

## Integrating digital technologies in tertiary education to prepare students for the job market

### L'Integrazione delle tecnologie digitali nell'istruzione terziaria per preparare gli studenti al mercato del lavoro

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#### Abstract

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Due to the continuous development of technology and the introduction of Information and Communication Technologies (ICT) in modern life, it becomes necessary to introduce new tools in the educational process. The integration of new ICTs depends on the objectives and the teaching approach adopted by the teachers. This research project aims to study the new role of ICTs in educational practice that has been developed by the teachers of the University of Patras. Based on a quantitative study, this research tries to identify the role of ICT, educating students through new technologies to acquire skills they will require when they want to enter the labor market. The results of the survey show that for most surveyed teachers, ICT is a research tool as well as an important pedagogical tool for explaining basic concepts and promoting the learning environment.

**Keywords:** new technologies; educational teaching; tertiary education; digital skills; job market.

#### Sintesi

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Oggi, a causa del continuo sviluppo delle tecnologie e dell'introduzione delle Nuove Tecnologie dell'Informazione e della Comunicazione (TIC) nella vita moderna, è diventato necessario introdurre nuovi strumenti nel processo educativo. L'integrazione di nuove TIC dipende dagli obiettivi e dagli approcci didattici adottati dagli insegnanti. Il progetto di ricerca che si presenta nel contributo mira a studiare il nuovo ruolo sviluppato dagli insegnanti dell'Università di Patrasso, nell'uso delle TIC nella pratica educativa. Sulla base di uno studio quantitativo, questa ricerca si propone di identificare il ruolo delle TIC, educando gli studenti, attraverso l'implementazione di nuove tecnologie, al fine di acquisire nuove competenze utili per l'inserimento professionale. Dai risultati dello studio condotto si evince che per la maggior parte degli insegnanti che hanno partecipato a questo progetto le TIC sono uno strumento di ricerca e un importante strumento pedagogico per spiegare concetti di base e promuovere l'ambiente di apprendimento.

**Parole chiave:** nuove tecnologie; insegnamento; istruzione terziaria; competenze digitali; mercato del lavoro.

## **1. The integration of new technologies into the educational process**

Education when used with technologies is a systematic and organized process of applying modern technology to improve the quality of teaching. It is a systematic way of integrating technology into teaching and evaluating the educational process (Panagiotakopoulos, 2013).

During the educational process, it is observed that teaching is based on two-way communication presenting the following main features. Initially, the teacher's action is conscious but systematic teaching which aims at understanding both simple and complex concepts, contributes to a better understanding for the learners (Fernández, 2011). In other words, teaching relates to the purposes and content of the lesson and is presented in the classroom. The results from teaching this way would be beneficial not only to the educator but also to the trainee as well as in rebirth (Hernández, Fernández, & Baptista, 2010).

During communication within the classroom, the coding of the message is adapted to the learner level, while its reception and decoding are achieved in a direct way and with the active participation of the trainees (Biesta, 2015). In this way, teaching is based on a specific action plan. This plan is characterized by a *deep knowledge-based infrastructure* which is structured in such a way so that it can support and interpret the concern of the teacher that develops on this point. This concern is related to the aims and aspirations of both the trainer and the general education (Marín, Inciarte, Hernández, & Pitre, 2017). Resolving this concern leads to the achievement of the teacher's goals and to creates a better image of the institution of education as according to the Juárez-Lugo (2014) study, as ICT (Information and Communication Technologies) allows each learner to learn according to his learning style and abilities. As an educational infrastructure, we define the common points of the course content and the "trainer's ability to transform the content of teaching" into dynamic and pedagogical forms (Zogopoulos, 2001, p. 47). Many times there are significant differences in the way in which various concepts such as communication, collaboration, interactivity and the whole construction and organization of knowledge (Hofstede, 1996) are understood.

