

The ICT Literacy Skills of Secondary Education Teachers in Greece

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Abstract: This article discusses the ICT literacy of secondary education teachers in Greece. Regardless of their specialty, a representable sample of 700 in-service teachers from 283 secondary education schools throughout Greece, participated in our questionnaire survey that was conducted from December 2017 until June 2018. The teachers were questioned about their familiarity with personal computer and smartphone use, whether they use ICT devices in the classroom, while also reporting any obstacles they face in order to implement ICT in the educational process. The data collected enabled us to review the teachers' ICT literacy. The ICT literacy definition we endorse is the one offered by ETS (Educational Testing Service) (2007); "ICT literacy is using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society". The findings of the research showed that the majority of Greek teachers are skilled ICT users, embracing their implementation in their teaching interventions, although ICT related Greek policies are contradictory.

1 INTRODUCTION

The importance of digital literacy is well acknowledged around the world as progressively more countries adopt ICT (Information and Communications Technology) policies in education (UNESCO, 2011). The infusion of ICTs in schools, that mostly took place in the early 90s, failed in its early stages to revolutionize education (Cuban, L., 2000, 2001), as in most cases technology was adapted to traditional school structures, classroom organization and existing teaching practices (Dakich, E., 2015). As of now educators have realized that in order to impact student learning, ICT must be integrated by teachers that are digitally literate and understand how to integrate it into the curriculum. According to the European Commission (2013) "teachers' confidence in using ICT can be as crucial as their technical competence, because confidence levels can have potential influence on the frequency with which teachers use ICT-based activities in the classroom".

In this article, we survey a representative sample of 700 secondary education teachers in Greece, in order to evaluate the Greek education system's ability to adopt ICT, based mainly on teachers' ICT literacy. Numerous frameworks have been published about the proper definition and meaning of digital and ICT

literacy. Ng, (2012), considering all existing definitions, stated that digital literacy has three dimensions, depending on the exact skills required; technical, cognitive and socio-emotional. The technical dimension involves possessing the technical and operational skills to use ICT for learning and in everyday activities, the cognitive dimension as the ability to think critically in the search, evaluate and create cycle of handling digital information, and the socio-emotional as being able to use the internet responsibly for communicating, socializing and learning. Many researchers list digital literacy as one of the 21st century skills (Vavik and Salomon., 2015) (Voogt et al., 2013) (Trilling and Fadel, 2009) but Trilling & Fadel also described ICT literacy as a part of digital literacy. Specifically, they grouped the 21st century skills into three main areas; Learning and innovation skills, digital literacy skills and career and life skills. They later divided the digital literacy skills in information literacy, media literacy and ICT literacy. The following ICT literacy definition was offered in 2007 by ETS (Educational Testing Service); "ICT literacy is using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society". Summarizing, digital literacy is a more broadband term than ICT literacy, and includes the skills

required to be able to critically evaluate and impart information, retrieved using ICT.

ICT training programs for teachers in Greece are divided into two levels. The A-level training curriculum is about acquiring basic knowledge and skills in the use of ICTs in education. The curriculum covers introductory concepts of computer science and basic usage of personal computer, use of word processor, spreadsheets and presentation software as well as connection and communication over the internet. It also deals with the acquisition of some basic knowledge for the adoption of ICTs in the educational process by using educational software products (Greek Ministry of Education, Pedagogical Institute, 2005). The A-level training program was later followed by the more advanced B-level ICT teacher training that addressed basic specialty teachers; Philology – Language, Mathematics, Physical Sciences, Informatics, Primary education and Kindergarten teachers. Today the B-level program has been totally redesigned and is composed by two (sub-)levels of knowledge and skills: a. “Introductory training for the utilization of ICT in school” (B1-Level ICT teacher training, 36 teaching hours) and b. “Advanced training for the utilization and application of ICT in the teaching practice” (B2-Level ICT teacher training, 42 teaching hours and additional 18 hours for preparing “in-class practice”). The combination of these two levels equals to the acquisition of knowledge and skills corresponding to the integrated training for the utilization and application of ICT in the teaching process (B-level ICT teacher training) (Computer Technology Institute and Press “Diophantus” CTI, 2016). The B1 as well as the B2 level programs are also divided in clusters, depending on the specialty of the teacher. The first A-level ICT training program for teachers in Greece, took place between 2001 to 2005 with 83,315 participant teachers and a total budget of 89,661,162 € (Greek Ministry of Education, Pedagogical Institute, 2005). Today, the ICT teacher training program is still very famous among teachers. Indicatively the last B1-level program that started in May 2017 and is scheduled to end in February 2019 has already 24,281 participating teachers.

