



The use of ICT in Polish and Greek educational systems: From policy to implementation

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Abstract:

The development of new technologies has introduced novel capabilities into every aspect of our lives. The continuous improvement of these technologies is part of society's development by breaking barriers to access to knowledge and by introducing new tools and solutions that are a permanent part of the modern world. This technological revolution affects the educational system by stressing the need to retrofit the infrastructure in terms of technology supporting the educational process. These technological developments allow people to engage themselves in the immersion of new technologies, presenting them with a wide range of opportunities. On the one hand, this is a factor that determines the luxury of a modern, prosperous and developing world, on the other hand, it is a challenge of how one should use information and communication technologies to improve their lives in a society, so as not to be excluded and being moved to the margins of digital illiteracy. These facts pose challenges to the designers of new applications and new technologies, who should consider the needs of modern society based on the new information and communication. Today's mediatised space requires people to have the necessary competencies to use it efficiently and skilfully. Moreover, the educational system should support and prepare the young generation to be able to function in this area, in which the mere use of web portals and social media does not guarantee any success in a person's future professional or private life.

Policy assumptions of digital transformation in Polish and Greek educational systems

Reports prepared by national committees or the European commission present forecasts about the use of modern information and communication technologies in the field of education. The report *Directions for the development of technology-supported education. New Technologies in Education. Proposed Strategy and Action Plan for 2014-2020* draws attention to activities aimed at preparing citizens to use modern technologies in all areas of life, including the preparation of teachers and the entire educational sector (Sysło, 2014). Another basic document related to the process of digital transformation in Poland is the *Order of the Minister of Education and Science* of September 3, 2022, which promotes the use of new technologies, innovations and digital tools in all units of the educational system, including higher education. It also presents suggestions on raising funds, on coordinating and developing electronic services to support the process of digitalization of educational and higher education systems and science, on developing and implementing new teaching tools to support education in the area of future competencies and development of creativity in society, and on monitoring the implementation of projects in the area of the *GovTech Poland* program (Republic of Poland, 2023).



Currently, a public discussion is taking place, in order to develop a conceptual document entitled *Digital Transformation Policy for Education in Poland* (Ministry of Education and Sciences, 2023), which envisages short-term actions until 2025 and long-term actions with a further perspective of change reaching 2030 and beyond. We can read in it that digital transformation is seen as a series of student-, parent- and teacher-oriented processes related to the need to use information and communication technologies as tools to support contemporary challenges for education. Among other things, the document contains issues related to the:

- a) digital transformation in equipping kindergartens, schools, students and teachers, and teacher training institutions;
- b) digital transformation in upgrading the skills of educational staff;
- c) digital transformation in other areas of the education system;
- d) digital transformation in digital didactics;
- e) digital transformation in school management solutions;
- f) digital transformation in building an ecosystem of digital schools and activities that network school communities.

The basic document setting out the tasks of digital transformation in Greece is the *Digital Transformation Bible 2020-2025* (Hellenic Republic Ministry of Digital Governance, 2021). It is a document that sets out goals for the development of the digital skills of Greek society, by suggesting actions targeting the main economic areas including the education sector. It assumes primarily:

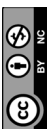
- a) fast and secure access to the internet for every citizen of the country,
- b) improvement of digital services in all areas of society,
- c) development of digital skills of all citizens of the state,
- d) improving and strengthening digital innovation capabilities,
- e) integrating digital technologies into all sectors of the economy including education, especially by:
 - increasing the integration of innovative technologies in the educational process at the primary and secondary school levels,
 - introducing a mandatory number of hours of computer science classes in secondary schools,
 - establishing a Digital Citizen Academy to increase the educational offer of online courses on an educational platform at different levels, corresponding to a personalized learning path based on the educational standards of Europe and the world,
 - launch training programs for all citizens in lifelong learning,
 - implementing a systematic digital skills certification program tailored to the changing labour market.

