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Technological Awareness in Primary Education: Case of Techouar Sid Ahmed Primary School

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Declaration

I hereby declare that this dissertation entitled **Technological Awareness in Primary Education: Case of Techouar Sid Ahmed Primary School**, is my own original work, reached from my own exploration. It has not been previously published or submitted for any other academic award. Any additional source is explicitly acknowledged by referencing.

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Dedications

Praise is to ALLAH who has enlightened me the way to take this scientific research, which I hope will be useful in the field of study and educational attainment.

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Abstract

In the digital age, technology has become an essential component of modern education, offering new opportunities for engagement, personalized learning and skill development. However, the integration of educational technology in primary schools, particularly in developing countries, remains inconsistent and often hindered by various challenges. This study investigates the level of technological awareness among primary school teachers from Techouar Sid Ahmed primary school and different initial stage of schooling, and parents of pupils at Techouar Sid Ahmed primary school, with a focus on how digital tools are perceived, used and supported in the learning environment. The research explores key factors influencing technology adoption, including training, infrastructure, teacher experience and parental involvement. A case study was employed using a mixed-methods approach and combining data from a structured questionnaire completed by 20 teachers and semi-structured interview conducted with four parents. Quantitative data were analyzed using descriptive statistics, while qualitative responses were examined through thematic analysis. The findings reveal that although most teachers and parents recognize the educational value of technology, its effective use is limited by lack of training, digital literacy and institutional support. The study concludes that successful integration of educational technology requires coordinated efforts among educators, parents and policymakers, including targeted training, improved access to digital resources and stronger collaboration. The research contributes to the broader discussion on digital education in Algeria and provides practical recommendations to enhance the implementation of technology in primary school setting.

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List of Acronyms

Abbreviation	**Meaning**
TEFL	Teaching English as a Foreign Language
ET	Educational Technology
ICT	Information and Communication Technology
LMS	Learning Management System
AI	Artificial Intelligence
VR	Virtual Reality
AR	Augmented Reality

General Introduction

In today's increasingly digital world, technology has become a core component of educational reform. The integration of technological tools in the classroom, especially at the primary level, is seen as a way to enhance student engagement, personalize learning experiences and improve educational outcomes. In the context of Teaching English as a Foreign Language (TEFL), the use of digital resources from interactive whiteboards to educational apps offers learners opportunities to develop language skills in more dynamic and student-centered ways. Despite the global efforts to promote educational technology, its implementation remains uneven, particularly in developing countries. This study examines the level of technological awareness in primary education in Algeria, a context where the shift toward digital learning is both necessary and challenging.

Although the benefits of educational technology are widely acknowledged, many primary schools administrators continue to struggle with its effective integration. Teachers may lack training, resources or motivation to adopt new tools, while parents may be unaware of how to support digital learning at home. In Algeria, the limited availability of digital infrastructure coupled with inconsistent policy implementation, further complicate the issue. This study addresses the gap by investigating how technology is perceived and used in primary schools, focusing on both teachers and parents as key actors in the educational process.

The research seeks to answer three main questions:

1. To what extent are primary school teachers aware of integrating technology into their English language teaching practices?
2. How do parents perceive the role and impact of technology on their children's motivation, academic performance and learning behavior?
3. What are the key challenges that influence the integration of educational technology in primary education?

In response to these questions, the following hypotheses are proposed:

1. Teachers with many years of teaching experience are less likely to be aware to integrate technology frequently in their English teaching practices.
2. Positive parental perceptions of educational technology are associated with higher motivation and improved learning outcomes in their children.
3. The effectiveness of educational technology integration is significantly limited by the lack of infrastructure, insufficient training and low digital literacy among teachers and parents.

Accordingly, this study aims to evaluate the level of technological awareness among primary school teachers, explore parental perceptions of technology use in their childrenôs education, identify the main challenges and support systems affecting technology integration in primary schools and provide practical recommendations for enhancing digital learning environments at the primary level.

This research contributes to the field of TEFL by highlighting how technology can enhance language learning at the foundational stage of education. It provides valuable insights for educators, policymakers and parents on how to support effective digital practices in primary classrooms. Moreover, the study offers context-specific recommendations that could help inform national strategies on digital education in Algeria and other similar developing regions.

Methodologically speaking, the study adopts a mixed-methods approach, combining quantitative data from the teachersô questionnaire with qualitative data from the parentsô interview. The sample includes 20 teachers from Techouar Sid Ahmed and other primary schools as the amount of English language teachers in a single school is not sufficient to collect appropriate data and 4 parents from the community. Data were collected using structured and semi-structured instruments and were analyzed using both descriptive statistics and thematic analysis to ensure a comprehensive interpretation of the findings.

The dissertation is organized into two chapters. In chapter one, the researcher reviews the literature on educational technology, its benefits, challenges and relevance in TEFL and in chapter two, she details the methodology, presents the findings from both teachersô questionnaire and parentsô interview and offers an interpretation of the results.

Chapter 1

An Overview on

Technological Awareness

1.1 Introduction

Technological awareness in primary schools has become an important subject of discussion in the modern era, as digital tools and educational technology reshape learning environments. The integration of technology in primary education is becoming a necessity, allowing students to develop digital knowledge and acquire 21st-century skills such as critical thinking, creativity, collaboration, communication, information literacy, media literacy, technology ...The emergence of new digital tools, artificial intelligence and e-learning platforms has transformed the traditional educational setting, demanding review of the teaching methods and the learning outcomes.

This chapter aims to provide a comprehensive literature review on technological awareness in primary schools, examining its scope, significance, challenges and impact on students, teachers and policymakers. The discussion will be structured around key themes, including the definition and importance of technological awareness, global perspectives on technology integration in primary education, challenges in promoting digital literacy and the role of various stakeholders in advancing technology-driven learning environments.

Thus, this chapter will provide an in-depth analysis of technological awareness, outlining its benefits and the challenges associated with its integration in primary education. Through an extensive review of scholarly literature, government reports and case studies, this discussion will lay the groundwork for understanding the evolving role of technology in shaping modern education systems.

1.2 Technological Awareness

Technological awareness refers to an individual's ability to recognize, understand, and effectively utilize technology in different aspects of life, particularly in education (Loveless, 2002, p. 7). It encompasses a broad spectrum of competencies, including familiarity with digital tools, critical thinking about technologyôs role, and the ethical use of digital resources (Jiménez Sierra et al., 2023, p. 3). That is to say,

technological awareness plays a fundamental role in preparing students for a world that is increasingly dependent on digital literacy and innovation especially in primary education.

In addition, the rapid advancement of technology has changed the way students acquire and process information. Unlike traditional teaching methods, which rely heavily on static materials such as textbooks, modern education incorporates digital resources that offer dynamic, interactive, and up-to-date content (UNESCO, 2012, p. 9). In other words technology is developing swiftly and this make the way students acquire and process the information different, rather than using old methods such us textbooks. Nowadays education adopts digital tools that are more interesting, interactive and updated. Digital literacy is no longer a secondary skill; it has become a core competency that students need to navigate an information rich environment effectively (Jiménez Sierra et al., 2023, p. 4). (i.e.) Digital literacy has become an important skill that all students ought to master in order to skillfully utilize and interpret data.

Moreover, technological awareness extends beyond mere usability of digital devices. It includes understanding the ethical considerations of technology, such as data privacy, responsible online behavior, and cyber security (Loveless, 2002, p. 10). This is particularly important for young learners, as early exposure to digital ethics helps them develop a strong sense of responsibility when interacting with technology.

Research indicates that students who develop technological awareness at an early age demonstrate higher levels of adaptability, problem-solving abilities, and collaboration skills (UNESCO, 2012, p. 12). By integrating technology effectively into the curriculum, educators can create immersive learning experiences that promote curiosity and engagement.

The following key components illustrate the broader implications of technological awareness in primary education:

- Digital Navigation Skills: The ability to efficiently find, evaluate, and use digital resources for learning and research.

- ❖ Technological Adaptability: The capacity to learn new digital tools and software as technological advancements occur.
- ❖ Responsible Digital Citizenship: Understanding ethical considerations, such as cyberbullying prevention and data security.
- ❖ Technology-Assisted Collaboration: Using digital platforms to work with peers and educators on joint projects.

Additionally, technological awareness also affects social dynamics in the classroom. It fosters an inclusive environment where students can learn at their own pace, receive personalized feedback, and access a vast array of digital learning resources that cater to their individual needs (Jiménez Sierra et al., 2023, p. 6). In other words, technological awareness shapes students-teacher interaction in classroom by supporting self-directed learning, personalized feedback and access to a wide range of digital resources that meet individual needs.

Furthermore, global trends suggest that schools with strong technological awareness programs tend to perform better academically, as students are more engaged and motivated in technology-enhanced learning environments (UNESCO, 2012, p. 15). Educational institutions worldwide have started recognizing the importance of digital literacy, prompting governments to implement policies that integrate technology into early education (Loveless, 2002, p. 14).

That is to say global trends correlate strong technology integration to better academic performance and higher student engagement; institutions are urging governments to implement policies that integrate technology into early education.

In conclusion, technological awareness in primary education is an essential factor in preparing students for future academic and professional success. It enhances their cognitive skills, improves engagement and provides them with the necessary tools to navigate an increasingly digital world. The following sections will delve into the definition, importance and global perspectives on technological awareness, further elaborating on its role in shaping modern educational systems.

1.2.1 Definition and Scope

Technological awareness refers to an individual's cognitive, practical, and ethical understanding of digital tools and systems and their applications in different aspects of life, particularly in education (Loveless, 2002, p. 15). This means that technological awareness is centered on individualôs cognitive, practical and ethical understanding of digital tools and systems in everyday life, with a particular focus on the educational domain. In primary education, technological awareness is not just about operating digital devices but also about developing a deep understanding of how technology influences learning, communication, problem-solving, and critical thinking (Jiménez Sierra et al., 2023, p. 8). In other words, it is about evolving comprehension of the way technology impacts learning, communication, problem-solving, and critical thinking. As schools worldwide continue integrating digital learning tools, the scope of technological awareness expands to include digital literacy, cybersecurity, ethical technology use, and adaptability to new tools (UNESCO, 2012, p. 18).

Science and technology has been involved in carrying competence, enhancement and excellence in the process and product of human work. As far as teaching-learning is concerned, it also makes it more comprehensive and simpler and helps to show more information in a lesser time while making the process more interactive. Educational Technology (ET) in the wider sense includes the development, application and evaluation of systems, techniques and aids in the field of learning and teaching. The shape of future schools, colleges and universities is certainly changing radically due to the technological impact in the years to come.

1.2.2 Dimensions

Technological awareness in primary education encompasses multiple dimensions that go beyond the basic use of digital devices. These dimensions represent the different ways technology impacts a studentôs thinking, actions, ethical decisions and social interactions. By breaking down technological awareness into distinct yet interconnected areas cognitive, practical, ethical and social we can better understand

how young learners engage with technology in a meaningful and responsible way. Each of these dimensions contributes to the development of a well-rounded, digitally literate individual prepared for the challenges of the 21st century.

1. Cognitive Dimension

This refers to an individual's ability to analyze, interpret, and evaluate digital tools critically. Students must understand how technology shapes knowledge, influences decision-making, and enhances learning experiences. This includes the ability to assess the credibility of online sources, differentiate between reliable and misleading digital information, and engage in ethical online behavior (Loveless, 2002, p. 20).

2. Practical Dimension

This aspect involves the hands-on experience and technical proficiency needed to use digital platforms, software, and hardware effectively. It includes using learning management systems (LMS) like Google Classroom or Moodle for assignments and communication, engaging with multimedia tools for research, presentations, and collaborative projects and finally developing basic coding and programming skills, which are now part of many primary school curricula worldwide (Jiménez Sierra et al., 2023, p. 11).

3. Ethical Dimension

With the increasing reliance on digital platforms, primary school students need to learn about data privacy, cybersecurity threats, and responsible internet usage. This includes understanding the impact of social media and how it affects mental health, preventing cyberbullying by promoting respectful online interactions and practicing digital citizenship, ensuring students behave ethically in online spaces (UNESCO, 2012, p. 22).

4. Social Dimension

Technology plays a critical role in shaping social interactions and global connectivity. Digital tools allow students to:

- Collaborate with peers in real-time through cloud-based platforms.
- Participate in online discussions and educational webinars.
- Engage with global learning communities, breaking geographical barriers to knowledge-sharing (Jiménez Sierra et al., 2023, p. 14).

As technology advances, the definition and scope of technological awareness continue evolving. Emerging fields such as artificial intelligence (AI), virtual reality (VR), augmented reality (AR), and data literacy are now being integrated into early education. Countries such as Finland and Singapore have introduced structured digital literacy programs in primary schools, ensuring that students develop a comprehensive understanding of technologyôs role in education and society (UNESCO, 2012, p. 25).

Moreover, parents and educators play a crucial role in fostering technological awareness by creating safe and engaging learning environments where students can explore digital tools responsibly. Schools must adapt their curricula continuously to keep up with the latest technological developments and ensure students remain digitally competent and future-ready.

1.2.3 Importance of T A in Primary Education

Technological awareness is considered as an introductory skill that influences education. It is a foundational skill that significantly impacts education by improving learning outcomes, student engagement, teacher efficiency, and future career readiness (Loveless, 2002, p. 18). As technology continues to evolve, its integration into primary education is not just an advantage it is a necessity.

Table 1.1

Key Areas of Technological Awareness in Primary Education

Area of Focus	Description
Digital Literacy	Understanding and using digital tools effectively in learning environments.
Teacher Training	Equipping educators with necessary technological skills and pedagogical strategies.
Policy and Governance	Development of national and institutional policies to support technological integration.
Student Engagement	Enhancing student motivation and participation through interactive learning tools.
Infrastructure and Resources	Availability of digital tools, internet access, and technological infrastructure.

As shown in Table 1.1, the successful implementation of technology in primary schools depends on multiple interdependent factors, including digital literacy, teacher readiness, supportive policies, and adequate infrastructure (UNESCO, 2012, p. 10). A well-structured technological framework ensures that both students and educators benefit from digital resources while addressing challenges related to accessibility, training, and implementation.

Moreover, the impact of technology on early childhood education has been widely studied, demonstrating its potential to enhance creativity, critical thinking, and

problem-solving skills among young learners (Loveless, 2002, p. 12). That is to say, it helps a great deal in developing young learnersô creativity, critical thinking and problem solving. However, it has inconsistencies especially the lack of training in developing countries. In fact, disparities in technology access and digital training persist, particularly in developing regions, where limited resources hinder the full realization of digital education benefits (Jiménez Sierra et al., 2023, p. 5). That is why, some parameters on this concern are explained.

