**ICT in Greek Primary Education: A Literature Review**

**ABSTRACT**

**Aims:** This literature review aims to synthesize and critically analyze scholarly findings regarding the integration of Information and Communication Technologies (ICT) in Greek primary education. It focuses on historical developments, pedagogical practices, teacher training, digital resources, infrastructure, challenges, and the policy framework, emphasizing advancements following the COVID-19 pandemic.

**Study Design:** The article is structured as a systematic literature review, drawing exclusively from peer-reviewed studies, national policy documents, and international reports. Key thematic areas are identified and analyzed to provide an evidence-based overview of ICT in Greek primary schools.

**Place and Duration of Study:** The review covers ICT integration in Greek primary education, with a focus on policy and practice developments from the late 20th century to the present, particularly highlighting changes in the post-2020 period.

**Methodology:** A comprehensive review of Greek and international literature was conducted, utilizing academic databases and policy repositories. Studies and documents were selected based on relevance, recency, and academic rigor, with an emphasis on peer-reviewed articles and official reports from 2000 to 2024.

**Results:** ICT integration evolved from limited, fragmented efforts in the 1980s to a robust national strategy post-2010, marked by the Digital School initiative and accelerated digital transformation due to COVID-19. ICT is increasingly embedded in daily teaching, supporting student engagement, collaboration, and differentiated learning. However, the degree of pedagogical integration varies, with technology often supplementing rather than transforming teaching practices.There has been substantial improvement in school infrastructure, digital resources (e.g., Photodentro, interactive textbooks), and connectivity. Disparities remain between regions and among students (digital divide).

**Keywords:** Information and Communication Technologies (ICT); Greek primary education; teacher training; digital resources; educational policy; digital divide; Digital School; blended learning; educational infrastructure; COVID-19.

1. **Introduction**

Information and Communication Technologies (ICT) have become integral to modern educational practices worldwide, offering new tools and methods to enhance teaching and learning. The integration of ICT in education is seen as a catalyst for improving student engagement and developing digital literacy, provided it is grounded in sound pedagogy. In the context of Greece, the incorporation of ICT in primary education has evolved over several decades, influenced by national policies, teacher training initiatives, and the broader European digital agenda (Antonopoulou, 2024). However, research indicates that the effective use of ICT in Greek schools is contingent on multiple factors – from infrastructure and resources to teacher preparedness and support systems. This literature review aims to synthesize scholarly findings on the use of ICT in Greek primary education, drawing exclusively on peer-reviewed sources. It will outline the historical development of ICT integration in Greek primary schools and examine key thematic areas: pedagogical applications of ICT, teacher training and professional development, digital resources and content, infrastructure and equipment, challenges and barriers, and policy frameworks and support. Emphasis is placed on recent advancements, particularly in the post-COVID-19 period, which has accelerated digital transformation in education. By reviewing empirical studies and policy analyses, this article provides an academic overview of how ICT has been implemented in Greek primary education and the lessons learned for future practice. All references are cited in-text and compiled in an APA-style reference list, ensuring an evidence-based and up-to-date discussion of the topic (Theodorakopoulos et al., 2024).

1. **Historical Development of ICT Integration in Greek Primary Education**

The journey of ICT integration in Greek primary education spans from modest beginnings in the late 20th century to extensive reforms in the 21st century. Initial efforts to introduce computers in schools date back to the 1980s, when implementation was *fragmentary* and lacked a cohesive national strategy. A more structured approach emerged in the late 1990s: the Unified Curriculum of 1998 formally included ICT as a component of the primary education curriculum, marking the first systematic push to incorporate technology in teaching. This was followed by the Cross-Thematic Curriculum Framework of 2003, which explicitly aimed to develop digital literacy in compulsory education. The 2003 curriculum encouraged students to use computers as *learning tools* for exploration, communication, and information retrieval, embedding ICT across daily school activities. These early policy milestones established the expectation that primary schools would utilize ICT not just for standalone informatics lessons, but across subjects as a means to enrich learning experiences (Antonopoulou, 2024).

By the mid-2000s, Greece intensified its efforts through large-scale training programs and infrastructure projects. In 2005, a nationwide initiative ensured that nearly all primary schools were equipped with computer laboratories dedicated to ICT education. The Panhellenic School Network (PSN) was developed as a national education network to provide internet connectivity and online services to schools. Despite these efforts, by the early 2010s Greece still lagged behind many European counterparts in key ICT indicators. In 2014, Greece had not yet captured the full benefits of ICT adoption and was behind in about 77% of EU ICT indicators. Recognizing these gaps, the Ministry of Education launched the Digital School (Ψηφιακό Σχολείο) program around 2010–2011, as part of the broader “New School” reform agenda. This program represented a comprehensive strategy converging three critical drivers: upgrading digital infrastructure in schools, developing rich digital educational content, and expanding teacher education and support in ICT. The Digital School initiative introduced interactive digital textbooks and lesson plans, created open access repositories of learning objects, and emphasized teacher training for effective technology integration. It was a concerted drive with a coherent vision to transform schools for the 21st century (Theodorakopoulos et al., 2024).