Based on the above our main hypothesis was that Greek teachers would be very familiar with using computers as well as the internet, although it was unclear as to what extent they use the computer for educational purposes. Furthermore, a relatively new parameter that is often ignored when talking about ICTs in education, are the smart mobile devices (smartphones and tablets) that are nowadays the most common means to conduct mobile learning activities.

As far as mobile phones are concerned, we also expected that teachers would be very familiar with them and various smartphone applications, as nearly every mobile phone sold today is “smart”. In order to examine their pc and smartphone-related skills, as well as whether mobile devices have penetrated the Greek schools and to what extent, we used a questionnaire that consisted of two main parts, one personal computer and one mobile device-related.

2 METHOD

2.1 The Questionnaire

In order to collect the research data, we created a pilot questionnaire that was distributed to secondary education teachers located in the island of Lesbos, Greece. That questionnaire did not only contain closed-ended questions but also some open-ended ones. For instance, teachers were asked to describe the reasons why they would not use an educational smartphone application in the context of an educational activity. The most popular answers were later transferred in the questionnaire that was finally used for this research (see appendix), that only consists of closed-ended questions. The questionnaire consisted of four parts. The first part contained the participants’ descriptive data, the second part was titled “familiarity with personal computers” and contained seven questions, the third part was titled “familiarity with smartphones and tablets” and contained five questions. The fourth and last part of the questionnaire was titled “Geocaching” and will not be examined in this article, as we mainly focus on the ICT literacy of the participants.

2.2 The Participants

Based on the total population of 68,139 secondary education teachers in Greece and 75 directorates of secondary education throughout the country, we targeted a less than 2% error margin. In order to achieve that we used a 7.55% percentage on the overall population that resulted in a total of 544 required sample of teachers. We also ensured that our sample would be representative by calculating the exact number of responses required by every region. The questionnaire was sent to hundreds of secondary education school all over Greece. As a result, the total number of participants reached 700 from 283 secondary education schools from every region of Greece (Figure 1).

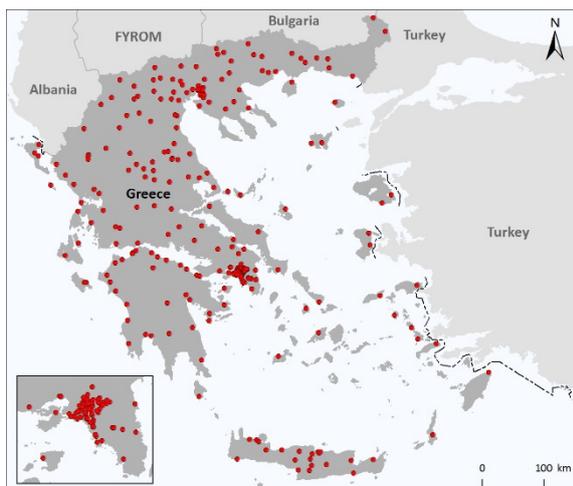


Figure 1: The location of every school that participated in the survey.

The collected data about the participant teachers (their age and specialty, as well as information about their school; whether it is a gymnasium, lyceum or vocational lyceum and its location) are presented in Table 1.

Table 1: Survey Demographics.

School				
Gymnasium	Lyceum	Vocational lyceum		
51.79%	32.71%	15.49%		
Specialty				
Mathematical and Physical Sciences	Languages and Philological Sciences	Information and Computer Sciences	Engineering Sciences	Other Courses
28.19%	33.77%	18.36%	4.11%	15.57%
Age				
23-35		36-50	51+	
5.31%		57.53%	37.16%	

2.3 Data Analysis

Every question was treated as a single categorical or ordinal variable, depending on the type of question and possible responses. For categorical responses, frequencies and percentages were calculated and the responses were cross-tabulated to check for statistical significance with the Chi-square test. For ordinal variables, descriptive statistics and Spearman linear correlations were calculated. Before the analysis of

data, we checked the responses for internal consistency with the use of cross-tabulations between pre-determined sets of questions that would reveal if the respondents were consistent in their responses and therefore if the particular sets of responses would be used in the overall analysis. These consistency questions included checking if the responses that referred to frequency of use of devices – software were consistent with later responses. SPSS 23 was used for the analysis.

