

## **PRE-SERVICE AND IN-SERVICE TEACHER TRAINING: THE USE OF TECHNOLOGY IN THE GREEK EDUCATIONAL SYSTEM**

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### ***Abstract***

*In the contemporary educational setting more and more educators both pre-service and in-service are trying to follow technological advances by integrating them to their educational style. Despite the continuous increase of technological resources that teachers can utilize during instruction along with the efforts made by the Greek educational system to establish more conducive conditions for a computer-centered learning in both primary and secondary education, limited research exists to date regarding the use of technology by computer-literate teachers, let alone the intention of technology use by computer-literate pre-service teachers. Therefore, this study examines the use of technology by pre-service and in-service Greek educators for professional purposes. Results show that pre-service teachers intend to use technology for future professional reasons in a greater degree than in-service teachers actually do, while some aspects of pre-service (Student 1 and Delivery) and in-service (Student 1, Student 2, Student3, Communication and grouping variable Student) teacher technology use are affected by their age and teaching domain.*

### **THEORETICAL FRAMEWORK**

Recent advances in computer-based technologies have paved the way for the reformation of educational process. Teachers have now the ability to incorporate technological tools to support their teaching both inside and outside the classroom (Bebell et al., 2004). However, as technology becomes more widespread in the educational system, the examination of technology use is proved to be an increasingly difficult topic of research (Bebell et al., 2004). According to Lim and Khine (2006) the use of computers still remains insignificant and ineffective, while Johnson et al. (2010), as seen in Ertmer et al. (2012), predict that till 2015 the plethora of online resources and their impact to educators will form the appropriate conditions for technology adoption.

To better understand the extensions of teacher technology use, we should first focus on what this concept represents. Becker (1994) proposed that a computer-using teacher will require at least 90% of its students to use a computer in the classroom during a school year. Subsequently, Rowand (2000) presents a number of reasons that teachers use technology, such as to create instructional materials, keep administrative records, communicate with colleagues, find information for lesson planning, make multimedia presentations etc., revealing that teacher technology use does not seem to be exclusively about student computer activity but appears to relate with educators activity too. Nevertheless, a more integrated approach about teacher technology use appears in Bebell et al. (2004), who demonstrate seven distinct scales measuring the use of technology by teachers: (1) Teachers' use of technology for class preparation, (2) Teachers' professional e-mail use, (3) Teachers' use of technology for delivering instruction, (4) Teachers' use of technology for accommodation, (5) Teacher-directed student use of technology during class time, (6) Teacher-directed student use of technology to create products and (7) Teachers' use of technology for grading.

In the contemporary educational setting more and more educators both pre-service and in-service are trying to follow technological advances by integrating them to their educational

style. Teachers' preparation and training programs play an important role in this process. This statement is supported by the survey of Kleiner et al. (2007), where more than 90% of the respondents have participated in a teacher education program that included the use of technology for instructional purposes. Although, pre-service teachers seem to be more skillful and efficient with technology, they learn to include technology tools in their teaching in a more abstract and stagnant way because teacher preparation programs usually offer only one course about technology learning (Niess, 2005). Tondeur et al. (2011) claim that pre-service teacher education should focus on how technology can be integrated in the pedagogical process, while Teo (2009) suggests that pre-service teachers in order to develop computer self-efficacy should have access during their training to all technologies that are available in school classrooms.

International studies on teacher technology use have shown that teachers use more frequently technology outside the classroom either for preparation and communication (Russell et al., 2003) or for administrative tasks related to student grades and attendance (Gray et al., 2010). Regarding Ottenbreit-Leftwich et al. (2012), 99.2% of teacher participants reported to use technology for communication purposes every week, while Thompson (2008) explained that teachers have started to communicate via e-mail with their students' parents more frequently. On the contrary, inside the classroom teacher technology use seems to be limited in low-level curricular tasks (Maddux & Johnson, 2006) with teachers of different domains using technology to deliver instruction equally (Bebell et al., 2004). Furthermore, new teachers, who are thought to be more computer-educated than their older colleagues, do not use technology for professional purposes more frequently than their peers (Russell et al., 2003; Russell et al., 2007). Specifically, new teachers reported higher technology use for preparation in contrast to their more experienced peers who reported higher levels of technology use for delivering instruction and for assisting students to engage in activities with the use of computer (Russell et al., 2003). Concerning teacher candidates, Usta and Korkmaz (2010) claim that pre-service teachers are positive toward using technology for educational purposes, and subsequently positive toward the teaching profession, with this positive attitude becoming higher as the technology literacy of teacher candidates rises.