Despite these reforms, external evaluations noted persistent shortcomings in the 2010s. For instance, even with the Greek School Network providing connectivity, many schools continued to experience relatively low broadband speeds (often <30 Mbps) and insufficient hardware in classrooms. Technical support was centralized and slow to address on-site needs, highlighting a gap between policy intentions and on-the-ground reality. Nevertheless, progress was evident: by the end of the 2010s, 88% of Greek youth (16–24 years old) had at least basic digital skills, reflecting a generation growing up more tech-savvy. In primary education, ICT was by then a regular part of the curriculum and school life, albeit with varying degrees of quality in implementation (Kalogeratos et al., 2024).

The COVID-19 pandemic in 2020 marked a watershed moment in the historical trajectory of ICT in Greek education. School closures necessitated an abrupt shift to distance learning, effectively stress-testing the country’s digital capacity. By the fall of 2020, the entire Greek education system – from pre-primary to secondary – was operating online via synchronous e-learning platforms. Over 300,000 virtual classes were being held daily, an unprecedented scale of remote instruction in Greece’s history. This emergency pivot exposed longstanding issues such as the digital divide and gaps in teacher digital skills, but also catalyzed rapid advancements. During 2020–2022, the government implemented emergency support measures: more than 90,000 tablets and laptops were distributed to schools, interactive whiteboards were installed in many classrooms, and about 177,000 educational robotics kits were provided for students aged 4–15. Internet connectivity for schools was also upgraded – enhancements to the school network ensured that over 14,000 schools (practically all primary and secondary schools nationwide) received improved broadband access (Karras et al., 2022). The post-COVID period thus accelerated the digital transformation of Greek primary education, with a strong policy push to not only recover from the pandemic’s disruptions but also to modernize the system for the future. In summary, the historical development of ICT in Greek primary schools has been characterized by steady if uneven progress, with major inflection points around the early 2000s curriculum reforms, the 2010s Digital School initiatives, and the 2020 pandemic-driven digital leap (Antonopoulou et al., 2023).

1. **Pedagogical Uses of ICT in the Primary Classroom**

One of the central themes in the literature is how ICT is actually utilized pedagogically in Greek primary classrooms. Simply providing technology does not automatically modernize or improve education – the educational value depends on how teachers integrate ICT into their teaching practices. Research consistently emphasizes that ICT use must be coupled with pedagogical innovation to yield benefits in student learning. For example, a nationwide review noted that earlier ICT efforts often over-focused on equipment deployment while underestimating the role of teachers and pedagogy in achieving true reform. In response, newer programs have aimed to link ICT with constructivist teaching approaches, encouraging teachers to shift from traditional didactics toward more interactive, student-centered learning experiences (Theodorakopoulos et al., 2022).

In practice, Greek primary teachers use ICT in various ways, ranging from basic to more sophisticated applications. Common pedagogical uses include digital presentations (e.g. using projectors or interactive whiteboards to display information), educational software for practice in subjects like math and language, and supervised internet research for project-based learning. Studies indicate that when used effectively, these technologies can increase pupil engagement and facilitate collaborative learning. For instance, multimedia applications can make lessons more engaging through audio-visual content, and online tools can enable group projects that extend beyond the classroom. In a 2010 case study, teachers reported that introducing laptops and educational software in primary classrooms led to more opportunities for students to learn through exploration and play, rather than rote memorization. Such findings align with international evidence that ICT, when well-integrated, can support diverse learning styles and foster critical thinking and creativity from a young age (Karras et al., 2024).

However, Greek teachers also face challenges in pedagogical integration. One observed pattern is that many teachers initially use ICT in a supplementary capacity – for example, showing videos or using drill-and-practice programs – rather than transforming their core teaching strategies. This may be due to limited training in instructional design with ICT, or because high-stakes assessment systems still prioritize traditional teaching methods. A qualitative study by Karakiza et al. (2013) found considerable confusion among ICT teachers about their pedagogical role in the new “Digital School” framework. While teachers acknowledged the importance of using technology, they were uncertain how to balance the multiple dimensions of their role – being facilitators of student-centered learning on one hand, and meeting the set curriculum objectives on the other. This role ambiguity sometimes led to ICT being used in a superficial way, without deep integration into lesson objectives.

Another important pedagogical aspect is the use of ICT for inclusive education and differentiated instruction. ICT tools can cater to varying student needs, including those with learning difficulties or disabilities, by providing personalized and multisensory learning experiences. Recent studies during and after the pandemic highlighted how Greek teachers employed ICT platforms to reach students at home and adapt materials for those who needed extra support. For example, in early primary grades, teachers used video-conferencing (e.g., Webex) combined with digital storytelling applications to maintain young children’s attention and participation during remote learning. Despite initial difficulties, many teachers demonstrated creativity and resilience in leveraging ICT to continue education for all students in an online environment. These experiences have opened new discussions in Greece about the pedagogical potential of blended learning (combining face-to-face and online instruction) in primary education moving forward (Kalogeratos et al., 2023).