The new situation in which the trainee is concerned relates to skills, knowledge and emotional states that he did not acquire earlier (Hofstede, 1996). The next action is coding. At the same time, the achievement of the objectives leads to codification, which is effected efficiently and using appropriate methods (Zogopoulos, 2001). The effectiveness of coding takes place throughout the teaching and where necessary corrections are made to better achieve it. Finally, the third step is to evaluate the results of the teaching process systematically to be able to ascertain whether the original objectives set were achieved and the extent to which those objectives were achieved. These results will determine whether or not there will be a rebirth, i.e. a redefinition of the objectives (Kossivaki, 1997).

## **2. Use of ICT in the educational process**

As mentioned in Papadiamantopoulou, Armakolas, and Gomas (2016), teachers' use of ICT tools is limited to supporting traditional teaching methods (Tzimoyiannis & Siorenta, 2007) and they believe that ICT is more useful for administrative tasks and preparation (Tzimoyiannis & Komis, 2006). Teacher training is considered to be the most frequent reason that teachers use technology (Tzimoyiannis & Komis, 2006). However, in the study of Kartsiotou and Roussos (2010) this statement is not verified and it is suggested that educators choose not only to use technology inside the classroom for learning purposes but

also supervise the use of computer by their students. There are several factors that make teachers use or resist using technology for educational purposes. To be more specific, research suggests that male teachers have more positive attitudes towards using technology (Roussos, 2007; Roussos & Politis, 2004). Older educators have lower use of technology than younger educators (Kartsiotou & Roussos, 2010) while Roussos and Politis (2004) and Roussos (2007) highlight a different aspect. The experience of teachers is an important factor in using technology (Roussos, 2007). According to Laurillard (2013), ICT shapes the characteristics of the new electronic environment, differentiating and adapting the traditional teaching model based mainly on a trainer and trainee. In other words, the educational process must ensure that these skills will enable one to cope with the new environment, the characteristic of which is the continuous effort of creative integration in a rapidly changing world (Ibidem). Their existence seems to change the role of teachers and the dynamics of the amphitheater. Better communication among all *actors* in education and beyond, as well as new educational practices and new roles seem to make teachers feel more effective and positive in using ICT in day-to-day educational practice, while at the same time highlighting the necessary role of ICT and their contribution to the labor market (Maia, Borges, Reis, Martins, & Barroso, 2018; Zaranis & Exarchakos, 2018).

In terms of effectiveness, surveys (Cherry, Rollins, & Evans, 2013) show a positive correlation between the frequency of e-resources and the average of high-quality students. As far as robotic teleconferencing is concerned, it needs improvement and coordination in voice, chat and screen sharing (Kousis, 2019). Regarding the effectiveness of e-learning, it is obvious that the two types (synchronous, asynchronous) must co-exist in order to improve the quality of the course (Anastasiadis, 2006). However, according to Laschou, Kollias, and Karasavvidis (2018), the effectiveness of information technology is linked to a changing institutional mood for use and exploitation.

### **3. Digital Skills and Job Market**

Digital skills are indissolubly linked to information management, collaboration, communication, content creation and knowledge acquisition, ethics, and responsibility, assessment, and problem-solving (Ferrari, 2012). The promise of learning in the 21<sup>st</sup> century is that digital technologies will transform traditional learning and mobilize those skills that are necessary for an emerging digital environment (Hatlevik, Ottestad, & Throndsen, 2015). According to Binkley and collaborators (2012), there are four types of skills:

- learning-thinking skills (creativity and innovation, critical thinking, problem solving and decision making, learning to learn and metacognition);
- working methods (communication, collaboration and teamwork);
- working tools (information technology, ICT, IT);
- social-intercultural skills (personal and social responsibility, productivity).

The main focus is on teaching and learning practices to ensure student's ability to acquire 21<sup>st</sup> century skills in the classroom as a preparation for working life (Leahy & Dolan, 2010).

