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Purposes for ICT usage and classroom activities in junior high schools: Evidence from teachers' attitudes

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Βιβλιογραφική αναφορά:

Purposes for ICT usage and classroom activities in junior high schools: Evidence from teachers' attitudes

Σκοποί χρήσης των ΤΠΕ και δραστηριότητες στην τάξη σε γυμνάσια: Απόψεις Εκπαιδευτικών

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Abstract
This paper investigated teachers' attitudes-views regarding the purposes for ICT usage and classroom activities with ICT tools, in junior experimental high schools in Greece (students aged 12-15 years old). The participants were 56 teachers of different specializations and data were collected via an open-ended questionnaire. The major purposes reported include that these tools are attractive, they cause/increase students' interest and motivation, and the lessons become more enjoyable. Factors that affect when and how ICT will be used in classrooms mainly regard the time and resources availability and the number of students in class. A range of ICT tools-applications are used in different school subjects for the accomplishment of various learning activities such as information search, presentation of students' work, discussions, communication, exercises, and assessment. Implications include teacher professional development and elimination of obstacles for technology utilization (infrastructure, large number of students in class).

Keywords
ICT, Digital technology, Teacher views-attitudes, High school, Greece

Περίληψη
Η εργασία αυτή διερεύνησε τις απόψεις των εκπαιδευτικών σχετικά με τους σκοπούς της χρήσης των ΤΠΕ και των δραστηριοτήτων στην τάξη με εργαλεία ΤΠΕ, σε πειραματικά γυμνάσια στην Ελλάδα (ηλικίες μαθητών 12-15 ετών). Οι συμμετέχοντες ήταν 56 καθηγητές διαφορετικών ειδικοτήτων και τα δεδομένα συλλέχθηκαν μέσω ανοιχτού ερωτηματολογίου. Οι κύριοι σκοποί-λόγοι που αναφέρθηκαν περιλάμβαναν ότι αυτά τα εργαλεία είναι ελκυστικά, προκαλούν/αυξάνουν το ενδιαφέρον και τα κίνητρα των μαθητών και τα μαθήματα γίνονται περισσότερο ευχάριστα. Οι παράγοντες που επηρεάζουν το πότε και πώς θα χρησιμοποιηθούν οι ΤΠΕ στις τάξεις αφορούσαν κυρίως τη διαθεσιμότητα χρόνου και τεχνολογικής υποδομής, καθώς και τον αριθμό των μαθητών στην τάξη. Ποικίλα εργαλεία-εφαρμογές ΤΠΕ χρησιμοποιούνται σε διαφορετικά σχολικά μαθήματα για την επίτευξη διαφόρων μαθησιακών δραστηριοτήτων, όπως αναζήτηση πληροφοριών, παρουσίαση της εργασίας των μαθητών, συζητήσεις, επικοινωνία, ασκήσεις και αξιολόγηση. Συζητιούνται προτάσεις για την επαγγελματική αναβάθμιση των εκπαιδευτικών και

την εξάλειψη εμποδίων αξιοποίησης των ΤΠΕ (υποδομή, μεγάλος αριθμός μαθητών στην τάξη).

Λέξεις-Κλειδιά
ΤΠΕ, Ψηφιακή τεχνολογία, Απόψεις εκπαιδευτικών, Γυμνάσιο

1. Introduction

Information and Communication Technologies (ICT) have become significant tools to access information, conduct learning classroom activities, and support both teachers and learners. Digital/educational technologies as integral tools in the educational process, can contribute to increasing student interest and promoting active participation, e.g., with the use of technologies in the teaching and learning process students may be empowered to actively engage in learning. In secondary education, ICT can be integrated into the classroom as a teaching and learning tool/aid across different subjects, and it is also a subject by itself; ICT integration into education is a complex and long-term process and it is influenced by various factors (Ross, 2020; Nikolopoulou, 2020). Despite the potential power of ICT for students' learning, the implementation of these technologies into the classroom is not as widespread as expected with the discussion on their role in the classroom to be still active (Voogt, Knezek, Cox, Knezek, & ten Brummelhuis, 2013; Voogt, Erstad, Dede, & Mishra, 2013, Nikolopoulou, Gialamas, Lavidas, & Komis, 2021). Over time, the use of ICT in schools is expected to increase as a result of, for example, the widespread use of technology in classrooms, teacher professional development, and various projects and initiatives.