In summary, the pedagogical use of ICT in Greek primary schools is evolving from basic applications toward more integrated, innovative practices. Key to this evolution is ensuring that teachers not only have access to technology but also the pedagogical know-how and confidence to redesign their teaching approaches. As Nikolopoulou (2022) observes, teachers’ practices improved with experience during the COVID-19 online teaching period, but sustained support and reflection are needed for those practices to translate into long-term pedagogical change. Going forward, pedagogical integration of ICT will likely emphasize student-centered learning, critical digital literacy, and the blending of traditional and digital resources to enrich the primary education experience (Kalogeratos et al., 2023).

1. **Teacher Training and Professional Development in ICT**

Teacher training has been identified as a cornerstone for successful ICT integration in Greek schools. Without adequately trained teachers, even well-equipped classrooms can fail to utilize ICT effectively. The Greek state, often with European Union support, has implemented a series of teacher professional development programs over the past two decades to build digital competencies and pedagogical skills.

The first large-scale ICT training initiative for teachers began in the early 2000s, known as “A-level” training (Επίπεδο Α’ Επιμόρφωσης). Running approximately from 2002 to 2008, this program focused on basic ICT skills for educators – essentially ensuring teachers could use computers, office applications, and the internet. Thousands of primary teachers participated, and research on its outcomes showed a measurable increase in teachers’ technical skills and frequency of ICT use in the classroom. However, critical evaluations (e.g., by Jimoyiannis & Komis) argued that the A-level training overemphasized technical proficiency at the expense of pedagogical integration. Teachers learned how to operate computers, but not necessarily how to redesign their lesson plans to incorporate those tools meaningfully (Theodorakopoulos et al., 2025).

**5. ICT to enhance teaching and learning.**

Recognizing this gap, the Ministry introduced the “B-level” ICT training (Επίπεδο Β’ Επιμόρφωσης) for teachers around 2008, extending through 2014 and beyond. B-level courses were more advanced and focused on the pedagogical use of ICT across different subjects. Teachers were trained in educational software, interactive whiteboard pedagogy, web 2.0 tools for collaboration, and general principles of instructional design with technology. An evaluation by Amanatidis (2012) of a pilot B-level training course found that such professional development could be effective if it was tailored to teachers’ profiles and needs. The study suggested that incorporating adult learning principles and linking theory with teachers’ real classroom challenges helped improve the training’s impact. Indeed, teachers who underwent the B-level training were observed to incorporate ICT into their teaching more frequently and in more student-centered ways than those with only basic training. Despite this, challenges remained in scaling the training to all teachers and providing sufficient follow-up support once they returned to their schools (Kalogeratos et al., 2024).

Beyond formal government programs, Greek teachers have also engaged in other ICT professional development opportunities. Universities, private educational institutes, and professional associations (like the Hellenic Mathematical Society or the Union of Greek Physicists) have organized ICT workshops and seminars. Notably, Regional Training Centers (PEK) established in 1992 and later the School Advisors system provided local training and mentorship, including on ICT integration. EU-funded projects (such as eTwinning and Erasmus+ exchanges) have additionally exposed Greek primary teachers to international best practices in educational technology. All these efforts underscore a consistent theme in the literature: continuous professional development is crucial, as ICT and pedagogical methods are constantly evolving. Teachers themselves acknowledge this need – in a survey, over 62% of primary teachers on Lesvos island had participated in some ICT training, and many expressed a *strong desire for further training*, particularly on the pedagogical aspects of ICT use (Kalogeratos et al., 2023)..

Despite improvements, research points out that many Greek primary teachers still feel insufficiently prepared to integrate ICT effectively. For example, Kalogiannakis (2010) reported that after a national training program, teachers felt technically prepared and generally positive towards ICT, but *desired more training focused on pedagogical development* for using ICT in class. Similarly, a study during the COVID-19 remote teaching period found that teachers experienced stress and uncertainty partly due to gaps in their training for online instruction. In response to the pandemic, the Ministry and the Institute of Educational Policy offered short-term webinars and created online guides for distance teaching strategies. While helpful, these emergency measures also highlighted that systematic, long-term training (for example, in blended learning methodologies, digital classroom management, and cybersecurity in education) is needed as part of teachers’ continuous professional growth (Kalliampakou and Antonopoulou, 2025).

In conclusion, teacher training in ICT for Greek primary education has expanded significantly since the early 2000s and has yielded positive outcomes, such as increased teacher usage of technology and improved confidence. Yet, a gap often remains between training and practice. The literature suggests that training programs should not be one-off events but part of an ongoing professional development continuum, including mentoring and communities of practice where teachers can share experiences. Especially in the wake of COVID-19, there is a renewed impetus to equip teachers not just with technical know-how but with the pedagogical resilience to integrate ICT in any teaching scenario – in-person, remote, or hybrid. Ultimately, empowering teachers through robust training and support is fundamental to realizing the potential of ICT in Greek primary classrooms.