Likewise, studies that examined similar questions to the Greek educational system have concluded to relevant results. Although, the majority of primary and secondary education teachers have received technological training, teachers have generally positive attitudes on ICT, schools are equipped with computers, internet connection and educational software is available, very few teachers use systematically ICT in their teaching (Jimoyiannis & Komis, 2004; 2006). In respect to Symeonidis et al. (2014), educators that attended a training program seem to take full advantage and make greater use of educational software and scenarios during instruction than non-trained teachers. Science teachers' use of ICT tools is limited to supporting traditional teaching methods (Jimoyiannis & Siorenta, 2007) and they believe that ICT is more useful for administrative tasks and preparation (Jimoyiannis & Komis, 2006). Teacher preparation is considered to be the most frequent reason that teachers use technology (Jimoyiannis & Komis, 2006), however, in the study of Kartsiotou and Roussos (2010) this statement is not verified and is proposed that educators choose not only to use technology inside the classroom for learning purposes but also to 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 deduces that male teachers have more positive attitudes toward using technology (Roussos & Politis, 2004; Jimoyiannis & Komis, 2006; Roussos, 2007). Older educators have lower usage of technology than younger educators (Kartsiotou & Roussos, 2010) while Roussos and Politis (2004) and

Roussos (2007) highlight a different aspect. Experience of teachers is an important factor in using technology (Roussos, 2007). As we see in Symeonidis et al. (2014) less-experienced educators demonstrate greater use of ICT whereas Jimogiannis and Siorenta (2007) find that teachers who are in the middle of their career are more positive to use ICT in the learning process. Teachers of the economic and technological domain use more frequently computers and educators of science, technology and foreign languages are more positive toward the inclusion of ICT in education (Jimoyiannis & Komis, 2006).

Despite the continuous increase of technological resources that teachers can utilize during instruction along with the efforts made by the Greek educational system to establish more conducive conditions for a computer-centered learning in both primary and secondary education, limited research exists to date regarding the use of technology by computer-literate teachers, let alone the intention of technology use by computer-literate pre-service teachers. Therefore, this study examines the use of technology by pre-service and in-service teachers. In particular, we attempted to (a) identify the use of technology by in-service teachers for professional purposes and (b) identify the intention of technology use by pre-service teachers for professional purposes. Both technology use and intention of technology use refers to teachers of primary and secondary education in Greece. The participants were familiar with practicing technology for educational purposes.

## **METHODS**

### Methodology

The research method that was chosen in order to achieve the objectives of the study was a quantitative descriptive research design. The data was collected with the use of a questionnaire based on the research tool of the USEIT study (Russell et al., 2003) and it was adapted to reflect the Greek educational system. The participants in the study were pre-service and in-service teachers that have participated in the teacher training programs EPPAIK and PESYP offered by the School of Pedagogical and Technological Education (ASPETE), which include courses for technology integration in the classroom. The total participants' number was 148. The questionnaire was distributed online between 2 to 15 March 2016. The sampling method that was used was a convenience sampling technique.

### Experimental Material

The questionnaire that was used for the purposes of our survey is composed of 7 questions and two parts. The first part recorded the demographics of participants (gender, age, domain, experience), while the second part was used to measure separately the specific ways that in-service teachers use technology and the intention of pre-service teachers to use technology for their future professional needs. For the measurement of in-service teacher technology use 2 questions were used, with the first measuring the level of satisfaction about technology use (5-point semantic differential scale) and the second one recording the frequency of the specific uses of technology by teachers including 8 items (7-point Likert scale). For the measurement of teacher candidates' intention to use technology a nominal scale was used. The items that were used to measure both the intention of pre-service to use technology and in-service teacher technology use have been influenced by the seven district scales measuring the use of technology proposed by Russell et al (2003). However, the categories of teacher technology use have been shaped accordingly to the specific features of the Greek educational system. In particular, the categories of teacher technology use that are used by this survey were:

- Teachers' use of technology for class preparation (Preparation, 2-items)
- Teachers' use of technology for delivering instruction (Delivery, 1-item)
- Teacher-directed student use of technology during class (Student, 3-items)
- Teachers' professional e-mail use (Communication, 1-item)
- Teachers' use of technology for recording student performance (Performance Record, 1-item).

## Analysis

The data analysis contains one factor analysis for all the variables of the questionnaire and the non-parametric tests: (a) Chi-square for independence which explores the relationship between two categorical variables and (b) median-comparison tests, Mann-Whitney U Test which tests for differences between two independent groups on a continuous measure and Kruskal-Wallis Test which tests for differences between more than two independent groups on a continuous measure (Pallant, 2011) of our sample.