As can be seen from the above strategies of Poland and Greece, the common aim is to systematically improve the digital competencies of their citizens to ensure that they find their way in the educational system, based on new information and communication technologies, in the labour market or after their professional activity. They are intended to support the equipping of schools and educational institutions with modern solutions in the field of information and communication technologies, both in stationary form, but also available as applications or platforms for improving citizens' competences.

Challenges of implementing ICT in education

Digitalization of education is one of the basic, but also necessary means to guarantee the achievement of a basic educational goal, which is the development of new information and communication technologies used in schools, as well as the development of students' knowledge and skills in using technological tools in their life. A university graduate should be able to make informed decisions when solving specific tasks set by the labour market, but also, and perhaps most importantly, to be successful in the era of a changing digital society (Plebańska & Tarkowski, 2016).

Providing educational units with the necessary information and communication technologies is just one element that guarantees the possibility of employees to use them. Unfortunately, technological facilities alone are insufficient when they merely lie around and are unused due to the lack of competences of the teacher. It is the teacher who is responsible for the educational context in which new technologies in education will or will not be used. Lack of appropriate skills related to the operation of a given tool, fear or apprehension related to its damage, lack of exploration of how a given artifact can be used during one's own work in classes makes



the traditional form of information transfer for the young generation something unattractive and does not encourage them to take initiative on their own learning activities (Warzocha, 2023).

A number of available technological tools are designed to support the teacher's professional work, but it often happens that they hinder it, by leading to a problematic situation, after which the teacher returns to a traditional and proven method of teaching. The school of the future is a school in which the teacher will be proficient in the use of digital technologies in everyday use, those already used by students, which are ordinary environmental instruments for them (Walat, 2020). The daily life experiences and the difficulties that teachers face in an environment filled with information and communication technologies make the awareness of the digital divide between the teacher and the increasingly younger generation of students more visible in this professional group (Giavrimis & Nikolaou, 2020).

Nowadays, new tools are coming to schools under various European programs. In Poland such projects are "Digital School" and the "Laboratories of the Future", which were related to the purchase of modern equipment. According to the data, the total pool of funding under the European *Reconstruction and Resilience Framework (RRF)* has amounted to more than €723 billion in recent years, including €1 billion 355 million for Poland and €365 million for Greece (European Court of Auditors 2023). Among them are interactive whiteboards, VR goggles, educational drones, or educational robots in different varieties, from simple ones for preschool education to more advanced that can be self-programmed, such as in Lego Mindstorm or Photons sets. Among the technologies most frequently used by students were desktop computers, laptops, tablets, interactive whiteboards, or smartphones. Details of the use of individual devices in Polish and Greek schools are shown in Table 1 below.

Table 1. The use of individual devices in Polish and Greek schools

Country	PC	laptop	tablet	smartphone	interactive table	No use of ICT
Poland	87%	88%	59%	92%	28%	0%
Greece	88%	58%	42%	8%	39%	3%

Source: own compilation based on data from EU report 11/2023

The opportunities provided by modern information and communication technologies are so great that the obstacle and, at the same time, the condition associated with their use is a person. The pyramid of the use of information technology in education (Figure 2) illustrates the hardware base (necessary hardware), software base (software), but also the necessary competences of the teacher. Access to broadband high-speed Internet seems to be a fundamental element for the introduction and application of new solutions in the educational process. Most of today's devices require access to high-speed Internet in order to allow the acquisition, processing and transfer of information (level 1).