Among the factors influencing teaching and learning via ICT are, teachers' skills, knowledge and attitudes, the school climate/context (Somekh, 2008) and the technical support (Kaouri, 2017; Grimalt-Álvaro, Ametller, & Pintó, 2019). For example, Somekh (2008) reported that teachers chose to use-incorporate ICT tools in classes because students' interest was increased. ICT raises pupils' interest in learning and this was demonstrated by their increased engagement with the learning activity, their enthusiasm, their improved self-confidence and a sense of success in learning (BECTA, 2003). In the Greek literature for ICT use in secondary education there are some empirical studies regarding teachers' views on factors that affect/inhibit ICT use-integration in classrooms (e.g., Jimoyiannis & Komis, 2006; Nikolopoulou & Gialamas, 2016; Nikolopoulou, 2020), but there is little evidence associated with the purposes-reasons for using ICT tools. Exploring the purposes-reasons for ICT usage in class, as these are expressed by teachers, is important because the reasons affect, but they also relate to classroom educational practices (Kervin & Mantei, 2009). *Purpose* is essential when implementing ICT into the classroom (Ertmer & Ottenbreit-Leftwich, 2013), while teachers' pedagogical beliefs/visions influence their classroom practices. The purpose-aim of this paper was to explore teachers' attitudes regarding the purposes for ICT usage in junior experimental high schools in Greece (students aged 12-15 years old), the factors that influence when and how ICT is used in the classrooms, as well as record the main ICT tools used and the corresponding learning activities. For the purpose of this paper the term *ICT* is treated as synonymous to *digital technology* and *Information Technology* (*IT*) to indicate any forms of technology used to store, display, process, transmit, share or exchange information by electronic means; which includes mobile technology/applications as well.

2. Literature review

Teachers' beliefs about the importance of using ICT in the classroom are likely to influence implementation decisions (Petko, 2012). For example, teachers' positive beliefs about ICT usage in the classroom and their influence on student outcomes are likely to have a positive relationship with the use-implementation of ICT. Teacher perspectives regarding the purposes for using-implementing ICT into the classroom include the development of students' 21st century skills (such as an ability to collaborate with others and work effectively in a team, to be creative and think critically), skills that are of increased importance in modern society (Voogt et al. 2013; Dwyer, Hogan, & Stewart, 2014). Teacher perspectives also include the affordances of the ICT tools such as the dynamic visual presentations, interactivity and immediate feedback (Hennessy, Ruthven, & Brindley 2005; Hennessy et al., 2007), as well as their power to stimulate/increase students' interest (Somekh, 2008). For example, the affordance of inquiry-based learning allows students to more deeply explore concepts and ideas that non-digital teaching tools might not be capable of. Student-centered and teacher-centered activities are implemented in European classrooms (European Commission Report, 2019); e.g., students process and analyze data, give presentations to the whole class, work on projects, work in groups, and teachers present, demonstrate and explain to the whole class.