However, according to van Deursen and van Dijk (2010), *digital literacy* should be more than the ability to use digital resources effectively. Digital literacy is presented as a set of attitudes that allows users to perform intuitively in digital environments and to have easy and effective access to the wide range of knowledge incorporated into these environments

(Martin, 2008). In addition, van Deursen and van Dijk (2010) proposed a range of conceptual knowledge about digital skills, which represent technical or media aspects (medium skills) and important aspects or aspects of content (skills related to content information, communication, creation and strategic skills (van Laar, van Deursen, van Dijk, & de Haan, 2017). Finally, Mitrovic (2010) interprets e-skills as “the ability to develop and use ICT to participate appropriately in an environment where access to electronically acceptable information is increasingly dominated, and a well-developed ability to synthesize this information in a more effective way to gain knowledge more easily” (p. 2).

According to Hüsing and Korte (2010), demand for high-tech skills is on a steady growth path. Many surveys (<http://eskills-monitor2013.eu/results.html>) indicate that demand rates are rising dramatically each year, although supply does not follow the same growth rate. One last estimation of the *gap* between demand and supply in 2020 will be 500.000 (<http://eskills-scale.eu>). The decrease observed in recent years is due to the increase in the number of professionals with education in new technologies in higher education (European Commission, 2018). It also emphasizes the need to strengthen educational programs in order to enable students to cope with a highly competitive environment with very high demand. European Commission (2018) tackles the need for digital skills of four broad groups:

- digital skills for all: developing digital skills to enable all citizens to be active in our digital society;
- digital skills for the labour force: developing digital skills for the digital economy (upskilling and reskilling workers, jobseekers; actions on career advice and guidance);
- digital skills for ICT professionals: developing high level digital skills for ICT professionals in all industry sectors;
- digital skills in education: transforming teaching and learning of digital skills in a lifelong learning perspective, including the training of teachers.

It is, therefore, necessary to strengthen ICT in tertiary education in order to meet the needs of the job market.

#### **4. Research questions**

The main purpose of the research is to study the state of universities regarding the integration of new ICT in the educational process (during a lesson, during experiments, in laboratories, etc.) of higher education and the views of the teachers on its use. Teachers use new technologies, but their attitudes differ from grade to education. The essential goal of new technology systems in tertiary education is to enhance active participation and promote effective learning. The main purpose of the research is to study how learning is made more effective according to the views of the teachers, but also to link them to the labor market. In particular, the research questions that this study can answer are:

- how often do teachers integrate new technologies into higher education?
- what tools do teachers use to support teaching their lessons?
- how effective are teachers judging the use of ICT in the educational process?
- to what extent are student’s digital competencies being used during the course?
- to what extent are ICTs linked to the job market?

## 5. Methodology

The research tool chosen in our case, given the quantitative survey, is the questionnaire (Panagiotakopoulos & Sarris, 2015). The questionnaires used in this research study were distributed directly to the respondents and were both hardcopy and online through social networking. The format of the questionnaire used for the purpose of this study was the weighted questionnaire. This questionnaire is considered a particularly valid and reliable tool for measuring the degree of use and satisfaction of using ICT in tertiary education. As described below, it has a high reliability index. The creation of the questionnaire was based on the relevant literature (Fernández, 2011; Hernández et al., 2010; Hüsing, Korte, & Dashja, 2015; Marín et al., 2017).

The questions that were included in the questionnaire were closed-ended questions where the question allowed only specific answers. The questions related to the demographic characteristics-individual data of the sample subjects are characterized as *independent* variables, since they have no decisive influence on the answer they give, while the questions investigating the attitudes, the views of the teachers and the degree of satisfaction of all parties from the use of ICT are characterized as *dependent* variables, since their answers depend on the above characteristics.

The survey was conducted between February and April 2019 while the questionnaire was distributed on 20 February 2019 and completed on 10 March 2019. The research was conducted through an electronic (Google Form) and a printed questionnaire to teachers of 37 departments of the University of Patras (50 professors, teaching undergraduate and graduate courses). The famous SPSS Statistics-Version 24 (Statistical Package for Social Sciences) was used to statistically process the collected questionnaires and to draw useful conclusions. During the statistical processing and analysis of the results, Cronbach's correlation coefficient  $\alpha$  was calculated to check the reliability of the questionnaire. According to Cohen, Manion, Morrison, and Morrison (2007), values of a greater than 0.7 express consistency and ensure consistency and reliability. In our case it was found that Cronbach's entire questionnaire was  $\alpha = 0.7$ . Therefore, we conclude that our questionnaire as a whole is reliable.