## Participants and their characteristics

Overall, 148 pre-service and in-service teachers, served as participants in our study, 39.9% of which were male and 60.1% female. Half of the respondents (50%) aged from 31 - 40 years old, 25% from 22 - 30 years old, 20.3% from 41 - 50 years old and 4.7% were more than 51 years old. Concerning teachers' domain, 22.3% of participants' domain was economic sciences, 21.6% technical sciences, 14.2% environmental sciences, 12.2% computer sciences, 9.5% health sciences, 6.1% elementary school teachers, 6.1% political/social sciences, 4.1% physical sciences, 2.7% literature and 1.4% arts. Regarding their experience in the teaching profession, 45.9% of respondents were teacher candidates and recorded to have no experience in teaching, while 54.1% were in-service teachers. From in-service teachers, 27.5% recorded having 3 - 5 years of experience in their career, 22.5% 1 - 2 years, 20% 6 - 10 years, 13.8% 11 - 15 years and 16.3% more than 15 years. Finally, in-service teacher participants' seem to somehow agree with the statement that they are currently using technology during instruction as much as they would like ( $M = 3.46$ ).

## RESULTS

### In-Service Teachers

The results show that in-service teachers tend to use technology several times a year to several times a month for Preparation 1 ( $M = 3.46$ ), Preparation 2 ( $M = 3.60$ ), Delivery ( $M = 3.51$ ), Student 1 ( $M = 3.28$ ), Performance Record ( $M = 3.14$ ), while they tend to use technology once or twice a year to several times a year for Student 2 ( $M = 2.66$ ), Student 3 ( $M = 2.60$ ) and Communication ( $M = 2.45$ ). The grouping variables show that in-service teachers use technology more frequently for Preparation ( $M = 3.53$ ) and Delivery ( $M = 3.51$ ) and less frequently for Student ( $M = 2.85$ ) and Communication ( $M = 2.45$ ). In total, in-service teachers seem to use technology for professional purposes approximately several times a year ( $M = 3.10$ ).

Moreover, investigating the differences between the Degree of Perceived Technology Use and gender, age, domain, experience and the differences in in-service teacher's technology use according to gender, age, domain and experience we found that:

- A Mann-Whitney U Test revealed a statistically significant difference in In-Service Teacher's Technology Use for Student 1 for females (Md = 3.00, n = 80) and males (Md = 4.00, n = 80),  $U = 550$ ,  $z = -2.280$ ,  $p = 0.023$ ,  $r = 0.25$ ). The mean ranks indicate that male participants use computers for Student 1 purposes more than females.
- A Kruskal-Wallis Test revealed a statistically significant difference: (1) in In-Service Teacher's Technology Use for Student 2 across 10 different domains,  $\chi^2(9, n = 80) = 30.921$ ,  $p = .000$ . Participants of the computer and physical science domains recorded the highest median score, (Md = 4.50 and Md = 3.50 respectively), while the participants of Health and Literature science domains both recorded the lowest median values, (Md = 1.00) which indicates that participants of the computer and physical science domains use computers for Student 2 purposes more than the participants of the other domains, (2) in In-Service Teacher's Technology Use for Student 3 across 10 different domains,  $\chi^2(9, n = 80) = 21.813$ ,  $p = .009$ . Participants of the computer, physical science domains and elementary school teachers recorded the highest median scores, (Md = 4.00, Md = 3.00 and Md = 3.00 respectively), while the participants of Health and Literature science domains both recorded the lowest median values, (Md = 1.00) which indicates that participants of the computer, physical science domains and elementary school teachers use computers for Student 3 purposes more than the participants of the other domains, (3) in In-Service Teacher's Technology Use for Communication across 10 different domains,  $\chi^2(9, n = 80) = 18.326$ ,  $p = .032$ . Elementary school teachers and participants of the physical science domain recorded the highest median scores, (Md = 4.00 and Md = 3.50 respectively), while the participants of Environmental, Health and Literature science domains all recorded the lowest median values, (Md = 1.00) which indicates that elementary school teachers and participants of the physical science domain use computers for Communication purposes more than the participants of the other domains, (4) in In-Service Teacher's Technology Use for the grouping variable, Student, across 10 different domains,  $\chi^2(9, n = 80) = 25.370$ ,  $p = .003$ . Participants of the computer, physical science domains and elementary school teachers recorded the highest median scores, (Md = 4.00, Md = 3.33 and Md = 3.33 respectively), while the participants of Literature and Health science domains recorded the lowest median values, (Md = 1.83 and Md = 1.66) which indicates that participants of the computer, physical science domains and elementary school teachers use computers for the Grouping variable, Student, more than the participants of the other domains.
- We observed no significant results between the Degree of Perceived Technology Use and gender, age, domain, experience and between In-Service Teacher's Technology Use for Preparation 1, Preparation 2, Delivery, Performance Record, grouping variables Preparation, Technology Use and gender, age, domain, experience and between In-Service Teacher's Technology Use for Student 2, Student 3, Communication, grouping variable Student and gender, age, experience and between In-Service Teacher's Technology Use for Student 1 and age, domain, experience.