Teachers' decision making on the usage-implementation of ICT into the classroom may be influenced by different factors. Some teachers believe they must first have the requisite skills in using the ICT (Petko, 2012); teachers feel the need to have an ability to use the technologies, but also be confident to use them. Willis, Lynch, Fradale, & Yeigh (2018) explored potential factors that might predict purposeful implementation of ICT into the classroom; competence using ICT and teachers' beliefs in the importance of ICT for student outcomes positively predicted purposeful implementation of ICT into the classroom. Teachers' TPACK (Technological, Pedagogical and Content Knowledge) level also impacts on their acceptance of digital technology; for example, secondary school teachers' technological knowledge, pedagogical knowledge, and perceived usefulness were found to affect teachers' acceptance of a specific technology called E-schoolbag (Yang et al., 2021). Access to the ICT infrastructure, availability of technical support, time availability, ICT training (Al-Mamary, 2022), as well as support from school leaders/head-teachers (Szyszka et al., 2022) also impact on teachers' technology use in classrooms. Early on, Somekh (2008) reported that teachers' beliefs and their use of ICT in the classrooms depend on the social and organizational contexts in which they live and work. School-wide innovation occurred when the principal's vision and motivation, and the support were of central importance. Ertmer and Ottenbreit-Leftwich (2010) examined technology integration by placing the teacher as an agent of change: his/her knowledge, pedagogical beliefs, and subject and school culture are dimensions affecting teacher technology use in the classroom (so as to facilitate increased student learning). The instructional practices and the degree to which basic skills such as digital literacy are emphasized in classrooms vary considerably between teachers, schools, and countries. The European Commission Report (2019) indicated a large variability of ICT use in schools, across European countries. For example, teachers who are highly digitally active, confident and supported are defined by regularly using computers/internet during their lessons for educational purposes; invest more time in professional development; voluntarily integrate ICT in their subjects because they chose to do so; feel that less barriers prevent them from using ICT for teaching; have more positive attitudes. Recently, Konstantinidou and Scherer (2022) found that teacher motivation

and collaboration were positively and consistently linked to teaching practices across countries, while countries' economic development and innovation explained variation in the teacher-level effects. Since processes of change in schools and classrooms cannot be understood in isolation (Somekh, 2008; European Commission, 2019; Konstantinidou & Scherer, 2022), the Greek context is described below.

Within the Greek context, schools have now been networked and equipped with computer laboratories, actions such as the 'digital school' are being implemented and the official curriculum makes references to ICT; Information Technology constitutes a separate subject (techno-centric approach) and is also a tool in different school subjects (i.e., integrated in the subject - holistic and interdisciplinary approach to learning). Many secondary school teachers have attended in-service training programmes in ICT. The current large teacher training programme 'In-service training of teachers in the utilization and application of digital technologies in the teaching practice' known as 'B-level ICT teacher training' (CTI, 2016) includes apart from the major specializations of secondary education (Greek language and literature, Mathematics, Physics and Information Technology), new disciplines and specializations (such as foreign languages, arts and economics). Some researchers also design materials for classroom usage; these materials may be developed within the context of a project. For example, Mystakidis et al., (2021) designed and developed learning materials for elearning modules on popular topics, targeting young learners. Teachers evaluated favorably all instructional and affective aspects of the playful storyfied modules; they appreciated the features of the courses (narrative aspects, visual, and auditory elements, etc.) as to their effectiveness for students' learning. Regarding the context of experimental schools in Greece, in these schools are tried new programmes of studies, new teaching tools/methods and ways of managing the school unit; the policy of these schools encourages the implementation of new educational materials (e.g., textbooks, software) and of innovative teaching practices (such as teaching via ICT tools). Experimental schools are also linked to Universities (University students carry out their teaching practice), while for the development of talent and inclinations of students, clubs are created and operate across the curriculum. With regard to mobile technology usage in secondary classrooms, although the integration of mobile devices (in particular, tablets and mobile phones) is negative affected by the current legislative framework (Nikolopoulou, 2021), there is some empirical data. The primary purposes-reasons for mobile devices' usage and the benefits reported by secondary school teachers were the attractive/ enjoyable/ interactive environment, students' motivation, participation, engagement and the support of lessons/teaching via mobile technology (Nikolopoulou, 2020). In parallel, students had, in general, positive attitudes and high confidence in the use of mobile devices (Nikolopoulou & Gialamas, 2017), the mobile phone was the predominant device used daily (Nikolopoulou, 2018), and little self-perceived mobile phone dependence was expressed by them (Nikolopoulou & Gialamas, 2018). The context of the experimental schools and the limited empirical findings constituted the background for the initiation of this study.