3 FINDINGS

The following descriptive statistics are presented either by text, charts or tables and provide an overview on how much teachers use ICT either for personal or educational use.

3.1 Descriptive Statistics – Personal Computers

Out of 700 teachers only 1.1% (8 teachers) answered that their school does not provide access to a personal computer, while 99.3% of those enjoying pc access also have access to the internet. In their personal life most of the teachers use a computer and the internet daily. When asked whether they use it for education purposes (lesson preparation or in-class use), only 2.4% answered “never”. In order to discern the exact web applications that they use as well as the skills required, the participants replied on how often they use certain popular education-related web applications (Table 2). In comparison with more popular, globally recognized applications such as google forms, dropbox etc. the one that Greek secondary education teachers use the most is Photodentro (Greek Ministry of Education, Pedagogical Institute, 2005). Photodentro is the Greek National Learning Object Repository (LOR), and hosts publicly available reusable learning objects such as educational videos and software, user generated content (UGC) and open educational practices (OEPs).

Although not as popular as Photodentro, “e-me” is a digital educational platform for pupils and teachers (Megalou et al., 2015). E-me was created in order to become the personal working environment for every pupil and teacher, safe place for collaboration, communication, sharing of files and utilization of digital content, a space for the social networking of pupils and teachers, framework for the integration and operation of external apps and a space where the work of pupils, teachers and schools can be

Table 2: Web Application Usage Frequency.

	Never %	Rarely %	Frequently %	Daily %	Total %
Forums (N=480)	41,5	32,5	22,3	3,8	100
E-class (N=521)	33,2	30,5	31,1	5,2	100
Dropbox (N=516)	27,1	36,2	30,4	6,2	100
Google drive (N=563)	16,7	23,1	46,4	14	100
Google forms (N=497)	34,6	30,4	31,2	3,8	100
Geocaching (N=442)	90,3	7,7	1,8	0,2	100
GoldHunt (N=438)	96,1	3,2	0,7		100
Mobilogue (N=438)	95	4,3	0,7		100
Google Earth (N=538)	20,6	47,8	29,7	1,9	100
e-me (N=434)	87,6	8,5	3,2	0,7	100
Photodentro (N=625)	10,7	29,4	54,4	5,4	100
Geogebra (N=478)	72	13,8	13,2	1	100

made public and showcased (e-me Digital Educational Platform, 2018)

Although, based only on the above table one can get an image of what specific tasks are the teachers able to perform, on a separate question, participants were asked what specific tasks they feel more familiar with. The teachers present themselves as very familiar various tasks, such as registration and login in various platforms/websites, emails and file uploading, and less but still on a satisfactory level, with map usage and cloud operations (Table 3).

Table 3: Web Application Related Skills.

Skills	Never %	Rarely %	Frequently %	Daily %	Total %
Register/login (N=693)	3,6	13,9	41,1	41,4	100
Maps (N=689)	9,1	25,7	43,3	21,9	100
File uploading (N=688)	6	19,6	38,1	36,3	100
Cloud apps (N=665)	23	24,4	26,8	25,9	100
email (N=694)	1,6	3	29,8	65,6	100

3.2 Descriptive Statistics – Smart Mobile Devices

The third part of the questionnaire focused on teachers’ familiarity with smart mobile devices such as smartphones and tablets. Furthermore, we survey whether smartphones have found their way through Greek secondary schools, the educators’ views about their use in the educational process and the obstacles that prevent them from implementing mobile learning technics. Educational applications for smartphones thrive nowadays (Michalakis et al., 2017), (Kohen-Vacs, D., et al., 2012), as the multifaceted benefits of mobile learning are now acknowledged by the educational community (Mehta R, 2016), (Taylor, J.K., et al., 2010).

62.75% of teachers use a smartphone or a tablet daily while a 18,77% frequently. At the same time 8.45% of the participants reported that they never use smart mobile devices.

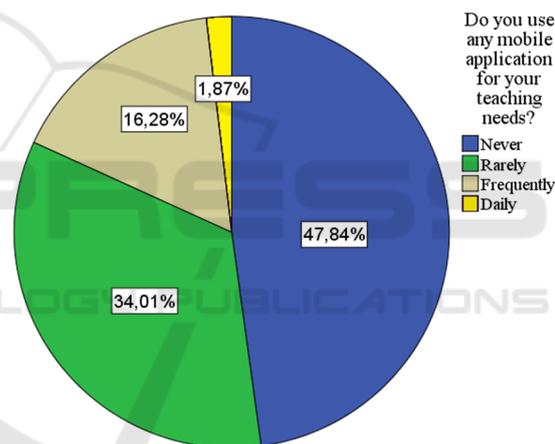


Figure 2: Smart Mobile Device Usage in School.