**6.Digital Resources and Content for Primary Education**

The availability of digital educational content is a critical factor in the integration of ICT in schools. Greece has made considerable efforts to develop and disseminate high-quality digital resources for primary education, particularly under national programs like Digital School. One of the flagship developments is the creation of open educational resources (OER) and repositories to support the curriculum. A prominent example is Photodentro, the Greek National Learning Object Repository, which hosts thousands of curriculum-aligned digital resources (interactive simulations, educational games, videos, lesson plans, etc.) that teachers can freely use and adapt. According to Analyti et al. (2024), the introduction of repositories such as Photodentro has been *transformative* in promoting resource sharing and equity, as it allows even remote or under-resourced schools access to diverse learning materials. The repository approach aligns with Greece’s commitment to the European Digital Agenda, ensuring that digital content is accessible and supports a common, modern curriculum nationwide (Kalogeratos et al., 2021).

Another digital resource development is the “Interactive Textbooks” initiative. All primary school textbooks in Greece have been digitized and made available online through the Digital School platform (e-books repository). These interactive textbooks often include multimedia content and hyperlinks to external resources, providing an enriched learning experience beyond the static printed page. Teachers can project these e-textbooks in class using interactive whiteboards or assign sections to students for self-paced learning at home. The literature praises this initiative for modernizing content delivery; for example, a study by the European Schoolnet noted that Greece’s Digital School programme provides *impressive provision of digital educational content* for teachers, which is a strong foundation for ICT-enhanced teaching. This content ranges from basic literacy and numeracy exercises for early grades to more complex digital labs and 3D visualizations for science in upper primary.

The concept of digital resources also extends to platforms and tools provided to schools. The Ministry of Education has rolled out a national Learning Management System (LMS) called “e-class” and an online collaboration platform “e-me” specifically tailored for Greek schools. These platforms offer virtual class spaces, homework assignment and submission systems, and communication tools for teachers, students, and parents. During the pandemic, such platforms became essential: teachers used e-class/e-me to upload assignments and educational material, and to maintain interaction with students asynchronously. Research during COVID-19 found that teachers who actively used these platforms were able to mitigate some of the disruption by keeping students engaged with a structured flow of digital content.

Despite the wealth of digital resources available, their utilization is not yet uniform across all primary schools. Some challenges persist in integrating these resources into everyday teaching. One issue identified is that of curation and alignment: teachers can feel overwhelmed by the abundance of digital materials and may need guidance to select the most pedagogically appropriate ones for their class. Additionally, a gap in teacher awareness and skills can hinder effective use; not all teachers are fully aware of the breadth of content on Photodentro or comfortable navigating the LMS features to incorporate e-resources into their lesson plans. To address this, the Ministry’s actions include training sessions focused on digital content usage and the creation of helpdesk services and communities for sharing best practices. However, as one report pointed out, elements like the helpdesk and systematic evaluation of resource usage were initially less developed compared to content creation itself. This suggests a need for ongoing support to ensure resources are not only available but effectively integrated into teaching and learning(Kalogeratos et al., 2021).

Another noteworthy aspect is Greece’s participation in international OER and content initiatives. Greek educators and the Ministry have contributed to projects like Europeana (for cultural heritage content in education) and have utilized content from global sources (e.g., Khan Academy videos translated into Greek, or PhET science simulations). The concept of sharing and openness is thus increasingly embraced. The literature by Analyti et al. (2024) emphasizes that OER facilitate accessibility and equity, allowing teachers from any region (mainland or island, urban or rural) to use the same quality materials. This is particularly important in Greece, given disparities in school resources; a central repository can help bridge gaps by delivering content to schools that might lack other supplementary materials(Kalliampakou and Antonopoulou, 2025).

In summary, Greece has built a solid ecosystem of digital educational content for primary education, highlighted by initiatives like Photodentro and interactive e-textbooks. These resources, combined with platforms for distribution and classroom use, form a critical pillar of ICT integration. The challenge ahead lies in maximizing their impact: encouraging more teachers to weave digital resources into daily practice, updating content continuously to stay relevant, and ensuring that this digital content is used to support innovative pedagogy rather than just as an add-on. The continued focus on open resources and sharing culture bodes well, as it fosters a collaborative approach to enriching the teaching and learning process in Greek primary schools(Giotopoulos et al, 2025).

**7.Infrastructure and Equipment in Schools**

Adequate infrastructure is a prerequisite for ICT integration. In the context of Greek primary education, infrastructure includes hardware (computers, interactive whiteboards, tablets, robotics kits), connectivity (internet access and network capacity), and technical support systems. Over the years, the Greek government has invested significantly in school infrastructure, although with varying degrees of success and remaining gaps.