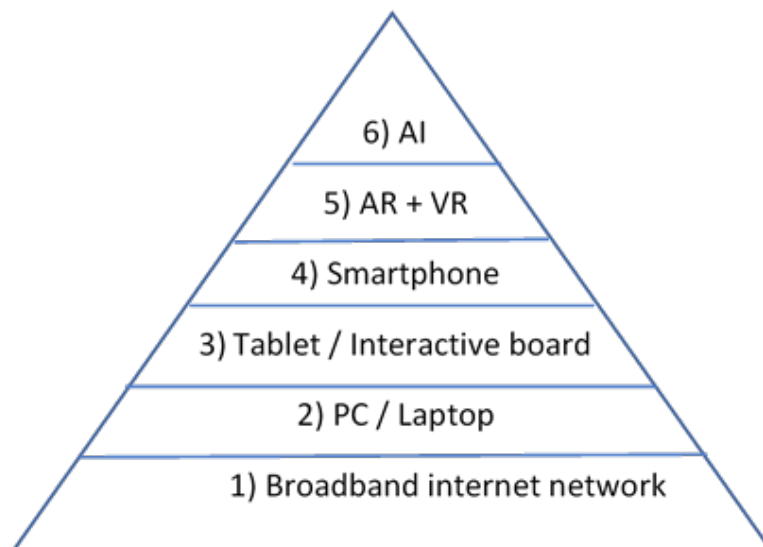


Figure 1. Pyramid of ICT use in education

Tools such as laptops and desktops allow the preparation of the necessary educational materials, which the teacher will later easily be able to use in his classes. The preparation of these materials is closely related to the teacher's attitude and possession of the necessary digital competencies. But given that once developed digital materials, made available in the cloud or on a virtual disk, will allow them to be used from anywhere and at any time without the need to create them anew each time the situation requires it (level 2).

Most of current available applications will allow their use on any device, whether it be an interactive whiteboard, tablet, interactive monitor, or interactive projector. The development of these applications, their updating and the introduction of new ones is based on similar solutions, which are only upgraded and adapted to new technological resolutions. An example is the use of language learning software in the form of interactive platforms, teaching videos, which, adapted to modern requirements and educational needs, are being developed and introduced into, for example, goggles, 3D glasses, etc. All that remains is the question of the teacher's openness and readiness whether and to what extent he will introduce them into his work (level 3).

Today's generation, in fact, regardless of age, uses such solutions involuntarily. If we look at the available smartphones, which allow us to send information in the form of a message, email, voice data, graphic data, make a purchase, make a payment, log in to our bank and much more, we can have a reflection on the technologies that were available before and have now been optimized and customized. The user of such a smartphone, wishing to take advantage of all the benefits and functionalities that the equipment offers, must learn to do so, whether she likes it or not – including the teachers who are recipients of this technology and often active users. Why, then, shouldn't the teacher learn how to use the new technology to support her work, reducing the time she has to spend on the professional activities she has to deal with on a daily basis – after all, it also provides support and allows her to adapt to the conditions and issues to be realized through the use of appropriate educational programs (level 4).

The last decade has introduced access to AR and VR technology solutions in a broad sense. Thanks to them, many programs and applications have been developed to support employees in various industries and fields of the economy. In the field of education, we can use full teaching suites, allowing full interaction and immersion in a world based on virtual solutions. This software is available with dedicated goggle technology or created for the educational unit (level 5).

The proliferation of VR technologies has led to the refinement of these solutions in the form of artificial intelligence (AI). On the one hand, AI provides support for those who use the resources at its disposal, such as adaptive systems, educational chatbots or ChatGPT solutions to get answers to the questions posed. On the other hand, there is the question of the ethics of the content received, which is signed by a student or even an employee of the educational environment (level 6).

The above solutions, starting from the fundamental ones, on which the entire technological infrastructure is based, access to broadband Internet and ending with artificial intelligence solutions create such a huge educational potential that the teacher's failure to use these opportunities may lead to the margin of digital exclusion. Therefore, it becomes important and necessary to change the approach, thinking and attitude to modern ICT solutions by the teaching community, but also to introduce appropriate program assumptions at the level of state educational policy necessary for teachers to use in each subject at least selected tools to support their professional work.