3. Methodology

3.1. Research objectives

The research objectives were:

1. To investigate the purposes for ICT usage in classrooms.
2. To identify the factors that influence when and how ICT is used in the classrooms.
3. To record the main ICT tools used and the corresponding learning activities.

Official permission was obtained from the Greek Ministry of Education and the author's University research ethics committee. It is noted that although the focus of this paper is not on mobile technology, relevant aspects are included since it is a sub-category of ICT, and it was included in teachers' open-ended responses.

3.2. Sample

The teachers participated voluntarily in this study (ethical considerations are discussed in next sub-section) and they worked in three junior experimental high schools (students aged 12-15 years old) in Attica, Greece. Table 1 shows the demographic characteristics of the sample (gender, years of teaching experience, specialization/discipline, frequency of ICT use in class, years of experience with ICT, in-service teacher training in ICT). Out of 56 teachers, 42 were women and 14 were men, and these numbers reflect the greater number of female teachers in junior high schools. In terms of specialization, 18 were teachers of Greek language and literature, 12 science teachers, 12 foreign language (English, French and German) teachers, 8 mathematicians, and two teachers for each of the specializations, home economics, arts and religion. Most of them have attended the A' level in-service teacher training in ICT (technical training), while about half of the sample attended the B' level teacher training in ICT (pedagogical training). The frequency of ICT use in class was reported as follows: weekly (2-4 times a week) by 32% of the sample, monthly (2-4 times a month) by 42.9%, and less than once per month by 21.4%.

These high schools, apart from computer laboratories, have one computer in the science lab, interactive whiteboards in many classrooms, and there is also a laptop for anyone who wants to use it in the classroom. One of the three schools has also a multimedia room (for teaching practices etc.), while some teachers carry their own laptop in classrooms.

Table 1 Demographic characteristics of the sample (56 teachers)

Gender Female: 42 (75%) Male: 14 (25%)	**Years of teaching experience** 6-10: 4 (7.1%) 11-15: 22 (39.3%) 16-20: 12 (21.4%) 20^{+} : 18 (32.2%)
Specialization Greek language: 18 (32.1%) Science: 12 (21.4%) Foreign languages: 12 (21.4%) Mathematics: 8 (14.3%) Home economics: 2 (3.6%) Arts: 2 (3.6%) Religion: 2 (3.6%)	**Frequency of ICT use in class** Daily: 2 (3.6%) Weekly (2-4 times per week): 18 (32.1%) Monthly (2-4 times per month): 24 (42.9%) Less than once per month: 12 (21.4%)
Years of experience with ICT > 5 years: 50 (89.3%) 3-5 years: 6 (10.7%)	**A' level in-service teacher training in ICT** Yes: 42 (75%) No: 14 (25%)
B' level in-service teacher training in ICT Yes: 27 (48.2%) No: 29 (51.8%)	**In-school training for school network tools** Yes: 31 (55.4%) No: 25 (44.6%)

3.3. Data collection instrument and research procedure

The data was collected at the end of the academic year since it is a more convenient period; teachers have better time availability and it is a suitable period to evaluate the practices of the school-year. The research was qualitative and ethical issues/guidelines were considered; ethics are important in qualitative research (Creswell, 2012). The researcher initially asked for school principals' consent about the participation of teachers in the study, according to the new General Data Protection Regulation (GDPR). The school principals (head-teachers) of all three schools indicated willingness to participate in the study. All participants were informed about the research aims of the study and they were assured that, should they wish to participate in the research, their comments and input would remain anonymous; the data gathered will be used solely for research purposes.

Teachers were asked to complete an anonymous questionnaire (constructed by the author for the purpose of this study) which included open-ended questions. The general axes of the questionnaire were related to the research objectives and were: Why do you use ICT tools in class for educational purposes? Which factors affect/influence when and how you (will) use ICT in class? Which ICT tools-applications are used in your lessons and for what learning activities? The questionnaires were distributed and collected by the author.