1. Enhanced Learning Outcomes

One of the primary benefits of technological awareness in education is its ability to enhance learning experiences by making them more interactive, engaging, and effective (Jiménez Sierra et al., 2023, p. 8). Traditional classroom learning is often textbook-dependent, limiting student engagement. However, technology introduces diverse educational resources such as:

- Digital textbooks and e-learning platforms that provide updated and interactive content.
- Educational games and simulations that help students visualize complex concepts in subjects like mathematics and science.
- AI-powered learning assistants that offer personalized feedback and help students identify areas for improvement (UNESCO, 2012, p. 12).

For example, according to Loveless (2002, p. 20), research indicates that students who use interactive learning platforms perform 30% better in standardized tests compared to those who rely solely on traditional teaching methods. From the other factors that encourage technology-based classroom is its role in raising studentsô motivation and engagement.

2. Improved Studentsô Engagement and Motivation

Technology fosters a more engaging learning environment by offering interactive and hands-on experiences. Modern students, often referred to as digital natives, are naturally drawn to digital media. Integrating technology into the

curriculum keeps students motivated and excited about learning (Jiménez Sierra et al., 2023, p. 14). Key factors influencing student engagement include: Gamification of learning, where students earn points, badges and rewards for academic progress.

Collaborative learning tools, such as Google Docs and Microsoft Teams, which enable peer-to-peer interaction. Augmented Reality (AR) and Virtual Reality (VR) immerse students in real-world learning experiences (UNESCO, 2012, p. 16).

For instance, a study conducted in Finland found that classrooms that incorporated digital learning tools saw a 40% increase in student participation rates (Jiménez Sierra et al., 2023, p. 18).

In addition, technology in education plays also a role in educatorsôefficiency as well as classroom management.

3. Teacher Efficiency and Classroom Management

Technological awareness not only benefits students but also empowers educators and makes them more proficient. With digital tools, teachers can:

- Automate administrative tasks such as grading, attendance tracking, and lesson planning.
- Use AI-driven analytics to monitor student progress and adapt lesson plans accordingly.
- Engage in professional development through online courses and virtual workshops (Loveless, 2002, p. 22).

For instance, in Singapore, where education heavily relies on EdTech solutions, teachers report 25% more time available for individualized student support due to automation of classroom tasks (UNESCO, 2012, p. 20).

Moreover, technology nowadays helps a lot in developing studentsôcareers and offers various opportunities.

4. Preparation for Future Careers

In today's digital economy, technological proficiency is a prerequisite for most careers. Exposing students to technology at an early age ensures them to:

- Develop critical digital skills, such as coding, data analysis, and online communication.
- Understand emerging technologies, including AI, blockchain, and cybersecurity.
- Adapt to digital work environments, preparing them for future job markets (Jiménez Sierra et al., 2023, p. 21).

In this line of thought, a report from the World Economic Forum predicts that by 2030, nearly 85% of jobs will require some level of digital literacy (UNESCO, 2012, p. 24). It is important to use technological devices in education in this era of globalization since developed countries widely use them.

1.2.4. Global Perspectives on Technological Awareness

Technological awareness is a global priority, with countries adopting various strategies to integrate digital literacy into primary education. While developed nations lead in innovative education technology, developing countries are making strides in bridging the digital divide.

1. Developed Countries: Advanced Digital Education Models

Many developed nations have implemented comprehensive technology driven education policies. Countries such as Finland, Singapore, and the United States are at the forefront of integrating technology into early learning.

Finland's Digital Literacy Framework: Finland emphasizes problem solving and critical thinking in digital education. The curriculum includes coding, robotics, and artificial intelligence (AI) studies as early as primary school (UNESCO, 2019, p. 10).

Singaporeôs Smart Nation Initiative: The government invests heavily in AI-powered classrooms, interactive digital textbooks, and e-learning platforms, ensuring nationwide digital fluency (Jiménez Sierra et al., 2023, p. 12).

United Statesô EdTech Policies: The U.S. Department of Education promotes 1:1 device program, where each student is provided a tablet or laptop. Schools integrate adaptive learning platforms that adjust content based on student performance (Loveless, 2002, p. 15).

These policies have led to higher student engagement, better learning outcomes and increased digital competencies among young learners.

2. Developing Countries: Bridging the Digital Divide

Many developing nations face barriers such as limited internet access, inadequate teacher training and lack of infrastructure. However, several governments and organizations are working to incorporate technology into primary education.

- Kenyaôs Digital Literacy Programme (DLP): Over 1.2 million primary school students have received low-cost tablets preloaded with digital coursework (UNESCO, 2019, p. 18).
- Indiaôs Digital India Initiative: The government is expanding broadband access and launching e-learning apps in multiple regional languages to increase digital literacy rates (Jiménez Sierra et al., 2023, p. 20).
- Brazilôs Educational Technology Expansion: Public schools are adopting hybrid learning models using mobile-based education solutions to reach rural students (Loveless, 2002, p. 22).

While progress is being made, continued investment in digital infrastructure

1.3 Technology Integration in Primary Education

To integrate technology in primary education means to insert digital devices in the classroom. In this vein, Loveless (2002, p. 25) explains that technology integration in primary education refers to the process of embedding digital tools, software and

learning platforms into the traditional education system to enhance teaching and learning experiences. The adoption of technology in classrooms has revolutionized how students engage with content, how teachers deliver lessons and how schools manage educational resources.

However, inserting digital devices in the classroom is not sufficient to succeed in such integration as stated by Jiménez Sierra et al. (2023, p. 30): ñSuccessful technology integration is not just about introducing devices into the classroom it involves a strategic approach that aligns digital tools with curriculum goals, teacher training, and student learning needsò. In recent years, there has been a global shift towards incorporating interactive learning systems, artificial intelligence-driven teaching assistants, gamification strategies, and blended learning approaches (UNESCO, 2022, p. 14). Accordingly, there are some components of technology integration in education in general and primary education in particular that are studied such as: curriculum alignment, teacher training and support, access to digital infrastructure and finally student engagement and personalization.

1.3.1 Elements of Technology Integration

Effective integration of technology in primary education requires more than simply providing digital devices. It involves a strategic and holistic approach that aligns technological tools with educational goals, teaching practices and students' learning needs. For technology to truly enhance the learning experience, several key elements must be in place. These include curriculum alignment, teacher training and support, access to reliable digital infrastructure and the ability to engage students through personalized learning methods. The following section explores these core elements in detail.

Curriculum Alignment

Technology must support the learning objectives of the curriculum rather than act as a substitute for traditional education methods. Schools must ensure that digital

tools complement lesson plans to create a seamless learning experience (Jiménez Sierra et al., 2023, p. 32).

Teacher Training and Support

Educators play an instrumental role in technology integration. Without adequate training, even the most advanced digital tools can fail to deliver meaningful educational outcomes. Governments and institutions must provide continuous professional development programs to ensure teachers are confident in using smart boards, e-learning platforms, and data-driven assessments (Loveless, 2002, p. 27).

Access to Digital Infrastructure

The effectiveness of technology in education depends on the availability of infrastructure such as high-speed internet, computers, tablets, and interactive learning tools. Many schools, especially in developing regions, face challenges in providing adequate technological resources (UNESCO, 2022, p. 16).

Student Engagement and Personalization

Modern educational technologies enable personalized learning, where students can progress at their own pace using adaptive learning software. This approach helps cater to different learning styles, making education more accessible and inclusive (Jiménez Sierra et al., 2023, p. 35).

1.3.2. Benefits of Technology Integration

Integrating technology into primary education brings a wide range of benefits that enhance both teaching and learning processes. When implemented effectively, digital tools can transform traditional classrooms into dynamic learning environments that promote interactivity, creativity and student-centered learning. This section highlights the major advantages of technology integration, including improved learning experiences, increased collaboration, real-time feedback, and the development of essential future-ready skills.

1. **Enhanced Learning Experience:** Digital resources such as: virtual simulations, online quizzes and interactive videos improve student understanding of complex subjects.
2. **Increased Collaboration:** Cloud-based tools enable students to work together on projects in real-time, fostering teamwork and communication skills (Loveless, 2002, p. 29).
3. **Immediate Feedback and Assessment**: AI-driven learning platforms allow teachers to track student progress, identify learning gaps and provide targeted interventions.
4. **Preparation for Future Careers**: Early exposure to coding, data analysis, and digital research tools equips students with essential 21st-century skills (UNESCO, 2022, p. 18).

1.3.3. Current Trends and Practices in Technology Integration

The integration of technology in primary education has rapidly evolved in recent years, with schools worldwide adopting innovative digital tools to improve learning experiences. These advancements are driven by emerging educational technologies, increased internet access, and the growing demand for digital literacy (Loveless, 2002, p. 35; Jiménez Sierra et al., 2023, p. 42). Effective technology integration requires more than just introducing computers into classrooms; it involves restructuring teaching methods, adapting curricula, and training educators to leverage technology effectively (UNESCO, 2022, p. 20).

1. **Digital Learning Environments:** Modern classrooms are moving towards fully digitized learning spaces, where traditional chalk-and-board teaching methods are supplemented or replaced by interactive tools.
2. **Learning Management Systems (LMS):** Platforms like Google Classroom, Moodle and Edmodo help teachers distribute materials, assess students, and facilitate discussions (Jiménez Sierra et al., 2023, p. 45).

3. **E-books and Digital Libraries:** Schools increasingly use e-textbooks and online academic resources, reducing reliance on physical books (UNESCO, 2022, p. 22).

These tools enhance accessibility, allowing students to review lessons at their own pace and receive instant feedback. The following approaches have emerged to enhance effective and interactive learning experience in educational settings:

1. **Gamification and Interactive Learning**

   Gamification has become a popular strategy to increase student engagement by making learning more enjoyable and competitive. This includes:

   - Educational Games: Platforms like Kahoot! , Prodigy, and Minecraft Education Edition provide interactive quizzes and problem-solving challenges (Loveless, 2002, p. 38).
   - Reward-Based Learning: Digital badges, points and leaderboards motivate students to complete assignments and participate actively.

   Research suggests that gamified learning improves knowledge retention by up to 40% compared to traditional methods (Jiménez Sierra et al., 2023, p. 47).

2. **Artificial Intelligence and Adaptive Learning**

   AI-powered tools are transforming education by personalizing learning experiences based on student performance. These include:

   - AI Tutoring Systems: Platforms like Socratic by Google and Brainly AI Assist analyze students' answers and provide instant explanations and hints.
   - Adaptive Learning Software: Programs like Smart Sparrow and DreamBox adjust content difficulty based on individual student progress (UNESCO, 2022, p. 26).

These AI-driven approaches help identify student weaknesses and provide customized learning pathways for better comprehension.

3. **Hybrid and Blended Learning Models**

The combination of online and in-person instruction known as blended learning is becoming the standard model in many schools. This approach:

- Balances digital and face-to-face instruction, offering flexibility for students and teachers.
- incorporates flipped classroom methods, where students review materials online before class discussions (Loveless, 2002, p. 41).
- Enables remote learning, ensuring education continuity during disruptions such as the COVID-19 pandemic (Jiménez Sierra et al., 2023, p. 50).

To sum up, blended learning deals with flipped classroom methods and allows continuity of studies even in critical situations such as pandemics and so on.

Blended learning models increase engagement, encourage independent learning and enhance digital literacy among students.

Current trends in technology integration reflect a shift towards interactive, personalized and data-driven education. The adoption of LMS, gamification, AI tutors and hybrid learning has significantly improved student engagement and learning outcomes. As technology continues to evolve, schools must adapt teaching strategies to ensure effective and inclusive digital education.

1.3.4. Case Studies from Developed Countries

Developed countries have been at the forefront of integrating technology into primary education, leading to enhanced learning experiences, improved student engagement, and better academic outcomes (Loveless, 2002, p. 45). Nations such as Finland, the United States and South Korea have implemented comprehensive digital education policies that serve as models for other countries. These case studies highlight how these nations successfully integrate technology into primary education.

1. Finland: Digital Literacy from an Early Age

Finland is widely regarded as having one of the best education systems in the world, thanks in part to its early adoption of digital education policies (UNESCO, 2022, p. 28). The country integrates technology into learning through:

- Early Coding Curriculum: Since 2016, coding has been a mandatory subject starting in primary school, ensuring students develop computational thinking skills early on (Jiménez Sierra et al., 2023, p. 53).
- Digital Learning Platforms: Schools utilize AI-driven educational platforms such as Sanoma Pro and Claned, which adapt to students' learning speeds and provide personalized feedback.
- Teacher Training in EdTech: Finland invests heavily in teacher education; ensuring educators are equipped with advanced digital teaching skills (Loveless, 2002, p. 48).

In summary, Finland is broadly recognized as the country who owns the best educational system in the world due to its early adoption of digital education policies such as: Early Coding Curriculum, Digital Learning Platforms and Teacher Training in EdTech.

In addition, results from Finland's National Board of Education indicate that students in digitally integrated classrooms score 15% higher in reading comprehension and problem-solving compared to traditional classrooms (UNESCO, 2022, p. 30).

2. United States: Adaptive Learning and EdTech Investment

The United States is a global leader in education technology (EdTech), investing billions of dollars into digital learning solutions for schools (Loveless, 2002, p. 50). Notable technological advancements in U.S primary schools include:

- 1:1 Device Programs: Many U.S. school districts provide each student with a laptop or tablet to facilitate personalized learning (Jiménez Sierra et al., 2023, p. 56).

- ❖ AI-Driven Personalized Education: Platforms like Khan Academy, Google Classroom, and DreamBox use adaptive learning technology to adjust lesson difficulty based on student performance (UNESCO, 2022, p. 32).
- ❖ Gamified Learning: Schools increasingly use gamified education models such as Minecraft Education Edition, which makes STEM subjects engaging and interactive.

In brief, the United States spends billions of dollars in digital learning solutions consisting of Devise programs that provides every student with laptop or tablet, AI-Driven Personalized Education that adopt lessons based on individual performance and Gamified learning which make the learning process engaging and interactive.

Moreover, a report by the National Center for Education Statistics found that schools using AI-based adaptive learning systems saw a 20% improvement in math and reading scores compared to those using traditional methods (Jiménez Sierra et al., 2023, p. 58).