Factors hindering the digitalization of educational institutions in Poland and Greece

The possibility of using tools to support the digitalization of educational units in Poland posed a challenge for the units themselves and for the school directors. On the one hand, despite the good bandwidth of the Internet connection in schools (50% of schools have a connection from 100 Mbps to 1Gbps), which guaranteed the smooth flow of data on individual platforms or educational programs, there was a lack of adequate equipment available to students to fully use digital resources. Many times, students had better mobile equipment at home (laptops, tablets, etc.), but due to school security reasons they could not bring them or use them during school activities: 74% in Poland and 83% in Greece, respectively. It is interesting to note that only 13% of people in Poland believe that technological facilities in schools are inadequate, while in Greece 40% of respondents do. This is an important indicator of the Greek educational system demonstrating the need to invest in technological facilities in the education system. Greece struggled with low bandwidth (45% of



schools have a 30-100Mbps connection) and a lack of network adaptation in buildings where educational services were provided. This has posed a problem for many schools related to the lack of optimal use of resources provided in large-scale clouds on the Internet. The European Union's strategy is that member states should reach a bandwidth of 1Gbps by 2025. Unfortunately, as individual countries declare, not all will succeed in reaching this goal (Figure 2 below).

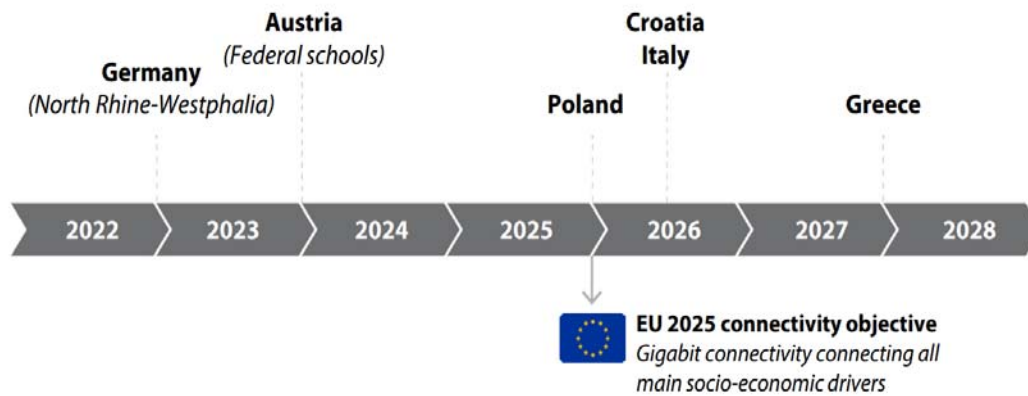


Figure 2. Countries' targetson the availability of 1 Gbps connections (European Court of Auditors, 2023, p. 39)

In Poland, there was no overarching plan, a strategy for the digitalization of schools. On the one hand, such a strategy allowed school principals to apply for support from various sources, while on the other hand, it led to difficulties in choosing the appropriate programs and sources that would be sufficient to better equip schools. In Greece, the purchase of equipment was organised by the ministry, which also put schools in charge of selecting technology on their own, with virtually no guidelines. The role of the principal and the board of education was to determine and select what type of equipment would best meet the needs of teachers and students. Due to the lack of a timeframe and allowing self-selection of appropriate equipment, there were delays in their delivery that lasted until 2022; during this period some of the information and communication technologies that could support the educational process had evolved (European Court of Auditors, 2023).

Another factor hindering the digitalization of schools is the scarcity of adequate curricula or education plans to motivate teachers to use the new tools in their classes. In addition, the lack of knowledge and skills created a barrier among teachers related to the preparation of digital teaching materials. Despite courses created to assist teachers in helping them develop digital materials, many teachers did not take the initiative and desire to develop their education in this area on their own; this is in contrast with research indicating that teachers generally would wish to attend training in, e.g., computational thinking (Fessakis & Prantsoudi, 2019). It is worth emphasizing that this type of initiatives is a prerequisite for the digitalization of educational entities both in Poland and Greece. Both schools and teaching staff should use resources in the use of ICT to adapt the teaching-learning process to the modern requirements of society, including a generation raised with technology. According to research, the percentage of students using digital technologies outside of IT lessons at school in Poland is 30% and in Greece 19% – this is low compared to, for example, Germany, where technologies are used by 39% of students (Plebańska & Tarkowski, 2016).