With regard to content/thematic analysis, the codes for the data analysis were descriptive. Through the process of coding, patterns of responses were used to inform themes and categories generated in line with their relevance to the research questions (Creswell, 2012). Teachers' responses were thematically grouped into those which (predominantly) related to reasons for ICT use, factors influencing this usage, and learning activities -with ICT tools- in classrooms. As ethical guidelines were followed, the teachers completed the questionnaires in a quiet location within the school setting, during a time period that their teaching duties were not disturbed.

4. Results and Discussion

4.1. Purposes for ICT use in the classroom

Table 2 shows the purposes-reasons for using ICT in the classroom, as these were reported by the teachers. Most references (48) regarded that ICT tools are attractive, they cause/increase students' interest/motivation/participation and the lessons become more enjoyable. Other reasons (with fewer references) were, but are not limited to: alternative ways of approaching the school subject, better presentation and understanding of abstract concepts, combining multiple ways of presenting the information and development of skills.

Table 2 Purposes for ICT use

Purposes/Reasons for ICT use	**references**
Attractive, cause students' interest, more enjoyable lesson	48
Alternative ways/approaches to the school subject	14
Better presentation & understanding of abstract concepts	12
Facilitation of the learning process, economic (saving materials)	9
Combining multiple ways of presenting the information	8
Investigation, exploration	7

Discovering learning (situations)	6
Interactivity	6
Skills' development (e.g., information retrieval skills)	6
Creating multimodal texts	5
Enhanced interaction, collaboration among students	5
Preparing school activities and tasks	4
Synchronous & asynchronous communication with students from other countries	2
For observation	2
(Self)evaluation	2

Regarding the reasons for ICT use in classes, some indicative excerpts from the questionnaires are presented below (teacher's specialization is in brackets): "*Better understanding of science concepts through simulations and virtual experiments...due to lack of material for real laboratory exercises*" (Science teacher); "*If it was possible, I would use ICT tools in every lesson. Their use is required for the development of multiliteracies in the 21st century. Students familiarize themselves with multimodal texts; they develop analytical and synthetic skills and can express themselves creatively. The combination of ICT and English is a window in the modern world. The presentation of teaching material via concept maps, diagrams, timelines, etc. develops new abilities*" (English teacher); *"(ICT) is related to students' interests and their familiarity with the sound and the images, it strengthens performance... (I use ICT tools) for material that is not available in printed textbooks*" (Greek language and literature teacher).

The reasons reported were, in general, in line with relevant literature (e.g., Kafai, Fishman, Bruckman, & Rockman, 2002; Somekh, 2008; Kim & Kim, 2017; Hsieh & Tsai, 2017) which explored teachers' views; teachers stated that ICT increases students' motivation to participate in the educational process and makes lessons more interesting and enjoyable. For example, Kim and Kim (2017) indicated that the most frequent types of pedagogical activities performed in the classroom were activities designed to motivate students. Motivation and engagement are critical for learning since these are expected to lead to better academic results. Also, high school Taiwanese teachers' conceptions (Hsieh & Tsai, 2017) regarded meeting students' preferences, conducting classes with efficiency, enhancing learning, and focusing on student ownership.

4.2. Factors influencing when and how ICT is used in the classroom

Table 3 shows the factors that influence when and how ICT is used in the classroom for educational purposes, according to teachers. Most references (34) were associated with the school infrastructure (availability of the computer laboratory or of a classroom with a projector, suitable technical equipment, etc.) and afterwards, 26 references regarded the school subject/content/chapter being taught. Some indicative excerpts from the questionnaires were: "*if the school was better equipped, I would use them more often*" (Greek language and literature teacher); "*the availability of the classrooms in school and the subject/lesson to be taught. Also, the existence of appropriate multimedia material (simulations, software, etc.)*" (Science teacher); "*the content of the subject, e.g. in statistics, in order to simulate a random experiment, while in Algebra it (ICT) is not necessary*" (Mathematics teacher); "*the main reason is the availability of the lab/classroom that provides the necessary hardware (computer, interactive projector, etc.) and the internet connectivity*" (Home economics teacher);

"*the classrooms where I teach, lack technical infrastructure - computer facilities. If these were existent, I would use ICT every day, especially the GeoGebra program in geometry and the Libre office in Statistics*" (Mathematics teacher).