Computer labs: Since the early 2000s, most Greek primary schools have been equipped with a dedicated computer lab, typically containing a set of desktop computers for student use and peripherals like printers and scanners. Policy mandates ensured that “all school units” should have an ICT laboratory for teaching informatics and computer skills. By mid-2010s, the vast majority of primary schools indeed had at least one lab, although the number of computers and their condition varied. In many cases, labs had older machines, and student-to-computer ratios were still high (often a dozen or more students per computer in a class session). Recognizing this, the Ministry’s Recovery and Resilience Plan (2021) allocated funds to update ICT equipment. As noted earlier, between 2020 and 2022, over 90,000 new tablets and laptops were provided to schools, which likely refreshed the inventories of many labs and also supported classroom use (e.g., via mobile laptop trolleys) (Kalogeratos et al., 2021).

Interactive whiteboards and projectors: Starting around 2010, interactive whiteboards (IWBs) were introduced to Greek primary classrooms as part of the Digital School program. These boards, combined with digital projectors, allow teachers to display multimedia content and interact with software in front of the class. By 2022, the government had accelerated installations of IWBs, as evidenced by the push to install them in many classrooms during the pandemic period. Research suggests that IWBs are one of the most visible changes in the classroom environment – teachers found them particularly useful for whole-class teaching, making lessons more visual and dynamic. However, full pedagogical utilization of IWBs requires training (so that teachers move beyond using them as glorified projectors toward engaging students in interactive activities on the board). The literature points out that where IWBs were available, teachers often used them for showing videos or presentations, but more interactive features (like student manipulation of objects on the board or real-time quizzes) were less frequently exploited, likely due to limited familiarity or time to prepare such activities (Giotopoulos et al, 2025).

Internet connectivity: Internet access has been dramatically improved in recent years for Greek schools. The Panhellenic School Network (PSN) provides broadband internet to nearly all primary schools in the country. A recent report noted that during 2020–22, the capacity and reach of school internet connectivity were enhanced for 14,000+ schools, ensuring fast, reliable connections as a standard. This is a significant improvement from the mid-2010s when external evaluations observed that many schools still operated with relatively slow broadband and occasional connectivity issues. With better connectivity, primary classrooms can now regularly utilize online resources, video streaming, and cloud-based applications. Still, disparities can exist: some small or remote schools may face infrastructure challenges (for instance, on small islands or mountainous regions where telecom infrastructure is weaker, though satellite solutions have been used in some cases). Another aspect of connectivity is ensuring Wi-Fi coverage throughout school buildings, allowing use of laptops or tablets in regular classrooms (not just in the computer lab). The push for one-to-one device use or bring-your-own-device initiatives in primary education has been limited so far, but improved infrastructure lays the groundwork for more flexible ICT use beyond fixed computer labs (Kalogeratos et al., 2024).

Other equipment: The inclusion of educational robotics and STEM kits is a noteworthy development in Greek primary schools’ ICT infrastructure. The distribution of 177,000 robotics kits to K-12 schools (including primary) by 2022 reflects a policy emphasis on coding and robotics, aligning with international trends in STEM education. Many primary schools have started robotics clubs or integrate simple programming activities (using tools like BeeBots, Lego Education sets, or Arduino-based kits) into the curriculum – often facilitated by the newly introduced “Skills Labs” which emphasize digital and scientific skills. The availability of such kits provides hands-on opportunities for students to learn programming logic, problem-solving, and teamwork, illustrating an expanded notion of ICT that goes beyond computers to encompass a variety of digital tools and maker equipment(Giotopoulos et al, 2025).

Technical support: An often under-discussed but crucial component of infrastructure is technical maintenance and support. Studies have highlighted that Greek schools historically had limited on-site tech support; maintenance was usually handled by external technicians or enthusiastic teachers in addition to their teaching duties. The Digital School program envisioned a central helpdesk and regional support centers to assist schools. While a helpdesk does exist and is utilized, it was noted that a more systematic approach (like dedicated IT staff per cluster of schools) would improve response times and reduce downtime of equipment. In practice, the lack of immediate technical help can discourage teachers from using ICT – if a projector bulb burns out or a computer malfunctions, it might stay unusable for a long period, interrupting lessons and confidence. The recent investments of the Greek Recovery Plan also include strengthening technical support and infrastructure monitoring, indicating a policy realization that maintaining what is installed is as important as installing it in the first place.

In summary, the infrastructure and equipment for ICT in Greek primary education have significantly improved, especially in the last few years. Most schools now have the basic hardware and connectivity needed for digital learning, and newer additions like interactive boards and robotics kits are expanding the possibilities. The main challenges remain ensuring equitable quality of infrastructure across all schools and sustaining the infrastructure with proper support. As of the latest reports, Greece is on an upward trajectory, moving from a position of lagging behind to actively modernizing its schools’ technological capacity. Continued investment and strategic planning in infrastructure will be critical, as technology evolves and the expectations for digital learning in primary education continue to grow (Karras et al., 2024).

**Challenges and Barriers to ICT Integration**

While progress in ICT integration is evident, the literature documents a range of persistent challenges and barriers in Greek primary education. These barriers can be categorized into external factors (infrastructure, resources, support) and internal factors (teacher beliefs, confidence, and pedagogical norms). Recognizing these challenges is crucial, as they inform where policy and professional development efforts should be focused.