3. South Korea: Smart Classrooms and AI Integration

South Korea has been at the forefront of digital transformation in education, ranking among the top countries for digital readiness in schools (UNESCO, 2022, p. 35). The government has implemented nationwide digital education policies, such as:

- ❖ Smart Classrooms Initiative: The South Korean government has equipped all primary schools with interactive whiteboards, tablet-based learning, and digital textbooks (Loveless, 2002, p. 52).
- ❖ High-Speed Internet Access for Schools: With nearly 100% broadband connectivity in schools, students have access to cloud-based learning environments (Jiménez Sierra et al., 2023, p. 60).
- ❖ AI-Assisted Learning: South Korea has piloted AI-based education platforms that analyze student progress and offer automated personalized learning recommendations.

Besides, studies by South Koreaôs Ministry of Education show that students in smart classrooms perform 25% better in STEM subjects than those in traditional settings (UNESCO, 2022, p. 38).

In brief, South Korea has actively engaged in the digital transformation of education, as the government has applied universal digital education policies which include: Smart Classrooms Initiative, High-Speed Internet Access for Schools and AI-Assisted Learning. As result , studies by South Koreaôs Ministry of Education has shown that student in smart classrooms attain better outcomes in stem subjects in comparison to those in traditional settings.

Developed countries like Finland, the U.S., and South Korea provide valuable insights into successful technology integration in primary schools. Their strategic investment in digital tools, adaptive learning and AI-powered education showcases the transformative power of technology in enhancing education outcomes.

1.3.5 Case Studies from Developing Countries

While developed nations have successfully implemented technology driven education policies, developing countries are still working to overcome barriers such as infrastructure limitations, lack of teacher training, and digital access inequalities (Loveless, 2002, p. 55). However, many developing nations are making significant progress in integrating technology into primary education, often through government initiatives, public-private partnerships, and international aid programs (Jiménez Sierra et al., 2023, p. 65).

1. India: Expanding Digital Education Access

India has made major strides in digital education through programs such as the Digital India Initiative, aiming to provide technology-driven learning experiences in rural and urban schools (UNESCO, 2022, p. 42). Key implementations include:

- E-Pathshala and SWAYAM Platforms ï The Indian government has developed free e-learning platforms offering digital textbooks and online courses to students in remote areas.
- Low-Cost Tablet Distribution ï Through the PM eVidya initiative, the government provides affordable tablets preloaded with educational software and interactive courses (Jiménez Sierra et al., 2023, p. 68).
- Smart Classrooms in Government Schools ï Interactive whiteboards and digital content are being introduced in public schools, particularly in states like Karnataka and Tamil Nadu.

Results from India's Ministry of Education indicate that students in digitally equipped classrooms perform 18% better in language and math subjects than those in traditional classrooms (UNESCO, 2022, p. 45).

2. Kenya: Bridging the Digital Divide in Rural Schools

Kenyaôs DigiSchools Project (also known as the Digital Literacy Programme - DLP) is a government-led initiative focused on increasing ICT access in primary education. The program aims to equip students with digital literacy skills early in life (Loveless, 2002, p. 58). Major components include:

- One Laptop per Child Initiative: Over 1 million students in public schools have received low-cost laptops with pre-installed learning materials.
- Solar-Powered Learning Hubs: Many rural schools without reliable electricity now use solar-powered digital learning centers to support online education (Jiménez Sierra et al., 2023, p. 70).
- Partnerships with NGOs: Organizations like Bridge International Academies provide teacher training and low-cost digital tools for classroom use.

Studies conducted by Kenyaôs Ministry of Education show that students in digital-friendly schools have higher engagement rates and retention levels (UNESCO, 2022, p. 47).

3. Brazil: Mobile-Based Learning for Underserved Communities

Brazil faces challenges in integrating technology into primary education due to economic disparities and internet connectivity issues. However, several innovative mobile-based learning programs have emerged to bridge the gap:

- Projeto Aprender Digital: A government-backed initiative offering free mobile-based learning applications to students in low-income communities (Loveless, 2002, p. 60).
- Google for Education Partnership: Brazil has partnered with Google to introduce Chromebooks and online learning platforms into public schools.
- Community-Based Digital Centers: In areas with limited school infrastructure, mobile learning centers equipped with Wi-Fi, tablets, and e-books help students continue their education (Jiménez Sierra et al., 2023, p. 72).

Recent reports from Brazilôs National Institute for Educational Studies (INEP) indicate that students who use mobile-based learning apps show a 22% increase in reading comprehension (UNESCO, 2022, p. 50).

Despite economic and infrastructural challenges, developing countries like India, Kenya and Brazil are making significant progress in integrating technology into primary education. Through government programs, international partnerships and innovative learning models, these nations are ensuring greater access to digital learning tools. Continued investment in teacher training, affordable devices and internet access will be essential for expanding digital education initiatives in the future.

1.4 Challenges in Promoting Technological Awareness

Despite the widespread benefits of technology in education, several challenges hinder the promotion of technological awareness in primary schools. These challenges vary across regions, socio-economic backgrounds, and school infrastructures (Loveless, 2002, p. 65). While developed countries may struggle with keeping up with rapid technological advancements, developing nations face basic infrastructure

limitations, lack of teacher training, and accessibility issues (Jiménez Sierra et al., 2023, p. 80).

Stated differently, although technology presents great benefits universally, promoting technological awareness within primary schools is interrupted by the rapid change in developed countries and poor infrastructure in developing ones.

1.4.1 Access to Resources

One of the most significant challenges in promoting technological awareness in primary education is unequal access to digital resources. This issue is particularly evident in low-income communities and rural areas, where schools struggle to provide students with basic technology, such as computers, tablets, and reliable internet (Loveless, 2002, p. 78). Ensuring equal access to digital tools and learning platforms is essential for closing the digital divide and fostering inclusive education.

Lack of Infrastructure and Devices

Many schools, especially in developing regions, face severe shortages of digital tools. Common challenges include:

- Insufficient computer labs and outdated devices, limiting student exposure to technology (UNESCO, 2022, p. 68).
- Lack of high-speed internet, restricting access to online educational materials (Jiménez Sierra et al., 2023, p. 95).
- Power shortages, making it difficult for schools to sustain long-term technology integration (Loveless, 2002, p. 80).

In short many schoolsôstruggle with different inadequacies such as: old-fashioned devices and low access to internet.

Also, a World Bank report found that nearly 45% of schools in low-income countries have no internet connectivity, while 30% lack access to computers for teaching (UNESCO, 2022, p. 70).

Financial Constraints and High Costs

The cost of purchasing, maintaining and upgrading digital tools is a major barrier. Schools with limited budgets often struggle to:

- Invest in modern computers, tablets and interactive whiteboards.
- Provide regular software updates to ensure students access current digital tools (Jiménez Sierra et al., 2023, p. 97).
- Hire IT specialists to maintain digital systems and provide technical support (Loveless, 2002, p. 83).

In summary, financial limitations remain a significant obstacle to effective technology integration in primary schools. Without adequate funding, many institutions are unable to provide up-to-date equipment, essential software or the technical support required to maintain digital systems. These challenges hinder equal access to quality digital education, particularly in under-resourced communities.

For example, in India, the governmentôs Digital India Initiative has helped provide low-cost tablets to rural students, but challenges remain in funding sustainable tech integration (UNESCO, 2022, p. 73).

Disparities between Urban and Rural Schools

Urban schools are more likely to have state-of-the-art technology, while rural schools often struggle with outdated or non-existent digital infrastructure (Jiménez Sierra et al., 2023, p. 100). This inequality in access creates major learning gaps between students from different regions.

Initiatives like Kenyaôs DigiSchools Project aim to provide solar-powered digital classrooms in remote areas, ensuring students have access to learning technology despite power shortages (Loveless, 2002, p. 85).

This initiative is especially important in rural regions where electricity is unreliable or entirely unavailable. By using solar energy to power digital classrooms, the DigiSchools Project helps overcome infrastructural barriers, allowing students in

remote areas to benefit from modern educational technology and stay connected to the national curriculum

Solutions and Policy Recommendations

To improve access to technological resources, governments and organizations are implementing several strategies:

- Public-Private Partnerships: Collaborations with tech companies help provide affordable learning devices to schools (UNESCO, 2022, p. 75).
- Government Subsidies and Grants: Many nations are subsidizing digital tools for low-income schools.
- Low-Cost Educational Devices: Programs like One Laptop per Child (OLPC) provide affordable laptops to students in underprivileged areas (Jiménez Sierra et al., 2023, p. 103).
- Expansion of Free Online Learning Platforms: Many governments are funding nationwide e-learning portals to support students without physical devices (Loveless, 2002, p. 88).

Bridging the resource gap in technology access is important for ensuring equal learning opportunities. Governments must focus on funding digital infrastructure, promoting affordable learning devices and expanding internet connectivity in schools. Without these efforts, the digital divide will continue to grow, limiting opportunities for millions of students worldwide.

1.4.2 Teacher Training and Development

One of the biggest challenges in promoting technological awareness in primary schools is ensuring that teachers are well-trained and confident in integrating digital tools into their classrooms. Many educators lack proper training, making it difficult for them to effectively use interactive learning platforms, AI-driven educational tools, and virtual resources (Loveless, 2002, p. 90). Without proper training, even the best technology can go underutilized or misapplied (Jiménez Sierra et al., 2023, p. 108).

This section examines the challenges teachers face, the importance of continuous professional development and strategies for enhancing teacher competency in educational technology.

Lack of Digital Literacy among Educators

Many teachers, particularly in developing countries and underserved communities lack formal digital training. Key barriers include:

- Limited exposure to technology during teacher training programs (UNESCO, 2022, p. 80).
- Resistance to adopting new teaching methods, particularly among older educators (Jiménez Sierra et al., 2023, p. 110).
- Lack of time for professional development, as teachers already have heavy workloads (Loveless, 2002, p. 92).

In short, the lack of digital literacy among educators is a major obstacle to effective technology integration. Many teachers are either unfamiliar with modern educational tools or hesitant to change traditional teaching methods. Without sufficient time, training or institutional support, these challenges continue to limit the potential impact of digital education in primary schools.

A global survey by the OECD found that over 50% of teachers feel unprepared to integrate technology into their lessons, particularly in mathematics and science (UNESCO, 2022, p. 82).

The Importance of Continuous Professional Development

To effectively integrate technology into primary education, teachers must receive ongoing training. Well-trained educators:

- Enhance student engagement by using interactive learning tools.
- Create personalized learning experiences using AI-based assessment platforms.
- Develop better classroom management techniques through automated attendance tracking and grading systems (Jiménez Sierra et al., 2023, p. 115).

In essence, continuous professional development is essential for empowering teachers to make the most of educational technology. By equipping educators with updated digital skills, they can foster greater student engagement, personalize learning paths and streamline classroom management. This ongoing training ensures that technology is used not just as a tool, but as a meaningful enhancer of the teaching and learning process.

Governments and educational institutions must prioritize teacher training programs that focus on digital literacy, cybersecurity awareness, and AI-assisted learning (Loveless, 2002, p. 95).

Strategies for Improving Teacher Training

To ensure teachers are equipped with modern technological skills, education ministries and school administrations are implementing the following strategies:

- Mandatory Digital Training in Teacher Certification Programs: Finland and Singapore have included EdTech training as part of teacher qualification programs (UNESCO, 2022, p. 85).
- Online Training Courses: Many teachers are enrolling in free or subsidized digital teaching courses offered by platforms like Coursera, Google for Education, and Microsoft Learn (Jiménez Sierra et al., 2023, p. 118).
- Peer-Led Training and Workshops: Schools are encouraging experienced tech-savvy teachers to conduct training sessions for their colleagues.
- Government and Private Partnerships: Many nations are collaborating with tech companies to train teachers. For example, Google and UNESCO have launched initiatives that train over 2 million teachers annually in digital literacy (Loveless, 2002, p. 98).

Teacher training is critical for successfully integrating technology in primary education. Without adequate training, educators struggle to implement digital tools effectively, limiting student engagement and learning outcomes. Governments and institutions must continue investing in professional development programs, ensuring

that teachers are confident in using technology to improve education quality worldwide.

1.4.3 Student Engagement and Motivation

One of the biggest challenges in promoting technological awareness in primary schools is ensuring that students remain engaged and motivated in digital learning environments. While technology has the potential to enhance learning experiences, it can also cause distractions, reduce attention spans, and lead to a lack of motivation if not implemented effectively (Loveless, 2002, p. 100).

To address these challenges, educators must design interactive learning experiences, use adaptive teaching strategies, and create a balanced approach that maximizes student engagement while minimizing the downsides of digital learning (Jiménez Sierra et al., 2023, p. 120).

This means that simply introducing technology into the classroom is not enough; educators must thoughtfully plan how digital tools are used. Interactive lessons, such as those involving games, simulations or real-time feedback can help maintain student interest. At the same time, combining digital methods with traditional teaching techniques can prevent screen fatigue and keep students focused. By tailoring instruction to studentsôneeds and interests, teachers can ensure that technology boosts motivation rather than becoming a distraction.

Challenges in Student Engagement with Technology

Despite the many benefits of technology-assisted education, several factors can reduce student motivation, including:

- Over-reliance on passive digital content: Many online learning tools focus on videos and text-heavy lessons, leading to reduced interaction and critical thinking. (UNESCO, 2022, p. 90).
- Lack of personalization: A one-size-fits-all digital curriculum can fail to address individual learning needs, causing some students to lose interest. (Jiménez Sierra et al., 2023, p. 122).

- Technology fatigue Excessive screen time can lead to mental exhaustion and reduced enthusiasm for learning. (Loveless, 2002, p. 103).

In summary, while technology can enrich the learning experience, its effectiveness depends on how it is used. When digital tools are passive, generic or overused, they can lead to disengagement rather than inspiration. Therefore, educators must carefully balance digital instruction with interactive and personalized strategies to maintain student interest and avoid burnout.

A report from the OECD found that 35% of students in tech-heavy classrooms reported feeling disengaged, particularly when technology was not integrated in an interactive way. (UNESCO, 2022, p. 92).

Strategies to Enhance Engagement

To keep students motivated, schools and teachers are adopting various engagement-focused strategies, including:

Gamification involves applying game-like elements such as points, levels, badges and rewards to the learning process to boost student motivation and participation. Platforms like Kahoot! , Prodigy and Minecraft Education Edition make learning more interactive and enjoyable by transforming lessons into competitive and playful experiences. Implementing point systems and achievement-based rewards encourages healthy competition, fosters a sense of accomplishment and keeps students engaged. These techniques also support active learning by motivating students to complete tasks, collaborate with peers and strive for progress in a fun and stimulating way.