This is partly due to the lack of a thorough development of strategies in educational entities, assuming the necessity of using digital technologies during the educational process. While it is true that both the Polish and Greek educational systems have already included digital competencies as a separate subject from elementary school onward, it is still insufficient, and its implementation depends to a large extent on teachers' preparation, knowledge and skills. Despite the efforts of the government, mandatory legal guidelines and numerous programs that raise digital competence as one of the mandatory elements of teacher training at the primary and secondary education, skills' levels are still insufficient and future teachers seem to not be fully prepared to use information and communication technologies in their professional work (see Figure 3 below).

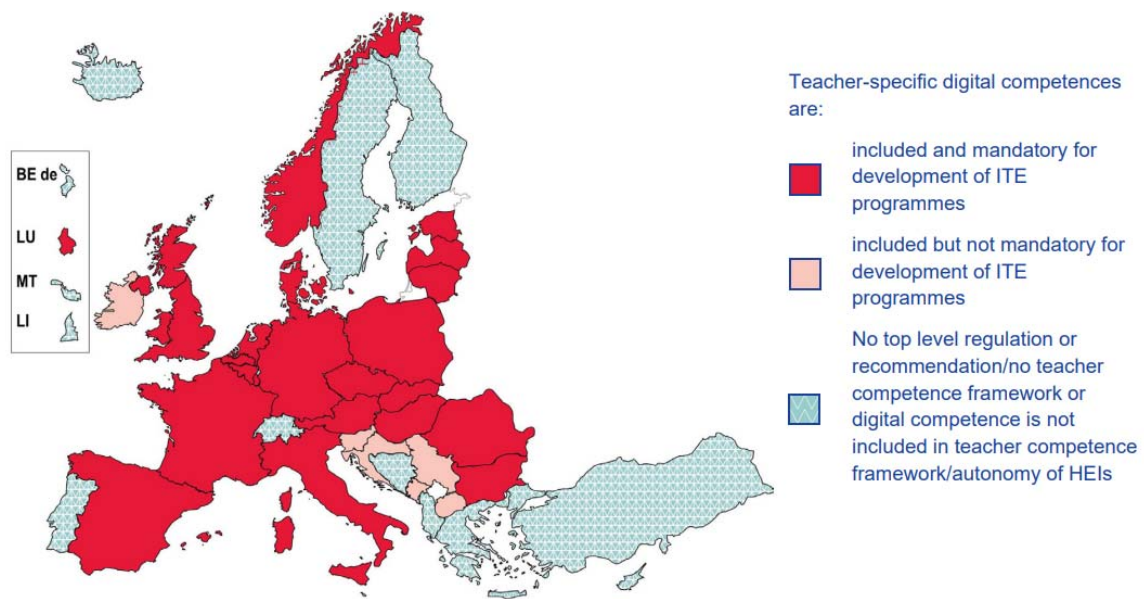


Figure 3. Teacher specific digital competences in government program (Eurydice, 2019, p. 12)

Teachers sometimes acknowledge their own lack of appropriate skills, but they also note the lack of appropriate or effective pedagogical models for using ICT in the learning process. They also point out the lack of adequate motivation on the benefits of using ICT in teaching. They also pay particular attention to the lack of pedagogical and technical support to be sure that the use of digital technologies in daily practice and the problems they face will find the necessary help and support and not the need to cope on their own. They point out that sometimes the equipment available in the school may not be old, but it is inefficient in relation to the requirements that are placed on modern teaching programs, which need equipment with certain specifications (Tomczyk et al., 2019).

The way a given technology is perceived by the teacher affects the extent that s/he will try to implement it during their classes. If the technology is perceived as interesting, innovative and the teacher sees the possibility of introducing it into their own professional practice, then s/he will try to accept it and implement it as a tool to support the teaching process. Otherwise, if the technology is perceived as a negative tool, without being convinced by it and being able to try it out during classes, such a teacher will try to avoid it and use previously proven teaching methods (Aivazidi & Michalakelis, 2023).