As to what kind of mobile applications teachers feel more familiar with, a worth mentioning result is that 24.5% report fully accustomed with mobile educational application while 43.3% are “quite familiar”. Also, the small percentage of teachers that are not accustomed to educational apps at all, 10.3%, is an encouraging sign regarding the future of mobile learning.

Regardless of the familiarity of teachers with educational applications, do they use mobile devices for their teaching needs? The pie chart presented in Figure 2, suggests not, as 47.85% of the participants have never used educational mobile application, and at the same time 34.01% only rarely.

Interestingly, contrary to that pie chart, 81.56% of participants reported that they would use a mobile

educational application in the context of an educational activity. Furthermore, an impressive 18.44% would use a mobile application more than 10 times per semester, and 30.12% 3 to 10 times per semester (Figure 3). An explanation for that contrast, between real and hypothetical implementation of mobile learning technics can be seen in Figure 3, where 66.3% of the teachers report prohibition of mobile devices in schools as the most common reason why they would not implement mobile learning.

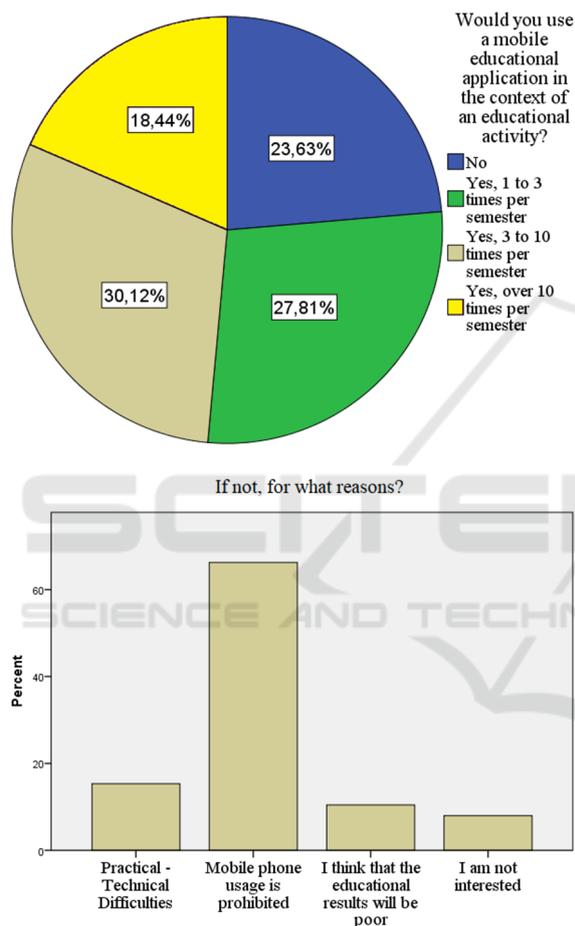


Figure 3: Intention and Obstacles for Mobile Learning Implementation.

The prohibition of mobile devices in Greek schools is a topic that will be discussed later in this article, as possible existence of such prohibition is against the Greek National Digital Educational Policy, that promotes ICT in primary and secondary education (Megalou and Kaklamanis, 2014). At the same time, possible ignorance of the teachers on the subject would reveal a simple but also fundamental malfunction of the country’s education system.

3.3 Statistically Significant Findings

The following findings are the results of an extensive cross tabulation analysis of the collected data. Statistically significant are considered only the findings with a calculated chi-square pi value lower than 0.05. The two main axes that we will examine are ICT experience and age.