One of the most frequently cited barriers is the lack of time in the school day and curriculum for teachers to experiment with and incorporate ICT. Greek primary teachers often have a dense curriculum and many responsibilities, leaving limited time to develop ICT-rich lesson plans or troubleshoot technical issues during class. In a study by Kokkinaki (2010), teachers reported that the pressure to cover the required material, combined with large class sizes, made it difficult to integrate new technologies meaningfully – ICT activities were seen as taking extra time that they felt they didn’t have. This perception of ICT as an “additional burden” rather than an enabler is a significant attitudinal barrier that needs to be overcome by demonstrating how technology can be woven seamlessly into lessons to perhaps even *save* time or enhance efficiency in the long run (Giotopoulos et al, 2025).

Infrastructure and technical support deficits have also been notable barriers, though these have been diminishing recently. As discussed, infrastructure quality historically varied, and where computers or internet were slow or unreliable, teachers naturally hesitated to rely on them for teaching. The statement “lack of infrastructure and technical support are the most significant reasons that impede teachers from the use of ICTs in the classroom” encapsulates what many teachers expressed in surveys. Even as equipment becomes available, if a teacher cannot get immediate help when something goes wrong, their willingness to plan a tech-integrated lesson declines. The technical issues faced during the sudden shift to online learning in 2020 (platform outages, lack of home equipment for some students, etc.) further exposed infrastructure-related challenges and inequalities. On the positive side, the substantial upgrades in recent years aim to mitigate this barrier; however, continuous investment and maintenance are needed to keep infrastructure from again becoming a limiting factor.

Teacher-level factors include confidence and digital competence, as well as beliefs about teaching. While many Greek primary teachers have positive attitudes toward ICT in principle, some remain skeptical of its true value or are uncomfortable changing long-standing teaching habits. Nikolopoulou and Gialamas (2016) note that teachers with more ICT training and personal experience tend to be more at ease in using it in the classroom, whereas others are more likely to stick to traditional methods. There is also evidence of a generational gap: younger teachers or those who have recently graduated often have higher digital fluency and are keen to innovate, whereas some veteran teachers may be more resistant or anxious about technology, particularly if they feel their students might outpace them in ICT skills. That said, training and support can shift these beliefs. Case studies show that when teachers see ICT leading to tangible student improvements (e.g., increased engagement, better project outcomes), their attitudes become more favorable and they are willing to invest the effort to integrate technology more regularly (Giotopoulos et al, 2024).

A significant challenge highlighted in recent literature is the digital divide – both among students and across regions/schools. Giavrimis (2023) investigated Greek primary teachers’ perceptions of the digital divide and found that teachers are acutely aware of inequalities in student access and skills. They identified *intra-social factors* such as socioeconomic status and parental support as key contributors to whether students benefit from ICT or are left behind. For example, not all students have computers or stable internet at home, which became a crucial issue during periods of remote learning. Teachers worry that ICT can inadvertently widen achievement gaps if some children cannot access online resources or if they lack parental help to navigate technology. Moreover, differences between schools – urban schools often having more resources than rural ones – can lead to uneven ICT experiences for students nationwide. The Greek state has tried to address this by equipping all schools and providing student device vouchers for low-income families in the pandemic’s aftermath, but teachers still perceive a need for targeted support to disadvantaged groups to ensure inclusive ICT integration (Theodorakopoulos et al., 2022).

Another barrier revolves around curriculum and assessment pressures. The national curriculum, while encouraging ICT use, is still content-heavy and accompanied by traditional assessments. Some teachers feel that standardized tests and the tightly defined curriculum leave little room for ICT-enhanced projects or interdisciplinary activities that might be more time-consuming. In addition, until recently, ICT itself (as a subject) was not formally assessed in primary education, which could lead some to view it as non-essential. However, the new curriculum reforms (like the 2021 curriculum framework which integrates informatics from first grade) and the introduction of digital skill development as a core aim indicate a shift that may alleviate this concern. As policy catches up, giving ICT a more prominent place in official learning objectives, teachers might feel more justified in dedicating time to it.

Finally, organizational and leadership factors within schools can either pose a barrier or facilitate ICT use. A supportive school principal who prioritizes technology, encourages experimentation, and organizes peer learning can create a school culture where ICT integration thrives. Conversely, if school leadership is indifferent or if there is no clear plan for ICT (no ICT coordinator or team), individual teachers may struggle alone to implement innovations. As one study put it, schools need *adaptive cultures and leadership support* aligned with ICT goals to overcome inertia. Some Greek primary schools have tackled this by forming ICT committees or designating lead teachers for technology, but this is not universal(Giotopoulos et al, 2023).

