th November 2014, Seville, Spain, ISBN: 978-84-617-2484-0, 2014, pages:1460-1464 , Ref, International, PhD
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3. DECLARATION OF ORIGINALITY OF THE RESULTS

I declare that the present dissertation contains original results obtained in my research with the support and assistance of my scientific advisers. The results obtained, described and/or published by other scholars are duly and in detail cited in the bibliography.

This dissertation is not applied to obtaining a scientific degree in another higher school, university or scientific institute.

Signature:

(Panagiotis Anagnostou)

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