## 6. Analysis of Results and Discussion

It is observed that the majority of respondents belong to the age group over 55 years. Subsequently, the age group of 45-54 years is followed by 32%, and the 35-44 age group is 16%. It is worth noting that there were no individuals from all the participants belonging to the 25-34 age group. From the chart below it is easy to see that the majority of respondents have either 21-30 or 11-20 years of service. More specifically, the percentage of these groups is 34% each, followed by 20% by those who have more than 30 years of service. Finally, 12% of respondents said they had less than 10 years of service. As far as the position held by the teachers in the university community we observed that the majority of the participants are professors, while the lowest percentage belongs to the lecturers. 26% of the participants stated that they hold the position of assistant professor while only 24% stated that they belong to the group of associate professors.

In the question how often do teachers incorporate new technologies in higher education, 40% of respondents said they use the new methods to a great extent during the lessons they deliver, and 38% said they use them a lot during the teaching (Figure 1). At this point, it is

worth noting that only two people said they use little or no ICT while delivering of their lessons.

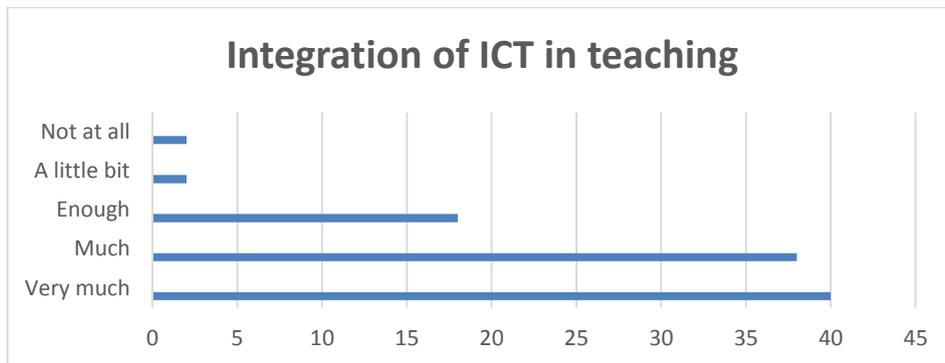


Figure 1. Integration of ICT in teaching.

In the question of what ICT tools teachers use to support teaching their lessons (Figure 2), the majority of them use 42% of applications such as word, powerpoint, excel, etc. to create more effective teaching. In addition, 30% of respondents upload notes and presentations of the course as well as additional material on the electronic platform e.g. e-class (<https://eclass.upatras.gr>). Only 2% use technology methods in laboratory classes (structural and designing analysis software) and another 2% use new technologies for an experiment or demonstration to students (numerical computing environment, proprietary programming languages).

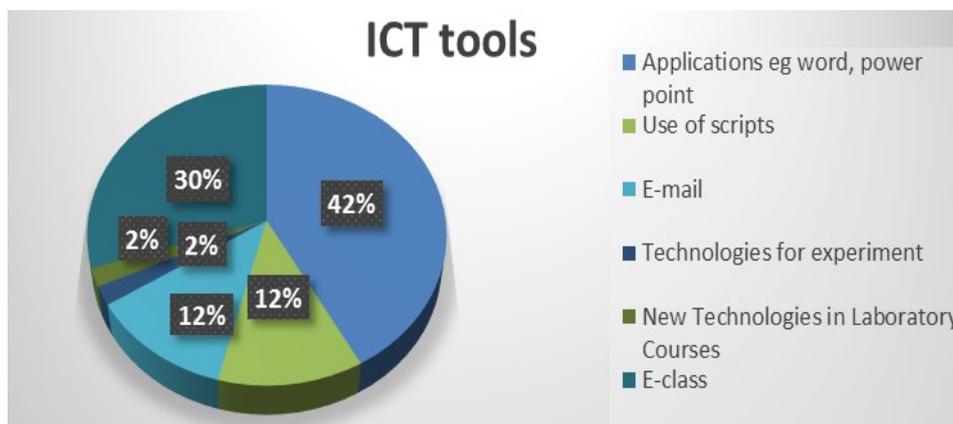


Figure 2. ICT tools.