Table 3 Factors influencing when & how ICT is used in the classroom

Factors	references
School infrastructure, availability of computer laboratory or of a classroom with projector, technical equipment	34
The subject taught (the content/chapter/unit of lesson)	26
The number of students in class, students' interests or needs	10
Time availability, management of school time, the lessons' timetable	6
The existence of internet connection	5
Teacher's mood, the school climate	4

Some factors that influence/affect when and how ICT is used and, in particular, ICT infrastructure and time availability, are in line with recent research (Al-Mamary, 2022). Equipment-related factors (e.g., infrastructure, internet connection and speed), pedagogy-related factors (e.g., material for teaching, support for teachers) and attitude-related factors (teachers' interest, teacher beliefs as to ICT benefits) were recently reported by the European Commission (2019). The factors also reveal some barriers to ICT usage. In the relevant literature, major barriers to ICT use in classes were the lack of equipment, the large number of students in the classroom and the lack of teachers' time (Kafyulilo, Fisser, & Voogt, 2016). There is an agreement with earlier research in Greece (Nikolopoulou & Gialamas, 2016; Nikolopoulou, 2020) on the limited infrastructure/resources in the classrooms and the time pressure; factors/barriers which are still reported up to date. However, the teachers in the current study did not mention any ignorance about how ICT is used, low self-efficacy on ICT use or lack of software related to the subject taught; obstacles-factors identified a decade ago. This means that by the years some barriers have been overcome and on this issue in-service teacher training in ICT has played an important role.

4.3. ICT tools used in different subjects and corresponding learning activities

Table 4 illustrates the use of specific ICT tools/applications in different school subjects and the corresponding learning activities. These constitute indicative examples, as answered by the teachers in the questionnaire, and in no way they exhaust the learning/educational activities carried out in classes. In this Table, the school subjects were placed into groups such as foreign languages (English, French and German), literature (ancient Greek language, modern Greek language, literature, history) and sciences (Physics, Chemistry, Biology, Geography).

Table 4 ICT tools used in different subjects and indicative learning activities

ICT tools /applications	Subjects	Learning activities
Video	Foreign languages	Listening*, activities with worksheets^, language exercises^, to initiate a discussion*
	Literature	to see/demonstrate worksheets*
	Mathematics	to present bibliographies*
Internet	Foreign languages	search for unknown words^

(searching for information)	Literature Science Home economics	search for information for various tasks^ information search^, Google maps^ to initiate a learning activity*
Presentations (e.g., Power-point)	Foreign languages Science	presentation of students' work, or of a subject unit* creation of tasks^
Forum	Foreign languages Science Mathematics	discussion - dialogue on a specific topic, introduce a text to students (in groups)^ asynchronous communication cognitive demanding debates^ problems/exercises
Interactive whiteboard	Greek literature Mathematics	(introduce a) new lesson*, for assessment work on mathematics software^
Simulations	Science, Mathematics	Experiments*^, functions*^
Webmail (Gmail, Yahoo)	Literature Science and Mathematics	inform students via e-mail, send/exchange files, solve students' difficulties submitting worksheets/assignments, communication with the teacher
School network tools		
E-class	Foreign languages Literature Science Mathematics	handling tasks, presentations uploading texts, educational material uploading notes, visualized material announcements, exercises
Grafis – collaborative tools	Science	submission of students' work
Personal website or blog	Foreign languages Science Home economics	educational material, presentation of tasks* provision of information/educational material* uploading educational material*
Other ICT tools		
Prezi, Hotpotatoes, Google forms Movie maker	Foreign languages	creating presentations assessment questionnaires film shooting at school

* use of teacher-centered ICT while teaching
^ collaborative or individual student-centered tasks