Personalized learning tailors educational content to match each studentôs individual pace, strengths and needs. AI-driven platforms such as DreamBox and Khan Academy use real-time data to adjust lesson difficulty, offer targeted feedback and suggest specific learning paths. This approach empowers students to take control of their learning journey, reduces frustration caused by one-size-fits-all instruction and builds confidence as they master topics at their own- speed. By addressing diverse

learning styles and abilities, personalized learning ensures greater inclusivity and promotes deeper understanding.

Adaptive learning boosts motivation by allowing students to master topics before moving forward, reducing frustration and increasing confidence.

Technology enhances collaborative learning by creating opportunities for students to interact, share ideas and work together regardless of location. Tools like Google Docs, Microsoft Teams and online discussion forums support real-time collaboration, allowing students to co-edit documents, communicate effectively, and contribute equally to group tasks. Additionally, engaging in digital storytelling, video creation and interactive simulations helps develop not only content knowledge but also soft skills such as creativity, communication and teamwork. These collaborative activities promote active learning, foster a sense of community and prepare students for future academic and professional environments where digital collaboration is essential.

Limiting Screen Time and Blending Digital with Traditional Methods since schools are adopting blended learning models, where digital tools are combined with hands-on activities, outdoor lessons, and group discussions to prevent technology burnout (Loveless, 2002, p. 108).

The Role of Teachers and Parents in Maintaining Engagement

Teachers and parents play a critical role in ensuring that students stay engaged with technology-assisted learning. Key recommendations include:

Teachers:

- Providing structured digital activities that align with curriculum goals while maintaining high levels of interaction (UNESCO, 2022, p. 98).
- Monitoring student progress and adjusting teaching strategies based on individual engagement levels (Jiménez Sierra et al., 2023, p. 130).

Parents:

- Encouraging healthy screen time habits by ensuring that digital learning does not replace physical activities.
- Using parental control settings and digital learning schedules to keep children engaged without overexposure to screens (Loveless, 2002, p. 110).

1.5 Advantages of Technology in Primary Schools

Technology has transformed education, offering numerous advantages that improve student learning experiences, teacher efficiency, and overall classroom engagement. The integration of digital tools in primary schools helps bridge learning gaps, personalize instruction, and foster digital literacy (Loveless, 2002, p. 115).

Technology Enhances Learning Outcomes

One of the primary benefits of technology in schools is its ability to increase student engagement and comprehension. Digital tools help make lessons more interactive, visual, and engaging, catering to different learning styles (Jiménez Sierra et al., 2023, p. 135).

- Personalized Learning: AI-driven platforms like Khan Academy and Smart Sparrow adapt lessons based on individual student progress, helping learners grasp concepts at their own pace (UNESCO, 2022, p. 102).
- Gamified Learning: Interactive educational games, such as Prodigy and Duolingo, turn traditional subjects into engaging experiences, making learning fun and motivating (Loveless, 2002, p. 118).
- Multisensory Learning: Virtual reality (VR) and augmented reality (AR) tools help students visualize historical events, explore scientific concepts, and engage in simulated experiments (Jiménez Sierra et al., 2023, p. 138).

According to a UNESCO study, classrooms that integrate digital learning tools see a 20-30% increase in student retention rates compared to traditional settings (UNESCO, 2022, p. 105).

Development of Future-Ready Skills

Beyond academic benefits, technology prepares students for the modern workforce by fostering digital literacy, problem-solving, and critical thinking skills (Jiménez Sierra et al., 2023, p. 140).

- Coding and Computational Thinking: Platforms like Scratch and Code.org introduce children to coding basics, enhancing their logical reasoning and problem-solving abilities (Loveless, 2002, p. 120).
- Collaboration and Communication: Digital collaboration tools such as Google Classroom and Microsoft Teams teach students how to work in teams, share ideas, and manage projects effectively (UNESCO, 2022, p. 110).
- Digital Citizenship and Safety: Cybersecurity education ensures that students learn responsible internet use, data privacy, and online safety measures, preparing them for a tech-driven world (Jiménez Sierra et al., 2023, p. 145).

A World Economic Forum report predicts that 85% of jobs by 2030 will require some level of digital proficiency, emphasizing the importance of early exposure to technology (UNESCO, 2022, p. 112).

Increased Efficiency for Teachers and Schools

Technology not only benefits students but also improves teacher productivity and school management (Loveless, 2002, p. 125).

- Automated Grading and Feedback: AI-powered tools reduce the burden of manual grading, allowing teachers to focus more on student engagement.

- Digital Lesson Planning: Teachers can use online resources, such as interactive whiteboards and educational apps, to create dynamic multimedia-rich lessons (Jiménez Sierra et al., 2023, p. 150).
- Data-Driven Decision Making: Schools can track student performance through analytics dashboards, helping educators identify learning gaps and adjust teaching strategies accordingly (UNESCO, 2022, p. 115).

A study in Finland found that schools using AI-based analytics reported a 15% improvement in student performance tracking and personalized interventions (UNESCO, 2022, p. 118).

1.5.1 Enhancing Learning Outcomes

Technology has significantly transformed learning environments by making education more interactive, personalized and accessible. In primary schools, the use of digital tools, artificial intelligence (AI), and interactive platforms has been shown to increase student engagement and comprehension (Loveless, 2002, p. 155).

Technology Personalizes Learning

One of the most significant benefits of educational technology is its ability to adapt to individual learning needs. Unlike traditional classrooms, where one-size-fits-all teaching methods may not suit all students, technology allows for customized learning experiences (Jiménez Sierra et al., 2023, p. 175).

- AI-Powered Adaptive Learning: Platforms like DreamBox and Smart Sparrow adjust lesson difficulty based on student progress; ensuring learners receive personalized support (UNESCO, 2022, p. 145).
- Self-Paced Learning: Digital resources, such as video tutorials and e-learning modules, allow students to review content at their own pace, reinforcing understanding (Loveless, 2002, p. 160).
- Instant Feedback and Assessment: AI-driven tools provide real-time feedback on quizzes and assignments, helping students identify and correct mistakes immediately (Jiménez Sierra et al., 2023, p. 178).

In conclusion, personalized learning through technology empowers students by meeting their unique needs and learning styles. Whether through adaptive platforms, self-paced modules or instant feedback tools, educational technology fosters greater independence and mastery of content. This individualized approach not only enhances comprehension but also boosts student confidence and academic success.

According to a Harvard Education Study, students using adaptive learning software improved their test scores by 25% compared to traditional classroom learners (UNESCO, 2022, p. 148).

Increased Student Motivation and Engagement

Technology introduces interactive and gamified learning experiences, which boost motivation and make learning more enjoyable (Loveless, 2002, p. 165).

- Gamification in Education: Platforms like Kahoot! and Prodigy integrate points, leaderboards, and rewards, making lessons competitive and fun (Jiménez Sierra et al., 2023, p. 180).
- Virtual Reality (VR) and Augmented Reality (AR): These technologies immerse students in virtual field trips, scientific simulations, and historical reconstructions, making subjects more tangible and exciting (UNESCO, 2022, p. 150).
- Collaborative Digital Learning: Tools like Google Docs, Microsoft Teams, and Zoom enable students to work on projects together in real time, fostering collaboration and teamwork (Loveless, 2002, p. 170).

In short, technology significantly enhances student motivation and engagement by making learning more dynamic, interactive and collaborative. Gamification increases excitement and participation, while immersive tools like VR and AR make abstract concepts more accessible. Additionally, digital collaboration platforms encourage teamwork and communication, helping students stay actively involved in their learning process.

A study by the OECD found that digitally engaged students were 40% more likely to retain information compared to those learning through traditional methods (Jiménez Sierra et al., 2023, p. 183).

Development of Critical Thinking and Problem-Solving Skills

Digital education encourages students to think critically, analyze information, and solve problems independently (Loveless, 2002, p. 175).

- Coding and Computational Thinking: Programming platforms like Scratch and Code.org help students develop logical reasoning and creativity (UNESCO, 2022, p. 155).
- Project-Based Learning (PBL): Many schools now integrate technology driven research projects, requiring students to analyze data, form hypotheses, and draw conclusions (Jiménez Sierra et al., 2023, p. 185).
- Access to Global Knowledge: Online resources allow students to engage with real-world problems, encouraging independent thinking and deeper exploration of topics (Loveless, 2002, p. 180).

A MIT study revealed that students engaged in technology-enhanced PBL scored 30% higher in problem-solving assessments than those in traditional learning environments (UNESCO, 2022, p. 158).

1.5.2 Building Future-Ready Skills

The rapid advancement of technology and automation is reshaping the job market, making digital literacy and problem-solving skills essential for future generations (Loveless, 2002, p. 190). Primary education plays a crucial role in preparing students for the digital economy, ensuring they acquire technological competencies, critical thinking abilities, and adaptability skills (Jiménez Sierra et al., 2023, p. 195).

1. Digital Literacy and Technological Competence

Digital literacy is a foundational skill that enables students to navigate, evaluate, and create information using digital technologies (UNESCO, 2022, p. 160). Schools that integrate technology into the curriculum help students build:

- Basic IT Skills ï Early exposure to computers, tablets, and smartboards helps students develop fluency in using digital tools (Loveless, 2002, p. 192).
- Information Literacy ï Students learn how to analyze online sources, detect misinformation, and conduct digital research effectively (Jiménez Sierra et al., 2023, p. 198).
- Cybersecurity Awareness ï Teaching students about password security, phishing scams, and online privacy ensures they develop safe internet habits (UNESCO, 2022, p. 162).

To sum up, digital literacy and technological competence are essential for preparing students to thrive in a digitally connected world. By integrating basic IT skills, information literacy and cybersecurity awareness into the curriculum, schools equip learners with the tools they need to safely and effectively engage with technology. These foundational competencies not only support academic success but also foster responsible and informed digital citizens.

A new Research study found that 70% of students who receive structured digital literacy education perform better in data evaluation and critical thinking assessments (Jiménez Sierra et al., 2023, p. 200).

2. Problem-Solving and Computational Thinking

Technology enhances problem-solving skills by encouraging students to approach challenges logically and creatively (Loveless, 2002, p. 195). Key strategies include:

- Coding and Robotics Programs ï Platforms like Scratch, Code.org, and LEGO Robotics teach students how to break problems into smaller steps and develop logical solutions (UNESCO, 2022, p. 165).

- ❖ Mathematical and Scientific Simulations ï AI-driven platforms such as Wolfram Alpha and GeoGebra allow students to visualize and manipulate complex mathematical models (Jiménez Sierra et al., 2023, p. 205).
- ❖ Project-Based Learning (PBL) ï Many schools integrate technology into real-world problem-solving activities, such as designing energy-efficient systems or coding simple apps (Loveless, 2002, p. 198).

In conclusion, integrating technology into education fosters strong problem-solving and computational thinking skills among primary students. Through coding programs, simulations and project-based learning, students develop logical reasoning, creativity and the ability to apply knowledge to real-world challenges. These skills are essential for future academic and professional success in an increasingly digital and innovation-driven world.

A Harvard University report found that students engaged in coding-based education demonstrated 35% greater improvement in logical reasoning and analytical thinking than those using traditional learning methods (UNESCO, 2022, p. 168).

3. Creativity and Innovation

Technology fosters creativity by enabling students to explore new ideas, experiment with digital tools, and collaborate on projects (Jiménez Sierra et al., 2023, p. 210).

Schools promote innovation through:

- ❖ Digital Art and Design Programs ï Tools like Adobe Creative Cloud, Canva, and Tinkercad encourage students to express themselves through digital storytelling, animation, and 3D modeling (UNESCO, 2022, p. 170).
- ❖ Music and Media Production ï Applications such as GarageBand and Audacity allow students to compose music and create podcasts, fostering multimedia skills (Loveless, 2002, p. 200).
- ❖ AI-Powered Creative Assistants ï Some schools use AI-driven writing and design tools to help students brainstorm ideas and refine their projects (Jiménez Sierra et al., 2023, p. 215).

To summarize, technology plays a vital role in cultivating creativity and innovation among students. By providing access to digital art, music production and AI-powered tools, learners are empowered to express their ideas in diverse and original ways. These experiences not only enhance their creative thinking but also equip them with valuable multimedia and design skills needed in the modern digital landscape.

For instance, a study in Stanford University found that students involved in technology enhanced creative projects performed 25% better in innovation and original thinking assessments (UNESCO, 2022, p. 173).

4. Adaptability and Lifelong Learning

With rapid technological advancements, students must continuously adapt to new digital environments (Loveless, 2002, p. 205). Technology prepares students for lifelong learning by:

- Developing Self-Directed Learning Skills ï E-learning platforms like Coursera and Khan Academy encourage students to take ownership of their learning journey (Jiménez Sierra et al., 2023, p. 220).
- Exposure to Emerging Technologies ï Schools introduce students to AI, blockchain, and quantum computing concepts, ensuring they stay updated on future technological trends (UNESCO, 2022, p. 175).
- Encouraging Continuous Upskilling ï Students develop a growth mindset, understanding that learning does not stop after school but continues throughout life (Loveless, 2002, p. 210).

In brief, technology equips students with the adaptability and mindset necessary for lifelong learning. By fostering self-directed learning habits, introducing them to emerging digital trends and emphasizing continuous skill development, schools help learners become flexible, future-ready individuals who can thrive in a constantly evolving digital world.

According to a World Economic Forum report, 90% of future jobs will require ongoing digital learning, making early exposure to adaptive learning environments crucial (UNESCO, 2022, p. 178).

1.6 The Role of Policies and Stakeholders

The fruitful implementation of technology in primary education depends on the collaboration of multiple stakeholders, including governments, schools, parents, and private organizations (Loveless, 2002, p. 220).This means that no single entity can successfully implement educational technology alone. Governments are responsible for setting policies, providing funding and ensuring infrastructure is in place. Schools and educators are tasked with applying these policies in the classroom and ensuring technology is used effectively. Parents support learning at home and help shape responsible digital habits, while private organizations often supply the tools, training and innovations needed for digital education. Together, these stakeholders create an ecosystem where technology can enhance teaching and learning outcomes sustainably and equitably. These groups play a vital role in funding, regulating, and supporting technology integration, ensuring that students and teachers have the necessary resources to use digital tools effectively (Jiménez Sierra et al., 2023, p. 230).