#### Pre-Service Teachers

The results show that all teachers intend to use technology for Preparation 1 purposes, 91.2% for Preparation 2, 89.7% for Delivery, 85.3% for Student 1, 80.9% for Student 2, 77.9% for Student 3 purposes, 72.1% for Communication and 95.6% for Performance Record.

Furthermore, investigating the association between pre-service teacher's intentions of technology use and gender, age, domain we found that:

- Female participants (95.2%) seem to intend more to use technology for Student 1 than male participants (69.2%). A Chi-square test for independence indicated significant association between gender and Student 1,  $\chi^2(1, n = 68) = 6.710, p = .010, \phi = .357$ .
- Participants of the computer, economic, health and literature science domains (100% respectively) seem to intend more to use technology for Delivery than participants of the environmental (93.9%), technical (90%) and political (66.7%) sciences. On the other hand participants of the domain of physical sciences (0%) seem to have no intention to use technology for Delivery. A Chi-square test for independence indicated significant association between domain and Delivery,  $\chi^2(1, n = 68) = 24.013, p = .001, \text{cramer's } v = .594$ .
- We observed no significant results between pre-service teacher's intentions of technology use for Preparation 1, Preparation 2, Student 2, Student 3, Communication, Performance Record and gender, age, domain, between pre-service teacher's intentions of technology use for Delivery and gender, age and between pre-service teacher's intentions of technology use for Student 1 and age, domain.

## CONCLUSIONS

The findings of our study suggest that in-service teachers use technology in general for professional reasons several times a year which allows the conclusion that teachers do not involve technology use in the educational process or in procedural processes very often. In particular, we can ascertain that technology is used more often, several times a month, by teachers to prepare for instruction, this statement seems to agree with the findings of Jimoyiannis and Komis (2006) and Russell et al. (2003) and to deliver instruction and less often, several times a year, to direct students to use technology for instructional purposes and to record students' performance. The least frequent use of technology by teachers is the process of communicating with others in and out of the school for professional reasons.

Secondly, examining the study we can deduce that male teachers use technology for directing students to work, individually or in groups, using a computer during the educational process more often than their female peers. Regarding the different domains of the participants, can be concluded that teachers of the computer and physical science domain and elementary school teachers use technology for directing students to incorporate the use of the computer during class more than the participants of the other domains, while teachers of the health and literature science domain use computers for the same educational purposes less than their peers from the different science domains. Elementary school teachers and teachers coming from the physical science domain tend to communicate more with others in and out of the school for professional reasons via email than their peers from the other domains, whilst teachers coming from the environmental, health and literature science domains use technology for the same reasons less than their coworkers coming from different domains. Jimoyiannis and Komis (2006) seem to agree expressing that physical science teachers believe that ICT is more useful for administrative tasks.

Considering the results concerning pre-service teachers, we can observe that most of the aspirant teachers express the intention to employ technology in the educational process or in procedural processes for professional reasons with Usta and Korkmaz (2010) confirming the same result. Particularly all the pre-service educators' intend to use computers for preparing additional educational material for their students, while using computer for communicating with other parts in and out of the school is the least favorable process.

Furthermore, female pre-service teachers express the intention to use more technology for directing students to work, individually or in groups, using a computer during the educational process more than male aspirant teachers. Regarding the different domains of the participants, we can support the conclusion that teachers coming from the computer, economic, health and literature science domains have more the intention to utilize technology to deliver instructions than their peers of the environmental, technical and political sciences, whilst those coming from the domain of physical sciences express no intention to use computers for the same reasons at all.

Overall, our results show that teacher candidates intend to use technology for future professional reasons in a greater degree than in-service teachers actually do, while some aspects of pre-service (Student 1 and Delivery) and in-service (Student 1, Student 2, Student3, Communication and grouping variable Student) teacher technology use are affected by age and teaching domain. Also, we can observe similar results concerning the low technology use for communication by both pre-service and in-service teachers. In contrast, opposite results are demonstrated between in-service and pre-service teachers, as male use computers for directing students to work, individually or in groups, during the educational process more than females but females' intent to use computer for the same reason more than males.

In the end, 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, the Greek educational system should make more organized efforts and schools, as educational communities, should be more supportive in order for aspirant teachers to evolve their potentials and skills in technology use and their scientific background and to incorporate more actively the utilization of computer and computer applications into the educational process.

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