Table 4 reveals that teachers use a variety of ICT tools/applications such as the internet, forum, video, power-point, and e-class to carry out learning activities within the different school subjects. Teachers' ICT based activities include preparing tasks for students and presentations, producing texts, uploading educational material, as well as creating/modifying digital content. Compared to an earlier survey with secondary school teachers in Greece, which showed that the use of ICT was limited to the use of the internet and word processing (Jimoyiannis & Komis, 2006), there exists an improvement throughout the years. This is also a consequence of the in-service teacher training in the pedagogical use of ICT (B' level training). Greek teachers,

frequently, make their own decisions as to the implementation of digital technology in their classes. The findings of the study are in some agreement with recent publications at European level, regarding the range of ICT tools used in classes (EEC, 2018); tools such as blogs, mind-mapping and digital narrative tools. The results reveal that teachers report both more traditional teacher-centered activities (e.g. teachers give a presentation to the class) and student-centered tasks/activities (e.g. students working on groups or individually in tasks). In line with the European Commission Report (2019) teachers present, demonstrate and explain to the whole class, and students work on exercises and tasks individually or in groups, discuss ideas with peers and the teacher, give presentations to the whole class, etc. It is also noteworthy to mention the exchange of emails between students and teachers; there is a higher frequency of communication via emails and apps between digital competent teachers and students (European Commission, 2019). Teachers also reported learning activities carried out via mobile technology, such as the presentation of audiovisual material (video, images, documentaries, etc.) and the presentation of students' work. There is a partial agreement with earlier studies (Kousloglou & Syrpi, 2018; Dinsmore, 2019) where teachers used mobile devices in the classroom for educational purposes such as searching-finding information. Searching for information via a mobile phone or a laptop was associated with all subjects; for example, in history, students were looking for an event that is not included in traditional textbooks, while in foreign languages they referred to the digital dictionary. Some extracts from the questionnaires were: "*with a mobile phone, performing mathematical calculations*" (Mathematics teacher); "*watching video, student presentations and experiments, exercises, laptop is a useful tool*" (Physics teacher); "*presentation of a lesson via the laptop, video watching, interactive exercises, e-Twinning program, e-class*" (Home economics teacher). Mobile technologies offer capabilities in different school subjects (Bano, Zowghi, Kearney, Schuck, & Aubusson, 2018; Nikolopoulou & Kousloglou, 2019, 2022), but these are officially banned from secondary classrooms.

5. Conclusions and Implications

This study identified teachers' purposes-reasons for ICT usage, the factors affecting their decisions and the main learning activities with ICT tools practiced in the classrooms. Increasing our understanding of teachers' beliefs could predict purposeful implementation of ICT into the classroom, and it can have implications for teachers' professional development. ICT related research indicated that school culture/context influences teachers' perceptions and use of technology (Somekh, 2008; Ertmer & Ottenbreit-Leftwich, 2010). The policy of the experimental schools encourages teachers to try-apply innovative teaching methods and strategies (including ICT tools), to organize cross-curricular activities, to participate in projects, and to evaluate the school unit. Although the findings of this study cannot be generalized (limitations are discussed in next section), they reveal a situation in a micro-level and they have implications for teacher professional development and education policy makers.

The most commonly reported purposes-reasons for ICT usage in class were that ICT tools (including mobile technology tools) are attractive, they cause/increase students' interest and motivation/participation, and the lessons become more enjoyable. The reasons were, in general, in agreement with the relevant literature (Kim & Kim, 2017; Hsieh & Tsai, 2017). Factors that continue to affect when and how ICT will be used in the classrooms are the technical facilities/equipment of the classrooms, the time available and the number of students in class (currently there are around 23 students). It is noteworthy that, throughout the years, specific factors reported as barriers to the