This question asked respondents about the effectiveness of using ICT. More specifically, as it is easily distinguishable from the Figure 3, the majority of respondents i.e. 40% believe that the new technology systems are quite effective and only 2% consider their use as very poorly.

This question asked teachers to answer the extent to which students' digital skills are being exploited during the course. More specifically, out of the 50 respondents, 13 responded that students are very much involved, while again 13 out of 50 consider that they are involved to a large extent (Figure 4).

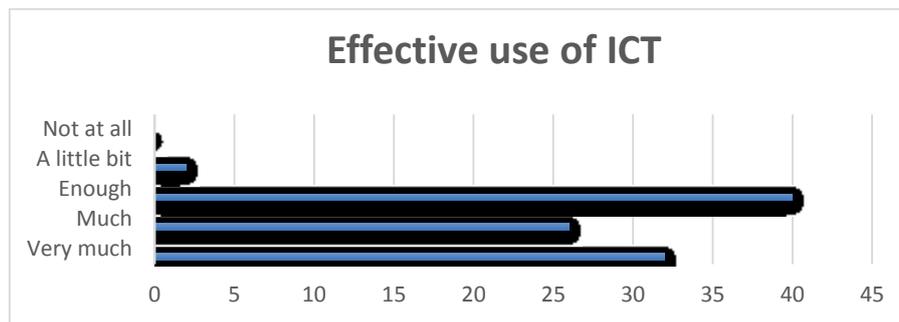


Figure 3. Teachers' views on the effective use of ICT.

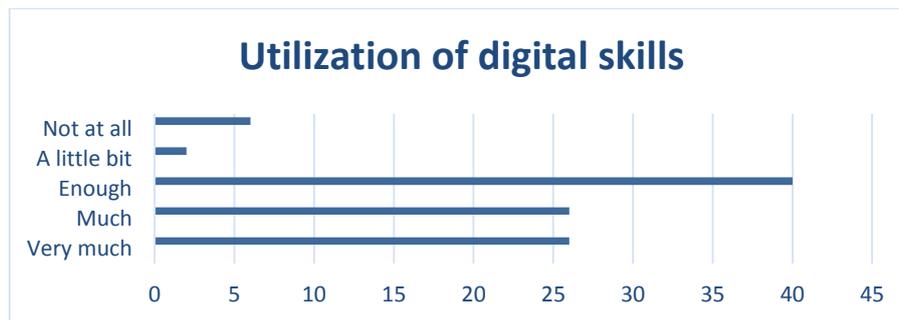


Figure 4. Teachers' views on student satisfaction with the use of ICT and the development of digital skills.

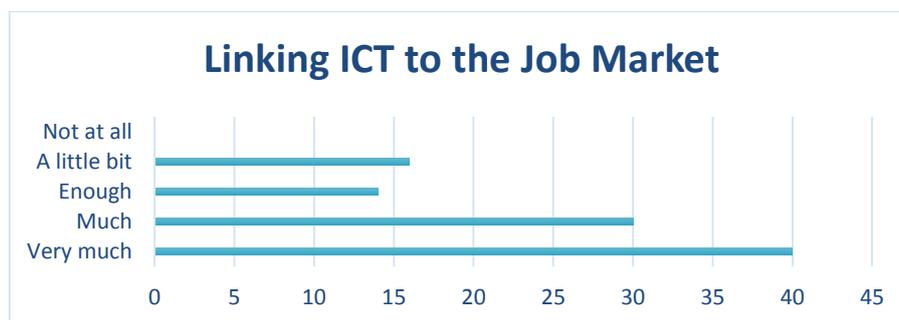


Figure 5. Teachers' views on the degree of connection of new ICTs to the job market.