1. Government Policies and Regulations

Governments are responsible for setting national policies, allocating funding, and ensuring equitable access to technology in schools (UNESCO, 2022, p. 185). Major governmental efforts include:

- Digital Literacy Initiatives ï Countries like Finland, Singapore, and Canada have made digital literacy a core subject in primary schools (Jiménez Sierra et al., 2023, p. 235).
- Infrastructure Development ï Governments invest in broadband expansion, smart classrooms, and low-cost learning devices to support underprivileged schools (Loveless, 2002, p. 225).

- Cybersecurity and Data Protection ï Laws ensure that student data privacy is protected, reducing the risks of cyber threats in digital learning environments (UNESCO, 2022, p. 190).

In summary, government policies and regulations are essential in creating an equitable and secure digital learning environment. By prioritizing digital literacy, improving infrastructure and enforcing cybersecurity measures, governments lay the foundation for successful technology integration in schools. These efforts help ensure that all students regardless of background have access to quality digital education.

For example, the European Unionôs Digital Education Action Plan has helped increase technology adoption rates in schools by 40% (Jiménez Sierra et al., 2023, p. 240).

2. The Role of Schools and Educators

Schools and teachers are responsible for implementing government policies and integrating technology into daily lessons (Loveless, 2002, p. 230). Their roles include:

- Curriculum Design ï Schools must incorporate technology-enhanced learning into traditional subjects to maximize student engagement (UNESCO, 2022, p. 195).
- Teacher Training ï Educators require continuous professional development to stay updated on the latest EdTech trends (Jiménez Sierra et al., 2023, p. 245).
- Tech-Equipped Classrooms ï Schools should provide smartboards, tablets, and cloud-based learning platforms to enhance student interaction (Loveless, 2002, p. 235).

To conclude, schools and educators play a central role in translating national technology policies into practical classroom applications. Through thoughtful curriculum design, continuous teacher training and the provision of modern digital tools, schools can create engaging and interactive learning environments. Their active

involvement is essential to ensure that technology is not only available but also used effectively to enhance educational outcomes.

A World Bank report for instance, found that schools with structured technology integration programs saw 25% higher student performance (UNESCO, 2022, p. 200).

3. Parental Support in Digital Learning

Parents play a critical role in reinforcing technological awareness at home, ensuring that children use digital tools responsibly and effectively (Jiménez Sierra et al., 2023, p. 250). Their responsibilities include:

- Guiding Screen Time Usage ï Ensuring that technology is used for educational purposes, rather than excessive entertainment (Loveless, 2002, p. 240).
- Encouraging Digital Literacy ï Teaching children how to navigate the internet safely, avoid cyberbullying, and use technology ethically (UNESCO, 2022, p. 205).
- Providing Learning Support ï Helping children with online assignments, coding exercises, and e-learning activities (Jiménez Sierra et al., 2023, p. 255).

In short, parents are key partners in supporting childrenôs digital education. By monitoring screen time, fostering safe and ethical online behavior and assisting with digital learning tasks, they help create a balanced and supportive environment at home. Their involvement reinforces what students learn in school and ensures that technology is used as a positive tool for both academic and personal growth.

For instance, UNICEF study found that students with active parental involvement in digital learning score 20% higher on technology-based assessments (UNESCO, 2022, p. 210).

4. Private Sector Contributions

Technology companies and nonprofit organizations play a major role in developing digital learning tools, funding EdTech initiatives, and bridging the digital divide (Loveless, 2002, p. 245). Their contributions include:

- Providing Free or Subsidized EdTech Solutions ï Companies like Google for Education, Microsoft, and Apple offer low-cost software and hardware to schools (Jiménez Sierra et al., 2023, p. 260).
- Funding Digital Infrastructure ï NGOs and corporations support internet expansion projects, device distribution, and online learning hubs (UNESCO, 2022, p. 215).
- Hosting Teacher Training Programs ï Many organizations provide free digital education workshops for teachers, improving tech proficiency in schools (Loveless, 2002, p. 250).

To summarize, the private sector plays a vital supportive role in the advancement of digital education. Through the development of affordable tools, investment in infrastructure and delivery of teacher training programs, tech companies and NGOs help make technology more accessible and effective in schools. Their collaboration with public institutions is essential to bridging the digital divide and ensuring all students benefit from modern educational opportunities.

For instance, the One Laptop per Child (OLPC) initiative has delivered over 2.5 million laptops to students in low-income countries, helping to close the digital gap (UNESCO, 2022, p. 220).

1.6.1 Government Initiatives

Governments worldwide play an important role in promoting technological awareness and integration in primary schools. Through funding, policy development, and nationwide digital education programs, they ensure that students and teachers have

the necessary tools and resources to benefit from technology-enhanced learning (Loveless, 2002, p. 255).

1. National Digital Literacy Programs

Many governments have launched digital literacy initiatives aimed at integrating technology into school curricula. Examples include:

- Singaporeôs Smart Nation Initiative ï The government has implemented nationwide digital literacy programs, making coding and computational thinking mandatory in primary education (UNESCO, 2022, p. 225).
- Finlandôs Digital Education Framework ï Finland integrates AI-driven learning and robotics education in schools, preparing students for future digital careers (Jiménez Sierra et al., 2023, p. 270).
- Indiaôs PM eVidya Program ï This initiative provides free online learning resources, low-cost tablets, and digital textbooks for students across the country (Loveless, 2002, p. 260).

A World Bank report found that countries with structured digital literacy policies see 30% higher student engagement in technology-based learning (UNESCO, 2022, p. 230).

2. Investments in Digital Infrastructure

Governments allocate funds for technology infrastructure, ensuring that all schools especially those in rural or underprivileged areas have access to:

- High-Speed Internet ï Programs like the U.S. E-Rate Initiative subsidize broadband connections for schools, reducing digital inequality (Jiménez Sierra et al., 2023, p. 275).
- Smart Classrooms ï The UAE government has invested in interactive whiteboards, AI tutors, and VR-enabled lessons in public schools (UNESCO, 2022, p. 235).

- Low-Cost Devices for Students ï Kenyaôs DigiSchools Project has distributed over 1 million government-funded laptops to primary school students (Loveless, 2002, p. 265).

This section highlights critical investments in digital infrastructure that facilitate technological awareness in primary schools, especially in underserved areas. By illustrating diverse strategies such as improving internet access, introducing smart classroom technologies and providing affordable devices, it emphasizes the role of infrastructure in bridging the digital divide.

These investments ensure equal access to digital education, bridging the technology gap in underserved regions.

3. Teacher Training and Professional Development

Many governments have introduced teacher training initiatives to ensure educators are equipped with the skills to integrate technology into the classroom.

- EU Digital Education Action Plan ï The European Union funds teacher training workshops on AI, coding, and EdTech (UNESCO, 2022, p. 240).
- Chinaôs National AI Education Program ï Chinese teachers receive statesponsored AI and robotics training, preparing them for high-tech classrooms (Jiménez Sierra et al., 2023, p. 280).
- Brazilôs EducadoresDigitais Project ï This initiative trains teachers in e-learning, gamification, and online content creation (Loveless, 2002, p. 270).

To summarize, teacher training and professional development are key components in successfully integrating technology in primary education. Programs like the EUôs workshops on AI and coding, Chinaôs focus on AI and robotics training and Brazilôs emphasis on e-learning skills demonstrate how empowering educators directly influences the effectiveness of technological awareness in classrooms.

A UNESCO study found that countries with mandatory digital teacher training programs experience higher technology adoption rates in schools (UNESCO, 2022, p. 245).

4. Digital Equity and Inclusion Programs

To address the digital divide, many governments implement policies to ensure all students regardless of socio-economic background have access to technology.

- South Africaôs ICT for Education Policy ï Focuses on providing free internet access to public schools (Jiménez Sierra et al., 2023, p. 285).
- One Laptop per Child (OLPC) Initiative ï Governments in Latin America and Africa distribute low-cost educational devices to students in low income areas (UNESCO, 2022, p. 250).
- U.S. Digital Equity Act ï Funds initiatives that expand internet access and provide technology grants for disadvantaged schools (Loveless, 2002, p. 275).

These initiatives help ensure that technology-based education remains inclusive for all students.

1.6.2 Parental Involvement

Parental involvement plays a critical role in the success of technology integration in primary education. Parents serve as guides, facilitators, and monitors in their children's digital learning journey, helping them develop responsible technology habits while maximizing the educational benefits of digital tools (Loveless, 2002, p. 280). When parents actively participate in their childrenôs digital education, students demonstrate higher engagement, better academic performance, and improved digital literacy skills (Jiménez Sierra et al., 2023, p. 290).

1. The Importance of Parental Support in Digital Learning

Parents help bridge the gap between school-based technology use and at home learning, reinforcing digital literacy skills in a familiar and supportive environment (UNESCO, 2022, p. 255). Research indicates that children whose parents engage in technology-supported learning activities perform significantly better in school (Jiménez Sierra et al., 2023, p. 295). Key benefits include:

- Enhanced Learning Outcomes: Children with parental guidance in technology-based learning demonstrate higher comprehension and problem-solving skills (Loveless, 2002, p. 285).
- Better Digital Citizenship: Parents play a role in teaching ethical internet use, online safety, and responsible screen time habits (UNESCO, 2022, p. 260).
- Stronger Parent-Child Engagement: Collaborative learning activities, such as coding exercises, online research projects, and educational gaming, foster better communication and stronger family bonds (Jiménez Sierra et al., 2023, p. 300).

In brief, parental support plays a crucial role in reinforcing digital learning beyond the classroom. Engaged parents not only help improve childrenôs learning outcomes and digital skills but also guide them toward responsible and ethical technology use. Additionally, shared digital activities enhance parent-child relationships, creating a supportive environment for technological awareness.

A Harvard University study found that students whose parents actively participated in their digital learning activities scored 20% higher on standardized tests than their peers without such support (UNESCO, 2022, p. 265).

2. Challenges Parents Face in Supporting Digital Learning

Despite its importance, many parents struggle with effectively guiding their childrenôs technology use due to several key barriers:

- Lack of Digital Literacy: Some parents feel unprepared to support their childrenôs online learning due to limited knowledge of digital tools (Loveless, 2002, p. 290).

- Time Constraints: Many working parents find it challenging to balance professional responsibilities while monitoring their childôs technology use (Jiménez Sierra et al., 2023, p. 305).
- Concerns about Screen Time: Parents worry about their children spending excessive time on devices, leading to potential distractions and reduced physical activity (UNESCO, 2022, p. 270).

In summary, while parental support is vital, many parents face significant obstacles in effectively guiding their childrenôs digital learning. Limited digital literacy, busy schedules and concerns about excessive screen time create barriers that can hinder their involvement.

A New Research Center survey found that 56% of parents struggle with regulating their childôs screen time, while 45% feel overwhelmed by the rapid pace of technological advancements (Jiménez Sierra et al., 2023, p. 310).

3. Strategies to Strengthen Parental Involvement in Digital Education

To support their childrenôs digital learning effectively, parents can adopt several strategies that promote safe, engaging and productive technology use at home:

- Setting Screen Time Limits: Encouraging a healthy balance between educational and recreational screen time (Loveless, 2002, p. 295).
- Participating in Digital Learning Activities: Engaging in online coding projects, educational games, or interactive reading apps alongside their children (UNESCO, 2022, p. 275).
- Encouraging Critical Thinking: Teaching children to evaluate online information, recognize misinformation, and engage in ethical internet behavior (Jiménez Sierra et al., 2023, p. 315).
- Utilizing Parental Control Features: Using tools like Google Family Link, Microsoft Family Safety, and Apple Screen Time to monitor and regulate childrenôs digital activities (UNESCO, 2022, p. 280).

A University of Oxford study found that children who had structured technology use at home, guided by parental involvement showed 30% higher digital literacy skills than those without (Jiménez Sierra et al., 2023, p. 320).

Parental involvement is essential for maximizing the benefits of technology in primary education. By actively engaging in their children's digital learning, setting healthy technology boundaries and promoting responsible online behavior, parents can ensure that technology remains a powerful educational tool rather than a distraction.

1.6.3 Private Sector Contributions

The private sector plays a vital role in advancing technological awareness and integration in primary education. Tech companies, nonprofit organizations, and private investors provide essential support through funding, digital tools, and training programs that enhance the quality of education worldwide (Loveless, 2002, p. 300). Their contributions help bridge technological gaps, making digital learning more accessible, affordable, and effective (Jiménez Sierra et al., 2023, p. 325).

1. Development of Educational Technologies

Private tech companies are at the forefront of creating digital tools and platforms that support modern education. Their innovations include:

- Learning Management Systems (LMS): Platforms like Google Classroom, Microsoft Teams, and Moodle help teachers manage assignments, assessments, and student progress (UNESCO, 2022, p. 285).
- AI-Powered Educational Software: Companies such as IBM, Pearson, and Coursera use artificial intelligence to personalize learning, ensuring that students receive content tailored to their academic progress and needs (Jiménez Sierra et al., 2023, p. 330).
- Virtual and Augmented Reality (VR/AR) Tools: Private firms like Meta (formerly Facebook) and Lenovo develop VR-enabled classrooms, where students experience immersive historical, scientific, and mathematical simulations (Loveless, 2002, p. 305).

To summarize, the private sector plays an important role in advancing technological awareness in primary education by developing innovative digital tools and platforms. From Learning Management Systems to AI-powered personalized learning software and immersive VR/AR experiences, private companies help enhance educational quality and accessibility.

A Harvard EdTech study found that schools using privately developed AI-powered tutoring platforms saw a 30% improvement in student comprehension rates (UNESCO, 2022, p. 290).

2. Financial Support and Infrastructure Development

Many private companies partner with governments and nonprofit organizations to fund digital education initiatives. Examples include:

- Public-Private Partnerships (PPP): Collaborations between corporations and education ministries provide technology access to underserved schools (Jiménez Sierra et al., 2023, p. 335).
- Device Donation Programs: Companies like Apple, Google, and Samsung donate tablets and laptops to schools in low-income regions (Loveless, 2002, p. 310).
- Broadband Expansion: Internet providers such as AT&T, Vodafone and Starlink invest in high-speed internet access for rural and underserved areas (UNESCO, 2022, p. 295).