Conclusions

In our study, we aimed to compare the use of ICT in education in Poland and Greece. We presented the current policies in both countries, together with relevant research on the digitalization of education in the two countries. The basic difference we have found is related to the adequacy of equipment at schools, at least as it is perceived by the students: more students in Greece think that the available equipment is inadequate, compared to those in Poland. This finding is also supported by the timeframe for reaching the goal of 1 Gbps bandwidth: Greece puts this target on 2027, while Poland in 2025. At the same time, the two countries share some common elements in the use of ICT in education. Firstly, both countries include digital competencies as an independent subject from primary school. Secondly, both countries have been offering opportunities for teacher training in the field of ICT – this trend was intensified during the Covid pandemic; however, we have noticed that these initiatives have not led to the desired effect, which is a solid development of teachers' skills. This is a complex phenomenon, which is related to the teachers' attitudes and visions of technology implementation in the classroom.

We believe that there is a need to create a modern space related to education, one that should be in line with the developing civilization, create opportunities for the development of the whole society in accordance with the idea of Lifelong Learning, then changes are inevitable and even necessary. Our priority, as teacher educators, should be to look for opportunities in how new information and communication technologies



can support the professional work of teachers, adapted to the modern requirements of the young generation of pupils or students. The fascination of the 'glass generation' or 'screenagers' with new technologies, should arouse at least reflection and then motivation, which will be then reflected in the use of new technologies that complement the proven and previously used methods of work.

Digital technologies, when they are appropriately introduced and used, can improve the efficiency of the teaching process itself, contribute to a balanced level of results achieved in relation to the effort, as well as showcase that new technologies are not only tools related to social networking, shopping or streaming, but, above all, they are tools that support the process of acquiring knowledge, transforming it, developing it and creating new knowledge. This implies the need to adapt systematic solutions at the level of state educational policy, which will later translate into the need for teachers to apply these solutions at the level of individual schools.

In order to fully realize the process of digitization of schools and the use of available technologies, it would be necessary to take into account several basic assumptions, which include:

- a) the need to implement new technologies in the core curriculum at all educational stages and in all subjects – technology should be a tool to support the teacher in achieving educational goals,
- b) openness to change through readiness and mobility of educational staff in the development of digital competencies adapted to the modern requirements of society,
- c) the introduction of substantive and technical support for educational staff that will allow a sense of security, care and change of attitude in the context of the need to use new information and communication technologies in the educational process,
- d) the introduction of certain standards that will allow to adapt the teacher's workshop to the technologies with which he will later work during her classes – providing methodological, substantive, technical support adapted to the requirements of modern technologies.

The use of technological tools including information and communication technologies has become one of the fundamental elements of modern society. Technology of today maybe come obsolete tomorrow, and this may affect even the ongoing research in the field (Fessakis et al., 2019). The ability to adapt to technological tools can protect each person from digital exclusion and marginalization. It therefore becomes important to adequately prepare today's generation of people to achieve a level of digital competence that will help them navigate and function in a mediatized and technologically developed society. Additionally, the preparation of today's teachers in terms of achieving an appropriate level of digital competence can contribute to raising the awareness of the digital transformation of the younger generation for which, in a way, they take responsibility. Given the need for systematic preparation of teachers to perform this important function in society, a huge burden is also placed on the educational policy of the state, without which the introduction of appropriate orders, reforms related to digital transformation, including digital transformation of education will be impossible. The awareness of the need for these changes, can raise the level of competence of society on the one hand, and on the other hand, point to solutions for other countries that will be preparing for such a task. As numerous reports have shown, Poland stands more or less in the middle of transformations related to the digitalization of society and individual branches of the economy. Similar is the case of Greece, for which the introduction of the necessary solutions is expected to raise the level of digital competence of society and contribute to the digitalization of the country among other countries of the European Union. Both the Polish and Greek educational systems require the introduction of relevant changes and reforms to achieve public awareness related to the necessary digitalization adapted to modern requirements based on new ICT solutions.

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