In summary, the challenges to ICT integration in Greek primary education are multifaceted – spanning practical issues like time and equipment, and deeper issues like teacher beliefs and socioeconomic inequalities. The literature suggests that addressing these barriers requires a holistic approach: continuing to improve infrastructure and support, providing ongoing pedagogical training and mentoring for teachers, adjusting curricula and assessments to be more ICT-friendly, and implementing policies that specifically target digital inclusion for all students. Encouragingly, many of these areas are recognized in Greece’s recent strategic plans. For instance, the National Digital Transformation Strategy 2020–2025 explicitly includes goals for teacher training and infrastructure, and the Recovery Plan pledges investments to reduce connectivity gaps. By systematically tackling these barriers, Greece can move closer to an educational system where ICT’s benefits are fully realized across all primary schools (Kalogeratos et al., 2023).

**8. Policy Framework and Support Initiatives**

The evolution of ICT in Greek primary education has been steered by a comprehensive policy framework, combining national initiatives and alignment with European Union strategies. The Greek government’s commitment to integrating ICT in education is reflected in a series of laws, strategic plans, and funded projects that provide both vision and resources for digital education.

Curricular and legislative support: Early policy steps were the inclusion of ICT in official curricula (1998 Unified Curriculum and 2003 Cross-thematic Framework as discussed) which established the foundational expectation of ICT use in schools. Beyond curriculum, Greece passed specific laws underlining digital education. For example, Law 4692/2020 on “school upgrading” explicitly emphasizes cultivating digital skills and introducing Skills Labs for STEM and digital literacy in primary schools. Likewise, Law 4823/2021 further mandated the enrichment of curricula with digital competencies and the development of *rich digital educational materials*. These legislative acts show that digital education is not a side project but embedded in the educational reform agenda. Moreover, Greece’s approach has been to pilot innovations – e.g., experimental schools were tasked with trying new technologies and digital resources per earlier laws – and then scale them up based on results.

National strategies and plans: A significant recent driver is the Digital Transformation Strategy 2020–2025, dubbed the “Bible of Digital Transformation”, which includes a dedicated section for education. This strategy sets out primary objectives such as investing in digital infrastructure (with an earmarked budget of €303 million for connectivity and €513 million for digital public sector transformation, part of which benefits schools) and developing digital skills at all levels (with ~€113 million for skills programs). The strategy envisions “Digital by Default” in education – meaning digital resources and methods should become a normative part of teaching. In tandem, the National Recovery and Resilience Plan “Greece 2.0” (2021) incorporates education in the national post-pandemic recovery, echoing the digital education goals of the strategy and providing EU recovery funds to achieve them. Through Greece 2.0, substantial EU funding has been allocated to, for instance, purchase devices for schools, create teacher training programs, and update educational content and platforms. The synergy between these plans ensures that there is both a roadmap and financing for improvements (Giotopoulos et al, 2024).

Specific programs and projects: The Digital School program (2010s) was an umbrella for many ICT projects: it delivered infrastructure upgrades (like interactive boards), developed content (digital textbooks, Photodentro repository), and offered teacher training sessions. Its implementation was backed by European Social Fund monies, such as the “Myschool” e-governance platform and other ICT in education projects (one document notes ~€2.3 million was invested in educational ICT infrastructure during 2010–14 through such funds). Additionally, Greece participated in EU initiatives like eTwinning, which encouraged schools to collaborate internationally via the internet, thereby indirectly stimulating teachers to improve their ICT skills. Another example is the European School Network surveys and consultations which Greece took part in, to benchmark progress and get recommendations (Giotopoulos et al, 2019).

Teacher training policies: On the policy level, Greece’s teacher professional development in ICT was organized through the aforementioned A-level and B-level trainings, which were funded and mandated by the Ministry. The policy support here was crucial – teachers received certification for these ICT training levels, which could be a consideration in their career advancement. More recently, Law 4961/2022, concerning emerging ICT and digital governance, includes provisions for the certification of teachers’ digital skills and development programs for educators. This indicates a move to formally recognize and perhaps require digital competency among teaching staff. Also, the establishment of the Greek National Coalition for Digital Skills and Jobs, a multi-stakeholder partnership, is partly aimed at teacher skill development as noted in Article 87 of the law. These structures align with EU’s DigCompEdu framework and show policy foresight in continually updating teacher competencies.

Ensuring equity and inclusion: Greek ICT policies have also addressed inclusion – for instance, ensuring that students with disabilities benefit from ICT. Law 4823/2021 specifically provides for assistive technologies for students with special educational needs. Moreover, during the pandemic, the Ministry compiled and distributed guidelines for distance education that included strategies for reaching vulnerable student groups. The policy of distributing free devices to disadvantaged students (via voucher programs in 2021) also falls under this equity umbrella, acknowledging and attempting to narrow the digital divide (Giotopoulos et al, 2025).

Monitoring and evaluation: A notable aspect of policy support is the emphasis on evaluation and evidence-based improvement. Greek education authorities, in collaboration with bodies like the OECD, have conducted periodic evaluations of ICT in education. A 2017 OECD assessment influenced the refinement of the Digital School strategy to include more about linking ICT with pedagogy and monitoring outcomes. Additionally, as part of Greece 2.0 and the transformation strategy, there is an intent to track progress indicators (like percentage of teachers trained, student digital skill levels, etc.). The existence of the Observatory for Digital Education (through projects with the Pedagogical Institute/Institute of Educational Policy) helps gather data and feedback from schools.