In short, private sector partnerships significantly enhance digital education through funding, device donations and infrastructure development. Public-private collaborations and corporate contributions help bridge gaps in technology access, particularly in underserved and rural schools.

For example, Googleôs ñProject Loonò launched balloon-powered internet services to improve connectivity in remote African and Latin American regions, benefiting thousands of students (Jiménez Sierra et al., 2023, p. 340).

3. Teacher Training and Professional Development

Private companies play a crucial role in enhancing digital literacy among educators through specialized training programs. These include:

- Google for Educationôs Teacher Training Program: Provides free certification courses on using EdTech tools effectively (UNESCO, 2022, p. 300).
- Microsoftôs Innovative Educator Program: Trains teachers to integrate cloud-based learning tools, AI, and digital assessments (Loveless, 2002, p. 315).
- NGO-Led Digital Literacy Workshops: Organizations such as Code.org and Khan Academy offer free teacher workshops on coding, gamification and blended learning (Jiménez Sierra et al., 2023, p. 345).

To sum up, private companies and NGOs play a vital role in strengthening teacher digital literacy through accessible training programs. Initiatives like Google for Education and Microsoftôs training empower educators to effectively use EdTech tools, while nonprofit workshops expand skills in coding and blended learning.

A World Economic Forum report found that teachers who completed privatesector-funded digital training programs were 40% more confident in using technology in classrooms (UNESCO, 2022, p. 305).

4. Supporting Digital Equity and Inclusion

Private organizations help bridge the digital divide by funding affordable learning technologies and inclusive programs. Key initiatives include:

- One Laptop per Child (OLPC) Program: Funded by private donors, this initiative has distributed low-cost educational laptops to over 2.5 million students in developing nations (Loveless, 2002, p. 320).
- Affordable E-Learning Subscriptions: Companies like Amazon, Coursera, and Udemy provide discounted or free access to educational resources for students from disadvantaged backgrounds (Jiménez Sierra et al., 2023, p. 350).
- Assistive Technology for Special Needs Education: Private-sector innovation has led to AI-powered speech-to-text apps, digital Braille tablets, and adaptive learning software that assist students with disabilities (UNESCO, 2022, p. 310).

Private organizations play a crucial role in advancing digital equity through accessible technologies and inclusive learning programs. Initiatives like One Laptop per Child, discounted e-learning platforms and assistive technologies help ensure that students from diverse and disadvantaged backgrounds can access quality digital education.

For instance, Microsoftôs AI for Accessibility Initiative has helped over 1 million students with disabilities by developing inclusive learning tools (Jiménez Sierra et al., 2023, p. 355).

1.7 Conclusion

The integration of technology in primary education is no longer a luxury but a necessity in an increasingly digital world. As explored throughout this chapter, technological awareness plays an essential role in shaping the learning experiences of young students, fostering engagement, improving academic performance and preparing them for a rapidly evolving job market.

Governments, schools, parents and private organizations each contribute to the successful implementation of educational technology, ensuring that students gain the necessary skills to thrive in a technology-driven society. However, despite the evident benefits, challenges such as limited access to resources, inadequate teacher training, socio-economic disparities and cybersecurity concerns continue to hinder equitable technology adoption in schools.

The discussion began with an examination of technological awareness, highlighting its definition, significance and the global perspectives on its implementation. The review of case studies from both developed and developing countries demonstrated how different education systems are navigating the challenges and opportunities presented by digital learning. Countries with strong digital education policies such as Finland, Singapore and South Korea have successfully implemented AI-driven learning platforms, coding curriculums and smart classrooms, leading to measurable improvements in student performance and engagement. In contrast, developing nations such as India, Kenya and Brazil have made remarkable progress in

bridging the digital divide through government initiatives, public-private partnerships and low-cost technology distribution programs. These examples illustrate that while technological advancements have the potential to transform education, they must be accompanied by strategic policies and continuous investment to ensure sustainability and effectiveness.

A critical analysis of the challenges in promoting technological awareness revealed significant barriers that must be addressed for digital education to reach its full potential. Schools in underprivileged areas often face infrastructure limitations, with a lack of internet access and digital devices preventing students from engaging in technology-enhanced learning. Additionally, the digital literacy gap among teachers remains a major concern, as many educators lack the training needed to effectively integrate technology into their classrooms. The socio-economic divide further intensifies inequalities in digital education, with wealthier students having greater access to high-quality learning tools, while those from disadvantaged backgrounds struggle with outdated technology or no access at all. Addressing these challenges requires long-term investment in teacher training programs, subsidies for low-income schools and national policies that promote equitable access to educational technology.

The role of stakeholders in driving technological awareness cannot be overstated. Governments play a pivotal role by implementing policies that support digital literacy education, infrastructure development and cybersecurity regulations. Schools and teachers must embrace adaptive learning technologies and create an environment that supports experiential and personalized learning. Parents also have a responsibility to monitor and guide their children's technology use, ensuring a balance between educational and recreational screen time. Furthermore, the private sector contributes significantly by developing advanced EdTech solutions, funding teacher training initiatives and expanding access to low-cost educational resources. Collaborative efforts between these stakeholders are essential in shaping a comprehensive and maintainable digital education ecosystem.

Looking ahead, the future of technology in primary education will continue to evolve as advancements in artificial intelligence, virtual reality and data-driven

learning analytics redefine how students interact with knowledge. However, for these innovations to be effective, policymakers must focus on closing the digital gap, ensuring responsible technology use and continuously evaluating the impact of digital tools on student learning outcomes. The ultimate goal of technological awareness in education should not be limited to the adoption of digital tools, but rather the creation of an inclusive and dynamic learning environment that empowers every child to become a capable and confident digital citizen.

Chapter Two:

Research Design and

Analysis

2.1. Introduction

This chapter presents the research methodology employed in this study, focusing on the design, data collection methods, sampling strategies and analysis procedures used to investigate the role of technological awareness in primary education.

The methodological approach in this study is justified by the need to capture both numerical trends and rich descriptive data, allowing for a more nuanced interpretation of findings. Following this mixed methods approach, the study aims to identify patterns in digital education implementation.

The remainder of this chapter details the research design and procedures, including sample selection, research instruments and data analysis techniques. It deals with the analysis of data as well as the interpretation and discussion of the main results. It also discusses the ethical considerations elaborated in conducting the study, making sure that data collection keeps to academic reliability and research ethics principles.

2.2. Research Design and Procedure

A well-structured methodology ensures the validity and reliability of the study, providing a clear framework for collecting and analyzing data (Creswell, 2014; Cohen, Manion, & Morrison, 2018). In the same vein, Grove (2003, p.195, cited in Bouklikha, 2016, p. 126) defines a research design as ña blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findingsò.

The current study adopts a mixed-methods approach, combining quantitative and qualitative research methods to achieve a comprehensive understanding of the technological awareness in primary schools. The quantitative component consists of a structured questionnaire administered to teachers in order to gather statistical insights on their experience with educational technology, accessibility issues and perceived benefits and challenges. The qualitative component involves a semi-structured

interview with parents. The mixed-methods approach ensures a comprehensive analysis by combining numerical data from questionnaires with descriptive insights from interviews (Creswell, 2014; Bryman, 2012), and so allowing for a deeper understanding of how technology is perceived and utilized in primary schools.

The quantitative data is collected through a structured questionnaire addressed to primary school teachers. This questionnaire aims to collect statistical data on their experiences with educational technology, accessibility, challenges and perceived effectiveness of digital learning tools. The qualitative part consists of a semi-structured interview conducted with parents, exploring their views on technology integration in the primary school.

Additionally, this approach helps in identifying patterns, trends and common challenges in technology adoption. The data collection process follows a systematic procedure to ensure reliability and validity, incorporating a purposive sampling to select participants based on their grade level, teaching experience and access to technology in the classroom.

Ethical considerations are taken into account throughout the research process too. Participants are informed about the purpose of the study and their consent is obtained before participation. Data confidentiality is maintained by ensuring anonymous responses in questionnaires and interviews, following ethical guidelines outlined in educational research (Kvale Brinkmann, 2009; Denscombe, 2017).

The following sections provide a detailed description of the sample selection process, research instruments and data analysis techniques used in this study. Moreover, a data analysis of the findings as well as the interpretation and discussion of those findings in relation with the hypotheses stated are discussed in this chapter.

2.3.1. Case Study

In point of fact, the case study is one of the research methodologies that is widely used in Social Sciences. It is defined by McKernan (1991) as:

> *A case study is eclectic, using a variety of research styles and methods; it is idiosyncratic and specific; it is process rather than product-oriented, and it is rich in description, interpretation and narrative, working more for understanding than for rigorous scientific measurement, prediction and control of settings, respondents, actions and so on. It is qualitative as opposed to quantitative, yet a good case study worker knows how to quantify masses of qualitative data*.
>
> (McKernan, 1991, quoted in Bulter, 2006, p. 132)

The present study is a case study of teachers from Techouar Sid Ahmed primary school and other primary schools. The aim of this study is to explore and present the integration of technology in primary education and try to find the challenges faced with such integration.

2.3.2. Sampling (Parents & Teachers)

The sample for this study consists of 20 teachers and 4 parents, selected to provide diverse perspectives on technological awareness in primary education. A purposive sampling method is used to ensure that participants have relevant experience with educational technology, allowing for meaningful insights into its effectiveness and challenges (Creswell, 2014; Cohen, Manion, & Morrison, 2018).

2.3.2.1. Parentsô Profile

The parent participants in this study were selected based on their direct involvement in their children's primary education and their familiarity with the use of digital tools at home. The four parents selected were from the local community of Techouar Sid Ahmed Primary School. They varied in educational background and occupational status, providing a diverse perspective on how technology is viewed and supported in the home environment. These parents were chosen purposively to offer insights into the role of families in reinforcing technological awareness outside the

classroom. Their responses during interviews helped illuminate parental attitudes, concerns and the level of digital support they provide to their children.

2.3.2.2. Teachersô Profile

The teacher sample included 20 educators currently working at the primary school Techouar Sid Ahmed and other schools since the researcher could not collect sufficient amount of data regarding the issue with using only the teachers of one single school. The participants varied in terms of teaching experience and access to educational technology. This diversity ensured a comprehensive understanding of the different ways technology is integrated into classroom practices. The majority of these teachers had varying levels of exposure to digital tools and platforms, which allows the study to assess both the strengths and challenges associated with technology use in primary education. Data collected through a structured questionnaire reflected their perceptions of technological awareness, availability of resources, training received and overall readiness to implement digital teaching methods.

2.3.3. Instrumentation

This study employed two research instruments: a structured questionnaire for teachers and a semi-structured interview with parents. These instruments were chosen to ensure a balanced combination of quantitative and qualitative data, providing both measurable trends and deeper insights into technological awareness in primary education.

The questionnaire was designed to gather statistical data on teachersô experiences with technology in the classroom, the availability of digital resources and the challenges they face in integrating technology into their teaching methods. It included closed-ended questions that assessed the frequency of technology use, teacher confidence in using digital tools and perceived benefits or limitations of technology in primary education. Some open-ended questions allowed teachers to share specific experiences or suggestions for improving digital learning in schools.

The interview with parents was conducted in a semi-structured format, allowing for in-depth discussions while maintaining consistency across participants. The questions focused on how parents perceived the role of technology in their childrenôs education, their level of involvement in digital learning at home and any concerns they had regarding screen time, online safety and accessibility of digital tools. This qualitative approach allowed parents to elaborate on their views.

To ensure accessibility and comprehension, the interview questions were translated into Arabic, as some parents were not proficient in English and also to ensure reliability and validity, both instruments undergo a piloting process before full implementation. The questionnaire was tested on a small sample of teachers to refine question clarity and structure, while the interview guide was reviewed to ensure it aligned with the objectives of the study. The final versions of both instruments were then administered, ensuring clear and meaningful data collection

By combining these research instruments, the study captured a comprehensive perspective on technological awareness in primary education, highlighting both the practical implementation of technology in schools and parental attitudes toward digital learning.

2.3.3.1. Parentsô Interview

The parentsô interview allowed a deeper exploration of personal experiences, providing qualitative insights that complement the statistical data gathered from the teachersô questionnaire. In the current study, 4 parents took part in a semi-structured interview. This interview focused on parental perspectives regarding their childrenôs use of technology for learning, both at school and at home. Topics discussed included access to digital resources, parental involvement in online learning and concerns about screen time and internet safety.

The interview was designed as a qualitative research tool to explore parents' perceptions of technological awareness in primary education. Unlike the questionnaire, which collects structured responses from teachers, the interview aimed to provide a

deeper understanding of how parents perceived their children's use of technology for learning, the challenges they faced in supporting digital education at home and their concerns regarding screen time and online safety.

A semi-structured interview format was used, allowing parents to share their experiences freely while ensuring that all key research topics were covered. This approach provided flexibility, enabling the researcher to ask follow-up questions based on parentsô responses. The interview focused on several main themes, including parental involvement in digital learning, the availability of technology at home and opinions on school-based technology initiatives. Parents were also encouraged to discuss any barriers they encountered, such as limited digital literacy or concerns about the risks associated with online learning.

The interviews were conducted individually in a quiet and comfortable setting, allowing participants to express their thoughts openly. With participantsô consent, the interviews were recorded and later transcribed for analysis. The data obtained from the interviews were analyzed using thematic analysis, allowing the identification of recurring patterns and key insights. This qualitative data complemented the statistical findings from the teachers' questionnaire, offering a broader perspective on technological awareness in primary education. By integrating both sources of information, the study aimed to provide a well-rounded understanding of the role of technology in primary schools and its impact on pupils, teachers and parents.

2.3.3.2. TeachersôQuestionnaire

A questionnaire is a set of questions that aims at gathering data from a large number of people. It helps researchers understand opinions, attitudes, experiences and behaviors to make well-informed decisions and drive a positive change, while also considering the contribution to knowledge. More precisely, a structured questionnaire is a data collection method that uses standardized questions to collect consistent and quantifiable information.

The 20 teachers completed a structured questionnaire designed to assess their experiences with technology in the classroom. The questionnaire explored areas such as the availability of digital tools, the impact of technology on pupilsô engagement and the challenges of integrating technology into lesson planning. By analyzing teachersô responses, this study aimed to identify trends in digital education adoption and areas requiring further support.