One of the research findings is that frequent and experienced everyday computer or smart mobile device users are also more frequent and more willing computer or smartphone users for educational purposes. The analyzes that led us to the above are the following;

- More frequent everyday PC use – more educational use of PCs;
- More frequent internet use – more educational use of PCs. $\pi = 0.0002$;
- More frequent everyday smart mobile device use – more educational use of PCs. $\pi = 0.0000027$;
- More frequent everyday PC use – more willing to use educational mobile apps in school. $\pi = 0.002$;
- More frequent everyday smart mobile device use – more willing to use educational mobile apps in school. $\pi = 3 \cdot 10^{-10}$ (Table 4);
- More frequent everyday smart mobile device use – more frequent educational use of smart mobile devices. $\pi = 25 \cdot 10^{-17}$;
- More familiar with various mobile applications – more willing to use educational mobile apps in school. In all cases $\pi < 0.05$;
- More familiar with various mobile applications – more frequent educational use if smart mobile devices. In all cases $\pi < 0.05$;
- Less frequent everyday PC use – less interested in mobile learning. $\pi = 0.004$;
- Less everyday smart mobile device use – less interested in mobile learning. $\pi = 0.044$;

The last two observations also confirm the above finding from an opposite perspective; Non or not frequent PC or smart mobile device users, are not interested in applying mobile learning techniques in their teaching interventions. The above statistically significant findings confirm that teachers need to be fully accustomed with the tools they use and therefore reassuring the need for constant ICT training that includes mobile technology related courses.

Table 4: Cross-tabulation Analysis; Smart Mobile Device Use and Intention to Conduct Mobile Learning Activities.

		Would you use a mobile educational application in the context of an educational activity				Total	
		No	Yes, 1 to 3 times per semester	Yes, 3 to 10 times per semester	Yes, more than 10 times per semester		
Do you use smart phones or tablets?	Never	Count	34	11	8	6	59
		Expected Count	14	16,4	17,7	10,9	59
	Rarely	Count	22	22	18	8	70
		Expected Count	16,6	19,5	21	12,9	70
	Frequently	Count	34	46	28	22	130
		Expected Count	30,8	36,2	39	24	130
	Daily	Count	74	114	154	92	434
		Expected Count	102,7	120,9	130,3	80,2	434
Total	Count	164	193	208	128	693	
	Expected Count	164	193	208	128	693	
Pearson Chi-Square Test:		Value:	63,248a	df:	9	pi:	3,2E-10

Table 5: Cross-tabulation Analysis; Teachers' Age and Educational PC Use.

		Do you use a PC for your teaching needs?				Total	
		Never	Rarely	Frequently	Daily		
What is your age?	23-35	Count	2	2	21	12	37
		Expected Count	0,9	4	17,9	14,2	37
	36-50	Count	5	37	188	169	399
		Expected Count	9,8	43,1	193,5	152,7	399
	51+	Count	10	36	128	85	259
		Expected Count	6,3	27,9	125,6	99,1	259
	Total	Count	17	75	337	266	695
		Expected Count	17	75	337	266	695
Pearson Chi-Square Test:		Value:	14,735a	df:	6	pi:	0.022

Another interesting finding of our research suggests that teachers between 36 to 50 years of age are more frequent PC users for educational purposes, $\pi = 0.022$ (Table 5), although younger participants are more frequent and experienced smartphone/tablet users. At first, the above finding is surprising, but given the high unemployment rate of young teachers in Greece, and the handful of years required in order to acquire teaching experience, teachers aged between 36 to 50 are indeed readier to adopt alternate teaching technics and material.

4 DISCUSSION & CONCLUSION

This research focuses on secondary education teachers' ICT literacy and not in-school ICT use. All, (except one mobile learning activity related),

questions regarding educational use of ICT by teachers do not provide data about ICT use during the lesson but indicates how much teachers use ICT either for lesson preparation or any other teaching related purpose, regardless of the teaching method they eventually apply.

Personal computer and internet use percentages are high amongst Greek teachers, while almost all schools provide pc and internet access. Meanwhile during 2018 the Greek ministry of education supplied many schools with new ICT equipment, indicating that school equipment may not be as outdated as it used to in previous years. Also, the vast majority of teachers use personal computers for educational purposes and the frequent use of photodentro LOR indicates that the development of such quality material is worth it, as teachers acknowledge its significance.