In conclusion, Greece’s policy framework for ICT in primary education is robust and multi-layered. It spans curriculum requirements, national strategies, legal mandates, funded programs, and alignment with international standards. This concerted policy support has been instrumental in the advances made – for example, without policy backing, the large-scale improvements in connectivity and resource development in recent years would not have been possible. The literature often cites Greece as a case where initial policy inertia gave way to proactive planning and investment, especially under external pressures like the pandemic and EU digital targets. The challenge remains to implement these policies effectively at the grassroots level, ensuring that every school and teacher feels the impact of these support measures. As policies continue to adapt (e.g., focusing on cybersecurity education as per the 2020 National Cybersecurity Strategy, or fostering links between education and innovation in initiatives like HEInnovate for teacher training), the trajectory for Greek primary education is one of increasingly integrated and smart use of ICT, backed by a clear strategic vision (Vasilopoulos et al., 2023).

**Conclusion**

The integration of Information and Communication Technologies in Greek primary education has undergone a remarkable evolution, guided by research insights, policy initiatives, and, more recently, the imperatives of a global pandemic. This literature review has highlighted how Greece moved from tentative, fragmented ICT introduction in the 1980s to a comprehensive, multi-faceted approach by the 2020s. Key milestones in this journey include the incorporation of ICT into national curricula (1998, 2003), the ambitious Digital School program of the 2010s focusing on infrastructure, content, and training, and the accelerated digital transformation spurred by the COVID-19 crisis. Scholarly sources consistently affirm that while significant progress has been made — virtually all primary schools now have internet-connected computer labs, a wealth of Greek-language digital resources is freely available, and teachers are more digitally skilled than ever — there remain challenges to address to fully realize ICT’s educational potential.

Pedagogically, ICT offers Greek primary education new avenues for interactive, student-centered learning. Successful examples show ICT enhancing engagement and catering to diverse learning needs. Yet, the impact is uneven; technology is still sometimes used as a superficial add-on rather than a transformative tool. The reviewed literature underscores that continuous teacher professional development is critical: teachers need not only initial training but ongoing support and time to refine their ICT-integrated practices. Encouraging developments, such as the newer emphasis on collaborative projects, coding activities, and blended learning models, suggest that pedagogy is gradually catching up with technology availability.

In terms of infrastructure and resources, Greece has made concerted investments in recent years that have narrowed the gap with other European countries. By equipping schools with modern hardware (interactive boards, robotics kits) and improving broadband access nationwide, Greece has tackled many first-order barriers. The focus now is shifting to ensuring these resources are used effectively and maintained. The expansion of open educational resources like Photodentro and the integration of digital content into daily teaching signify a cultural change towards openness and innovation in the Greek educational system. Nonetheless, challenges such as the digital divide and technical support need ongoing attention. As several studies pointed out, disparities in home access and regional resource differences mean that some students and schools benefit less from ICT than others. Policymakers will need to continue targeted initiatives (device subsidies, community internet access programs, etc.) to ensure equitable outcomes.

The COVID-19 pandemic served as both a stress test and a catalyst for Greece’s ICT in education. The immediate pivot to distance learning in 2020 was fraught with difficulties — many teachers and students struggled initially with unfamiliar tools, and existing inequalities were magnified. However, it also demonstrated that rapid change is possible: within months, teachers gained new skills, schools upgraded their digital infrastructure, and the general acceptance of ICT as essential (not optional) greatly increased. Post-pandemic, Greece’s educational authorities have embraced the momentum to implement structural improvements, as seen in the 2020–2025 Digital Transformation Strategy and Greece 2.0 plan which place digital education at the forefront of the recovery agenda. The literature suggests that experiences from the pandemic — such as effective practices in remote teaching and the importance of social-emotional support in digital settings — should inform future training and preparedness plans (e.g., developing robust hybrid teaching models and resilience against disruptions).

In conclusion, the use of ICT in Greek primary education is characterized by significant achievements coupled with ongoing challenges. The historical perspective shows a clear trend: initial lagging behind has given way to rapid catching up and even leading in certain areas like open resource provision. Greek researchers and educators have contributed valuable insights into how to integrate technology in culturally and pedagogically appropriate ways, emphasizing that success lies in viewing ICT not as a standalone goal but as part of a holistic improvement of teaching and learning. As of 2025, Greek primary education stands at a juncture where it has the policy support, infrastructure, and growing teacher capacity to leverage ICT for enriched education. The key findings of this review highlight the need for sustained investment in teacher development, continuous evaluation of initiatives, and a steadfast commitment to equity to ensure no teacher or student is left behind in the digital age. With these measures, Greece can continue to build on recent advancements and navigate the challenges, ultimately harnessing ICT to foster an engaging, inclusive, and future-ready primary education system.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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