The questionnaire used in this study was designed to collect quantitative data from teachers regarding their experiences with technology in primary education. It aimed to assess the frequency of digital tools usage in classrooms, the challenges faced in integrating technology into lessons and teachersô perceptions of its impact on pupilsô learning. By structuring the questionnaire with both closed-ended and open-ended questions, the study ensured a balance between measurable data and qualitative insights (Creswell, 2014; Cohen, Manion, & Morrison, 2018).

The questionnaire consisted of three main sections. The first section gathered profile information, including the teachersô years of experience and familiarity with digital education tools. The second section focused on technology integration, covering aspects such as the availability of digital resources, the level of institutional support for technology use, challenges that teachers encountered and teachersô self-reported confidence in using educational software. The final section explored feedback and recommendations, allowing teachers to provide reflection on the benefits of using technology in teaching English and their suggestions for improving technological awareness in primary schools.

A Likert scale format was used for most closed-ended questions, ranging from ñstrongly agreeò to ñstrongly disagree,ò to measure teachersô attitudes toward digital education. Open-ended questions gave teachers the opportunity to elaborate on specific experiences or propose solutions to common obstacles in classroom technology use. To ensure clarity and reliability, the questionnaire was piloted with a small group of teachers before full distribution. The pilot study helped refine

ambiguous wording and confirms that the questions effectively captured the intended data (Kvale & Brinkmann, 2009).

Once finalized, the questionnaire was distributed in person, ensuring accessibility for all participants. Responses were then analyzed using descriptive statistical methods, such as frequency analysis and percentage distributions, to identify patterns in teachersô attitudes and experiences with technology in primary education.

2.4. Data Analysis

This section outlines the procedures used to analyze the quantitative and qualitative data collected from teachers and parents. The quantitative data from the teachersô questionnaires were examined using descriptive analysis to identify patterns, frequencies and general trends. Meanwhile, the qualitative data from the parentsô interviews were interpreted through thematic analysis, allowing for the identification of recurring themes and insights. This dual approach ensures a comprehensive understanding of the findings, supporting the studyôs mixed-methods design.

2.4.1. Teachersô Questionnaire

In this sub-section, the researcher analyzes the data collected from a structured questionnaire administered to 20 English teachers mainly at Techouar Sid Ahmed primary school and other primary schools since the researcher could not collect sufficient amount of data concerning the issue with only the teachers of one single school. The questionnaire was divided into three main sections: general information, technology in teaching, suggestions and feedback. It aimed to explore teachersô experience levels, frequency of technology use, perceptions of its effectiveness, training availability and the challenges faced in digital integration. The data also includes teachers' suggestions for improving the use of technology in primary English language instruction. The responses provide valuable quantitative and qualitative insights into the current state of technological awareness among educators in the selected case.

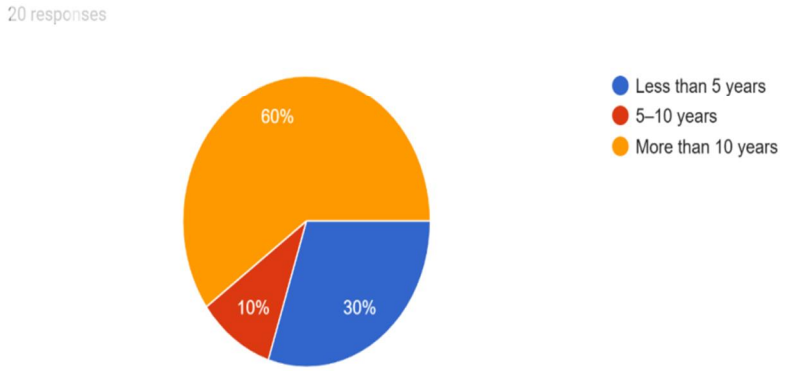
Rubric 1: General Information

This rubric includes questions 1 to 3 and focuses on teachers' professional experience and the extent to which they incorporate technology into their teaching practices. Understanding how long teachers have been in the profession and how frequently they use digital tools provides foundational insight into their technological awareness. These initial questions help identify potential correlations between experience level and technology integration, setting the stage for deeper analysis in the following rubrics.

Q1How many years of teaching experience do you have?

This question aims to determine the level of professional teaching experience among the surveyed teachers. It helps assess whether technology integration varies according to seniority and experience in the field.

Figure 2.1: *Distribution of Teachers by Years of Experience*



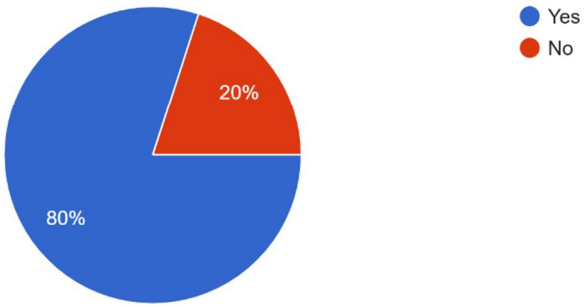
The results revealed that 60% of teachers had more than 10 years of teaching experience, indicating a group likely to have well-established classroom routines and a potential preference for traditional methods. 30% of teachers stated having less than 5 years of experience, suggesting a younger or newer segment that may be more open to experimenting with digital tools. Meanwhile, the remaining 10% of participants fell into the 5ï 10 years range, representing a transitional group with moderate experience

possibly balancing conventional practices with increasing interest in technology integration. This range of experience levels is important to consider, as it may influence attitudes toward adopting educational technology. Highly experienced teachers might face challenges in adapting to unfamiliar digital tools, whereas newer teachers may be more willing but less confident in applying technology within a pedagogical framework. Overall, this distribution provides a balanced context for analyzing how teaching experience relates to technological awareness and integration in the classroom.

Q2: Do you use technology (e.g., computers, tablets, interactive boards) in your English classes?

This question aims to determine the extent to which teachers incorporate technology in their English lessons, providing insight into adoption levels within the school.

Figure 2.2: Use of Technology in English Classes



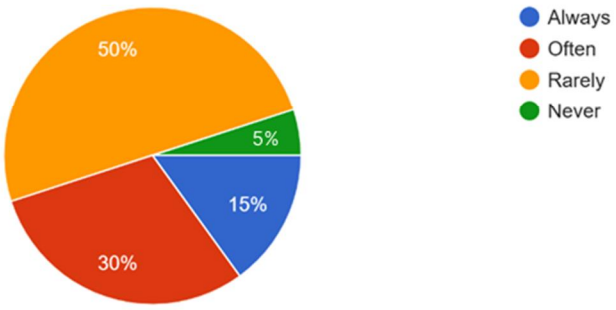
Out of 20 respondents, 80% reported using technology in their English classes, indicating a strong majority are integrating digital tools such as computers, tablets or interactive boards. Conversely, 20% stated not using technology regularly, which may reflect barriers such as lack of access training or personal preference.

This high adoption rate suggests that most teachers recognize the value of technology in enhancing instruction. However, the presence of a 20% minority not using these tools highlights ongoing challenges and potential gaps in resource availability or technological confidence. Understanding this split is crucial for tailoring support and training initiatives to increase effective technology use across all teaching staff.

Q3: How often do you integrate technology into your teaching methods?

This question measures the frequency of technology use to understand how regularly teachers apply digital tools in their instruction.

Figure 2.3: Frequency of Technology Integration



Among the 20 respondents, 50% (10 teachers) reported integrating technology *rarely* into their teaching. Additionally, 5% (1 teacher) stated they *never* use technology. On the other hand, 15% (3 teachers) said they *always* use technology, and 30% (6 teachers) reported using it *often*.

This distribution reveals a considerable variation in technology usage frequency. While a combined 45% (9 teachers) use technology often or always, a slight majority (55%, 11 teachers) integrate it infrequently or not at all. This suggests that despite a high overall adoption rate in Q2, many teachers face obstacles that limit consistent use of technology, such as lack of training, resources or confidence. It

underscores the need to explore factors influencing this usage patterns to support more regular integration.

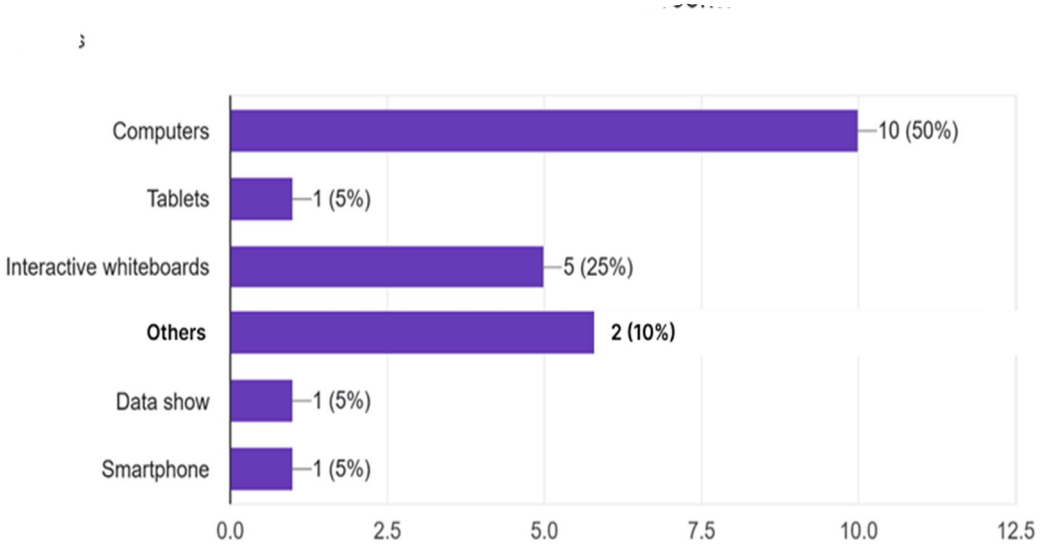
Rubric 2: Technology in Teaching

This rubric includes questions 4 to 8 where the researcher focuses on the kinds of technology teachersô use in their classrooms, their views on how technology impacts student engagement and learning outcomes and their assessment of technologyôs effectiveness in teaching English skills. These questions provide valuable insight into the practical applications and perceived educational benefits of technology integration.

Q4: What types of technology do you primarily use in your classroom?

This question identifies the specific digital tools and platforms teachers commonly rely on, offering insight into the technological resources currently employed.

Figure 2.4: Types of Technology Used by Teachers



Out of 20 respondents, half of the teachers 50% primarily stated using computers in their classrooms; making it the most commonly used technology. Interactive whiteboards follow with 25% of teachers incorporating them into their lessons. Other technologies have smaller shares: tablets, data show devices and smartphones each represent 5% (1 teacher each), while 10% of the respondents reported using other unspecified types of technology.

The dominance of computers and interactive whiteboards suggests that these are the most accessible and trusted tools among teachers, likely due to their versatility and ability to support various teaching activities. The lower usage rates of tablets and smartphones may indicate limited availability or possible concerns over classroom management and distraction. The presence of ñotherò technologies hints at some diversity in resource use, which could include software applications or emerging tools tailored to specific teaching needs.

Q5: Do you think technology helps improve studentsô engagement and learning outcomes?

This question seeks to understand teachersô beliefs regarding the impact of technology on student motivation and academic achievement.

All 20 teachers (100%) surveyed believed that technology positively improved studentsô engagement and learning outcomes. This unanimous agreement highlights a strong collective recognition of the benefits technology brings to the classroom environment. Such consensus suggests that teachers see digital tools as effective in making lessons more interactive, motivating students and catering to diverse learning styles.

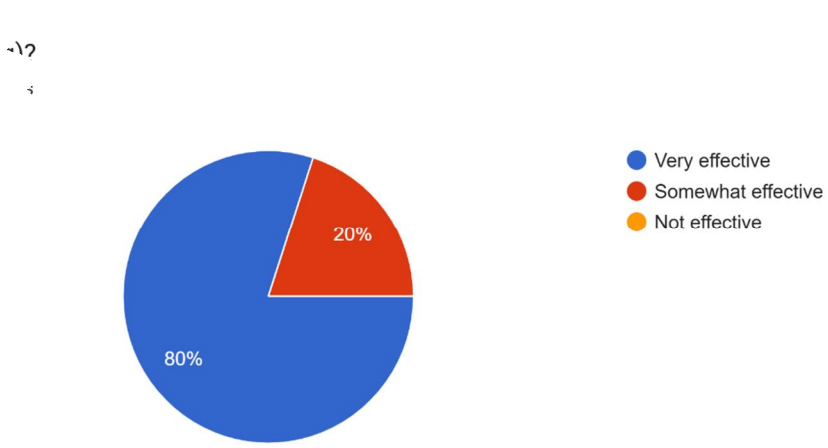
This positive perception lays a solid foundation for further integration of technology in teaching practices. It also implies a readiness among teachers to embrace digital innovations, provided they have the necessary support and resources. However, despite this enthusiasm, the actual frequency and quality of technology use

may still be influenced by other factors, such as training and infrastructure which require attention to translate positive beliefs into consistent classroom practice.

Q6: How effective do you find technology in teaching English skills (e.g., reading, writing, speaking, listening)?

This question assesses teachersô evaluation of technologyôs usefulness in enhancing various English language skills.

Figure 2.5: Perceived Effectiveness of Technology in Teaching English Skills



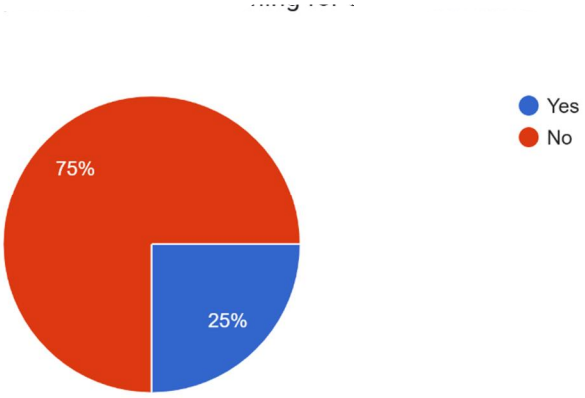
Among the 20 respondents, 80% (16 teachers) rated technology as *very effective* in teaching English skills, while the remaining 20% (4 teachers) found it *somewhat effective*. Importantly, no teacher reported technology as *not effective*.

This overwhelmingly positive response indicates a strong belief in the ability of technology to enhance the teaching and learning of English, particularly in developing reading, writing, speaking and listening skills. The high proportion of teachers rating it very effective suggests that technology is viewed as a valuable aid for creating interactive and diverse learning experiences. Meanwhile, the 20% who see it as somewhat effective may recognize benefits but also perceive limitations, possibly related to access, usability or alignment with curriculum goals. Overall, this data reinforces the essential role of technology in modern language education.