use of ICT (ignorance of how to integrate ICT, lack of appropriate software) cease to exist; this is a consequence of in-service teacher training. In order to overcome the obstacles and the great demand for computer laboratories and/or classrooms with appropriate technical infrastructure, it is suggested to improve network and computer infrastructure in schools and to reduce the number of students per class. This study's findings are in some agreement with research which indicated that even after the attempt to invest in ICT some teachers are expressing dissatisfaction about the lack of ICT availability in the schools (Prieto-Rodriguez, 2016). Teachers expressed a desire for further ICT implementation, provided that specific barriers are overcome (mainly, the large number of students per class and the school infrastructure). Teachers' responses also reveal that a variety of ICT tools-applications are being used in different school subjects for the accomplishment of various learning activities (e.g., searching for information, presenting students' work, interactive exercises, watching videos, discussing in a forum, and solving exercises). There is implementation of teacher-centered ICT use while teaching, and also collaborative and individual student-centered tasks; participants extend their pedagogical practices by using different teaching approaches. Student-centered teaching models, allowing students to learn at their own pace, have been acknowledged by experts to be beneficial for students (European Commission, 2019). In this study, it was the teachers' willingness and interest that initiated the application of learning activities with ICT, even of activities via mobile technology which are banned in Greek classrooms (there was not an imposition from above). Chen, Zhou, Meng, &Wu (2019) found that a major factor that influences teachers' usage of ICT to develop high-quality teaching activities was application willingness, while Konstantinidou & Scherer (2022) highlighted the influence of teacher motivation upon their classroom practices.

Processes of change in schools and classrooms cannot be understood in isolation because they are constrained or enabled by the policies of national education systems and national cultures. The findings of this study have initially implications for teacher professional development. Teachers need knowledge that enables them to identify which digital tools/applications are needed to support specific curricular goals and learning outcomes, to select appropriate technologies, and to facilitate their management in classrooms. The role of the teachers is vital for the adoption of technology-based solutions in education (Mystakidis et al., 2021). For example, they will plan, implement and evaluate the learning activities for their lesson/subject, while teachers' decisions and practices are critical to securing learning benefits. Professional development is expected to aid teachers enhance their pedagogical approaches to implement appropriate smart learning technologies, as well as enhance their confidence. In particular, the use of mobile devices by students has to be carefully done (when the teacher decides it is actually needed) with specific learning objectives, so as not to cause distraction. Teachers' preparation in classroom management of technology (e.g., management of internet safety and security of personal data when students go online in the classroom) and online teacher professional development constitute challenges (Powell & Bodur, 2019). Since, Greek teachers frequently make their own decisions about technology use in classrooms, it is recommended to maintain their enthusiasm (in being digitally active). Educational policy-makers and school leaders have an essential role in supporting teachers' pedagogical practices. School leadership is recommended to encourage-support teachers' efforts to introduce and experiment with various technology uses; including mobile technology as well. In parallel, implications for educational policy could, for example, inform future priorities and discipline-related pedagogical professional

development. Educational policy makers, school leaders and consultants should be aware and also support teachers' pedagogical practices with ICT. Indicatively, in the experimental high schools of this study, school leadership encourages and supports teachers' efforts to introduce and experiment with new technologies. Fruitful communication among educational stakeholders (teacher training institutions, policy-makers, curriculum planners, school consultants) is central, to advance smart learning technologies' support of the teaching and learning process.

6. Limitations and Future research

This study was conducted in three junior experimental high schools in Greece and the findings cannot be generalized due to the small sample and the type of schools. Also, this study collected teachers' self-reported data, which may weaken the reliability of the results. In the future, it is planned to include a larger sample and to also carry out some observations of teachers' practices. Future research is suggested to record the factors affecting teacher attitudes on the basis of tested models (e.g., UTAUT2 model - developed by Venkatesh et al., 2012), to investigate teachers' practices with new ICT tools-applications, as well as their link to student academic performance. As innovative technological tools are evolving, with new features and functions, it becomes crucial to examine their potential utilization in school-classrooms. Investigating teacher attitudes and practices/approaches, as well as digital technology adoption and implementation constitute ongoing research issues; e.g., how do teachers' pedagogical approaches change over time and how these relate to student learning?

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