Figure 5 presents teacher's responses on the extent to which they believe that new ICTs are linked to the labor market. The majority of respondents with 40% responded that they believe that new ICTs are very much linked to the labor market, with only 16% believing they are slightly connected.

## 7. Conclusions

As it is well known the integration of ICT into academic structures, creates an exponential knowledge supporting formal and informal learning processes (Marin et al., 2017). In the context of this empirical study, the views of the Tertiary Education trainers on the situation at the University of Patras regarding the use and integration of new ICTs were explored. Over the past two decades, the focus on integrating and using technology in the context of

the school environment has been steadily increasing. The European Commission occasionally adopts decisions and guidelines on the integration of ICT into education, the use of hardware and software, and the support of teachers (Hüsing & Korte, 2010). However, in tertiary education, the use of ICT is relatively new. Results concerning the trainers, we can observe that most of the aspiring teachers express the intention to employ technology in the educational process or in procedural processes for professional reasons with other researchers confirming the same result (Papadiamantopoulou et al. 2016; Usta & Korkmaz, 2010). Trainers intend to use computers for preparing additional educational material for their students and use computers for communicating with other sectors in and out of the university.

In spite of the positive attitude of teachers (effectivity, Figure 3), there is a serious problem the use of computers, as their incorporation is an exclusive element of the teacher's *passion* and is not subjected to any organized plan by the Ministry of Education. Additionally, teachers use technology to a great extent and incorporate them into teaching their lessons, while also using educational software to meet the learning needs of students. Although the sample is restricted to only one educational institution, namely the University of Patras, the answer to the question of whether the introduction of ICT will change the learning environment is reflected by teacher's strong belief in the effectiveness of their use. In other words, although the use of ICT is necessary for the process of university courses and their use is particularly effective, the problems they face are a barrier to the whole process. ICTs are directly and significantly connected with an effective learning environment and the development of new digital skills necessary to enter the job market more competitively. The results of linking the labor market with ICTs do not just reflect the view of teachers, but are of particular importance as the vast majority of respondents work with private companies (consulting). It is possible to support the belief that teacher training programs should develop a more targeted approach to preparing educators to use technology in and out of the classroom for performing professional activities. Moreover, the Greek educational system should make more organized efforts, and the educational communities should be more supportive in order for aspiring teachers to develop their potential and skills in technology use.

## **8. Research Restrictions and Future Proposals**

In any research process as in our case, there is a percentage of participants who have some reservation in completing the entire questionnaire or some of the questions. This difficulty may arise due to lack of time on the part of the respondent or may be related to the content of the entire questionnaire or individual questions. In our case, in particular, this difficulty is due to the lack of time available to respondents. In particular, we observed a general reluctance of teachers to complete the questionnaires, while at the same time they did not devote the time needed to complete it. In addition, the results of this survey are the recording of the view and perception of trainers on the integration and use of ICT in university education. In other words, the recording of the results is subjective, even though tools are used that favor the objective analysis of the data. Additionally, we can refer to the inability to access a sufficient number of participants from Patras University, although sampling was carried out on a random basis and on for the voluntary participation of trainers.

A future proposal for extending this study would be to conduct a larger sample of participants to verify or reject the conclusions of our study. Another future idea would be

to make a comparison of the issue in question with respect to its statistics relating to foreign countries with the corresponding Greek academic institutions. In other words, this study would be useful for professors to gain a deeper understanding of the importance of ICT in academic institutions. In this way, they will look for new techniques to succeed in distinguishing their *competitors* in the teaching practices they use. In addition, the research could be carried out focusing on different parameters that might provide a wider picture of the use of ICT in Universities, such as the way by which teachers include ICT during the educational process on student's grades in the courses, etc. Finally, the same research could be carried out at another time or even at other Universities, even in other counties or cities, in order to verify the same results or to recall them.

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