As far as smart mobile devices are concerned, teachers are also frequent users, while most of them also report fully accustomed with various tasks. In comparison with personal computers, mobile devices are not used for educational purposes yet, although 81.56% of the participants reported that they would conduct a mobile learning activity multiple times per semester. Comparing that percentage with the one that indicates how many of the teachers actually use a mobile device for educational purposes, 52.36%, and taking into account the fact that that percentage does not only represent mobile learning activities but every education-related use, Greek teachers although willing, they do not actually embrace mobile learning in their teaching interventions. An explanation could be looked for in the reasons why the rest 23.63% reported that they would never conduct such an activity (N=163). 66.3% reported that mobile devices are prohibited in school. Furthermore, in a later question of the same questionnaire, that is not considered in this paper, all participants were asked to report the main factors that should be taken into account when conducting a mobile learning activity (N=617). 37.1% of the participants reported the same prohibition. A simple google search confirmed that by the time the survey took place (December 2017 until June 2018) mobile phone use by secondary school students was prohibited, with no exceptions. In December 2006 the Greek ministry of education prohibited the use of mobile phones in schools. In exceptional cases students were allowed to carry their turned-off phone in their bag. In September 2012 the same prohibition was also applied to all similar devices that could record images and sounds, such as cameras. Since then, the first mobile-learning-friendly ministerial decision was issued in August 2016 with the subject "Use of Mobile Phones and Electronic Devices in School Units". The document prohibits students carrying mobile phones or "any other electronic device or game that features an image and sound processing system within the school space. Equivalent equipment available to them by the school they attend is used during the teaching process and the educational process in general and only under teacher's supervision" (Computer Technology Institute and Press "Diophantus" CTI, 2016). The document also enables teachers to carry their own devices for teaching purposes, and it also states that uploading photos and videos, in which pupils are depicted, on school websites should be avoided due to personal data regulations. That circular although allowing mobile phone use in schools for educational purposes, was only referring to primary education, thus retaining previous prohibitions to secondary

education schools, and leaving secondary education teachers who wanted to apply mobile learning vulnerable to the law. Eventually in June 22, 2018, an almost identical circular was forwarded to all education principles and all primary and secondary education schools of the country, enabling for the first-time secondary education teachers to implement mobile learning technics. Even though such issues should be addressed long before 2018, our findings suggest that mobile learning has the potential to thrive in Greece's secondary education, for three reasons;

Teachers are willing. Especially if we consider that the majority of the small percentage of teachers that would not conduct a mobile learning activity, reported so because of the until recently mobile phone prohibition.

Teachers are familiar and skilled smart mobile device users. As another one of findings suggest, those are two important conditions that favor the implementation of ICT in the classroom.

ICT teacher training programs and the general effort put in the ICT field by the ministry of education, such as photodentro and e-me are very promising signs of an educational system that is willing to adapt to the 21st century.

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- 5) *Does the institution you teach, give you access to a computer?*
a) Yes, for teaching only b) Yes, for personal use
c) Yes, for administrative support d) No PC access
- 6) *If yes, does it provide internet access?*
a) Yes, for teaching only b) Yes, for personal use
c) Yes, for administrative support d) No PC access
- 7) *Do you use personal computer outside the school for personal use?*
a) Never b) Rarely c) Frequently d) Daily
- 8) *If yes, how often do you use the internet?*
a) Never b) Rarely c) Frequently d) Daily
- 9) *Do you use a computer for educational needs? (eg teaching, lesson preparation etc.)*
a) Never b) Rarely c) Frequently d) Daily
- 10) *If yes, which of the following online applications do you use and how often?*
Fora, e-class, dropbox, Google drive, Google forms, Geocaching, Goldhunt, Mobilogue, Google earth, e-me, Photodentro, Geogebra / a) Never b) Rarely c) Frequently d) Daily
- 11) *How familiar are you with the following types of web applications?*
Applications requiring user registration and login, Applications using maps, Applications for file uploading, Cloud applications, Email applications / a) Not at all b) A little c) A lot d) Fully
- 12) *Do you use smartphones or tablets?*
a) Never b) Rarely c) Frequently d) Daily
- 13) *How familiar are you with the following types of mobile applications?*
Social media, News applications, Map applications, Educational applications, Entertainment applications, Applications using GPS features / a) Not at all b) A little c) A lot d) Fully
- 14) *Do you use any mobile application for educational purposes?*
a) Never b) Rarely c) Frequently d) Daily
- 15) *Would you use a mobile educational application in the context of an educational activity?*
a) No b) Yes, 1 to 3 times per semester c) Yes, 3 to 10 times per semester d) Yes, more than 10 times per semester
- 16) *If not, for what reasons?*
a) Practical - Technical Difficulties b) Mobile Phones are Prohibited c) Poor Educational Outcomes d) I am not Interested

APPENDIX

The questionnaire contained the following questions;

- 1) *In what type of secondary school do you teach?*
a) Gymnasium b) Lycium c) Vocational Lycium
- 2) *Where is your school located?*
- 3) *What lesson do you teach?*
- 4) *What is your age?*
a) 23-35 b) 36-50 c) 51+