Q7: Does your school provide adequate training for using educational technology?

This question evaluates whether teachers are supported by their schools through sufficient training to effectively use educational technology or not.

Figure 2.6: Availability of Adequate Training for Educational Technology



Out of 20 respondents, only 25% (5 teachers) reported that their school provided adequate training for using educational technology, while a significant majority of 75% (15 teachers) stated that such training was lacking.

This disparity reveals a major gap in professional development related to technology integration. The limited training availability likely hinders teachersô ability to confidently and effectively use digital tools, and this may contribute to inconsistent or infrequent technology use observed in earlier questions. The high percentage of teachers without adequate training underscores the need for schools to prioritize structured, ongoing professional development to empower educators and maximize the benefits of educational technology.

Q8: What challenges do you face when using technology in your teaching?

This question identifies the main obstacles teachers encounter in integrating technology into their instructional practices, helping to pinpoint areas requiring support.

Among the 20 respondents, the most frequently reported challenge was a *lack of resources*, stated by 10 teachers. This suggests that many teachers struggle with insufficient or outdated hardware, software or internet access, which can significantly limit their ability to utilize technology effectively.

Technical issues, including equipment malfunctions and connectivity problems, affected 6 teachers, indicating that even when resources are available, reliability can be a barrier. Moreover, 8 teachers pointed to *lack of training* as a significant hurdle, echoing previous findings that professional development opportunities are inadequate. This gap can undermine teachersô confidence and competence in using educational technology.

Lastly, 3 teachers mentioned other challenges, which might include factors like time constraints, classroom management difficulties or resistance from students or parents.

Overall, these challenges highlight the need for comprehensive solutions that address resource provision, technical support and ongoing teacher training to foster more effective technology integration.

Rubric 3: Suggestions and Feedback

This rubric includes questions 9 to 11 and gathers qualitative input from teachers regarding the perceived benefits of technology in English language teaching, their suggestions for improvement and ideas for better integration in primary schools. These open-ended responses offer deeper insights into teachersô experiences and priorities, complementing the quantitative data with reflective, context-rich perspectives.

Q9: What are the most significant benefits of using technology in teaching English?

This question explores teachers' perceptions of how technology enhances English language teaching, focusing on pedagogical, motivational and practical benefits.

Based on the open-ended responses from 20 teachers, several key themes emerged regarding the perceived benefits of technology in English language teaching:

1. **Increased Engagement and Motivation (mentioned by 16 teachers)** A dominant theme across responses was that technology significantly boosts student engagement and motivation. Teachers emphasized that multimedia tools such as games, videos, songs and virtual environments made lessons more enjoyable and interactive, capturing students' interest more effectively than traditional methods.

2. **Improvement in Language Skills (noted by 12 teachers)** Many responses highlighted that technology enhanced the four core English skills (reading, writing, speaking and listening). Specific tools were mentioned for teaching vocabulary, pronunciation and communication, including authentic materials like videos of native speakers and interactive speaking platforms.

3. **Access to Resources and Flexibility (noted by 10 teachers)** Teachers acknowledged the vast access to digital materials including e-books, websites like the British Council and audio/video libraries that technology provided. This flexibility allows both pupils and teachers to customize learning experiences and accommodate diverse needs.

4. **Classroom Management and Time Efficiency (mentioned by 4 teachers)** A few responses pointed out that technology assisted in organizing lessons more efficiently, saving time and supporting classroom control. Structured digital tools can streamline lesson delivery and facilitate better planning.

5. **Personalized and Inclusive Learning (noted by 6 teachers)** Several teachers highlighted that technology supported different learning styles and enabled personalized learning paths. This adaptability fosters learner-centered education and inclusion, allowing pupils to progress at their own pace.

6. **Preparation for Real-World Communication (mentioned by 3 teachers)** A minor but significant theme focused on preparing pupils for the digital and

real-world communication. Teachers noted that using technology in English instruction helped pupils build digital literacy and practical communication skills.

Summary:

To a great extent teachers viewed technology as a powerful tool for making English lessons more engaging, flexible and effective. By promoting motivation, enhancing core language skills and supporting personalized learning, technology was seen as an essential component of modern English language education.

Q10: What improvements or resources would you like to see to enhance the use of technology in your teaching?

This question explores the specific technological tools, support systems and infrastructural improvements teachers believe are necessary to improve the integration and impact of educational technology in English language teaching.

From the 20 responses, several clear themes emerged. The most frequent demand was for improved technological infrastructure, including interactive whiteboards, data shows, tablets and internet access. At least, 12 teachers emphasized the necessity of consistent device availability and reliable connectivity to support daily use in classrooms.

Another significant theme involved teacher training and pedagogical tools. Respondents called for more training on how to effectively integrate technology and expressed interest in tools that support collaborative and personalized learning, such as speech-to-text applications, group activity platforms and digital dictionaries.

Few participants highlighted the importance of equity, suggesting that socioeconomic disparities be addressed so all pupils can benefit equally. Lastly, teachers appreciated multimedia resources like videos, podcasts and games that enhance engagement and language development. These insights underscore the need for both hardware access and instructional support to meaningfully elevate the role of technology in ELT.

Q11: How can technology be better integrated into English language teaching in primary schools?

This open-ended question aims to gather teachers' suggestions for more effective integration of technology into English language instruction at the primary school level. The responses highlight pedagogical strategies, technical recommendations and systemic support measures necessary for meaningful technology use.

Analysis of the 20 responses revealed five dominant themes. The most prominent was the use of engaging multimedia tools such as videos, games, podcasts and digital storytelling to support the four language skills while maintaining pupilsô motivation and attention. Another theme was the development of interactive pupil-centered lessons, including the use of smartboards, group activities and visual aids.

Teachers also emphasized the need for professional training, proposing workshops and resource-sharing to help educators implement best practices. Several mentioned the importance of equitable access to technology highlighting infrastructure improvements like better internet and more devices.

Finally, few respondents stressed the need for institutional support and policy reform, noting that administrative participation and funding were vital for sustainable integration. Overall, responses suggest that both pedagogical innovation and systemic investment are essential for maximizing technologyôs impact in ELT classrooms.

2.4.2 Parentsô Interview

In this section, the researcher presents the thematic analysis of data collected through a semi-structured interview conducted with four parents. The interview aimed to explore parental perceptions on the use of technology in primary education, focusing on their observations, concerns and suggestions. The questions addressed key themes such as the childôs educational background, perceived benefits and drawbacks of digital learning, home-based support and recommendations for improving

technological integration. The analysis is organized into rubrics, each representing related questions and thematic insights drawn from the participantsô responses.

Rubric 1: General Information

This rubric provides a general overview of the learners' background from the parentsô point of view, focusing on their children's grade level and prior experience with technology. These two aspects are essential in framing the context for evaluating technological awareness. Understanding the educational stage of the children helps in assessing the relevance and appropriateness of digital tools used, while knowing whether the child has prior technological experience gives insight into digital readiness, both at home and in the classroom.

Q1: What is your child's grade level?

This question aims to identify the educational level of the child in order to understand how stage- specific needs may affect the use and perception of technology in learning.

Thematic Analysis

The responses reflect diversity in grade levels, ranging from preschool to primary education. This variety offers valuable perspectives on how technology is introduced and utilized across different early learning stages. Notably, the presence of primary-level pupils provides direct relevance to the focus of the study, as this stage marks a critical period for developing foundational learning skills. Additionally, the inclusion of a parent with a preschool-aged child enriches the dataset by highlighting differences in technological readiness and parental involvement at the earliest stages of education. These differences underscore the need for adaptable technological strategies tailored to the cognitive and developmental abilities of young learners.

Q2: Does your child have experience using technology?

This question is designed to assess the childôs familiarity with technological tools and platforms, which can influence their ability to engage with digital learning materials effectively.

Thematic Analysis

The majority of participants indicated that their children had some form of technological experience, particularly through mobile devices used at home for educational purposes. This suggests that technology use among children is becoming increasingly normalized, even outside the classroom. Such exposure may contribute positively to technological confidence and digital literacy. However, variation remains especially in younger children, where digital interaction is either limited or nonexistent due to developmental factors. This point to a digital divide not based solely on access, but also on age and parental discretion. The findings imply that early exposure to technology if guided properly can serve as a valuable foundation for formal digital learning, but it must be developmentally appropriate and well-supported by both parents and educators.

Rubric 2: The Use of Technology in Education

In this rubric, the investigator explores parentsô views on the educational role of technology, its impact on their childrenôs learning efficiency and any changes in motivation or interest linked to its use. These aspects are essential in evaluating how technology is perceived at home not just as a tool, but as a potential catalyst for engagement and academic growth. Parents' insights into effectiveness and behavioral shifts offer a deeper understanding of how technology complements or challenges traditional learning methods.

Q3: How do you view the role of technology in your child's education?

The aim of this question is to assess parentsô overall attitudes toward the use of technology in their child's learning process.

Thematic Analysis

Parents generally viewed technology as a beneficial and necessary element in modern education. Their responses reflect a belief that technology plays a constructive role when used under supervision. It is associated with educational modernization and seen as an essential tool that keeps pace with todayôs digital age. However, this support is often accompanied by a call for regulation and monitoring, indicating a cautious optimism. The analysis shows that while parents acknowledge the educational value of technology particularly its ability to support visual learning and reinforce basic skills they are equally aware of the potential for misuse. The role of technology therefore, is not viewed as inherently positive or negative but as conditionally effective depending on how and when it is used.

Q4: Do you believe technology helps your child learn faster or more effectively? Why?

This question aims to evaluate whether parents perceive a measurable improvement in their child's learning efficiency due to technology use.

Thematic Analysis

All responses suggest a strong belief that technology contributes to a faster and more effective learning. Parents attributed this to the interactive and engaging nature of digital tools, which make learning feel enjoyable rather than burdensome. Technology was also seen as a time-saving mechanism, helping children grasp concepts more quickly while keeping them interested and attentive. Some parents highlighted the ability of technology to identify and address learning gaps, thus personalizing the educational experience. Others emphasized that effectiveness

depends on using the right resources. Overall, the thematic pattern reveals that parents perceive technology as a facilitator of academic improvement when it is appropriately integrated and goal-oriented.

Q5: Have you noticed any change in your child's interest in studying with the use of technology?

This question seeks to determine whether technology influences the childôs motivation and engagement in academic activities or not.

Thematic Analysis

Most parents reported a noticeable positive shift in their childôs interest in studying when using technological tools. Responses indicated that educational technology increased motivation by delivering content in an appealing and interactive format. Tools like YouTube and educational apps were cited as useful in supporting language development and basic skills, especially in early learners. However, the degree of change varied depending on how often and effectively the child engaged with technology. While one parent noted only a slight improvement due to limited use, others observed marked enthusiasm and improved focus. The general consensus is that, when implemented meaningfully technology has the potential to rekindle a child's curiosity and make learning more stimulating.

Rubric 3: Challenges Faced by Parents

This rubric addresses the difficulties parents encounter when their children use technology for educational purposes, as well as their perceptions of its potential negative effects. These insights are important for understanding the barriers to effective home-based digital learning. They also highlight the complex role parents play in managing screen time, guiding content consumption and maintaining a balance between educational and recreational use of technology.

Q6: What challenges do you face as a parent when your child uses technology for educational purposes?

The aim of this question is to identify specific difficulties parents encounter in managing their childôs educational use of technology.

Thematic Analysis

Parents reported a range of challenges, with the most common being the difficulty in monitoring content and maintaining a balance between learning and entertainment. A prominent concern was that children often deviate from educational content toward games and non-educational videos, reducing the intended learning value. Another theme was the fear that technology diminished creativity and independent thinking by offering ready-made answers instead of encouraging exploration. Some parents also mentioned screen addiction and overstimulation as major concerns, especially when children spent extended periods on devices. Overall, the responses revealed that while technology supported learning, it introduced a new set of responsibilities for parents, who must now act as digital gatekeepers and behavioral moderators.

Q7: Do you think there are negative effects of using technology on your child?

This question aims to explore parental concerns regarding the psychological, cognitive or behavioral risks associated with technology use.

Thematic Analysis

Most parents acknowledged that there are negative side effects associated with technology, particularly in the form of dependency or screen addiction. Several participants emphasized that constant reliance on digital tools might reduce intellectual effort and inhibit critical thinking, as children began to expect immediate answers. Other concerns included a decline in traditional learning activities such as reading,

drawing and hands-on creativity. However, one parent noted that these effects were not necessarily harmful if technology use was closely supervised and time-limited. The recurring theme here is that the risks of technology are not intrinsic but stem from how it is used highlighting the importance of adult guidance and structured use in preventing negative outcomes.

Rubric 4: Support and Guidance

This rubric focuses on the external support systems surrounding the childôs digital learning specifically the role of teachers in guiding proper technology use and the parents' own confidence in supporting their childôs digital education. These two aspects are closely linked, as parental involvement often depends on the level of information and guidance they receive from educators. Together, they shed light on how well-supported digital learning is at both the institutional and household levels.

Q8: Do teachers provide sufficient guidance on how to use technology correctly and beneficially?

This question aims to assess the extent to which educators offer support and direction to both pupils and parents in using technology appropriately.

Thematic Analysis

Responses were mixed, indicating a gap in consistency when it comes to teacher-provided guidance. Some parents felt that teachers did offer valuable instructions and reinforced positive technology habits in their children. Others believed that guidance was minimal, especially outside the classroom context. This variability suggests that while some teachers may actively promote the educational use of technology, others may assume that pupils and parents are independently equipped to manage it. The recurring theme is that teacher involvement is critical, especially in shaping early digital habits and when missing, it creates uncertainty for parents trying to navigate educational technology at home.

Q9: Do you feel you have enough knowledge to support your child in using technology for learning?

This question explores parentsô self-perception of their digital competence and readiness to assist their children with educational technology.

Thematic Analysis

Parental responses revealed a broad spectrum of confidence levels regarding their own technological knowledge. Some expressed uncertainty or admitted lacking sufficient experience to fully support their children, particularly when navigating online content or troubleshooting devices. Others felt moderately confident, often emphasizing their role in supervision and moral guidance more than technical expertise. One parent indicated a measurable self-assessment, stating they possessed about 60% of the required digital knowledge. These responses suggest that parental digital literacy remains a key factor in successful technology use at home and that many would benefit from targeted support or training from schools to fill this gap.

Rubric 5: Opinions and Suggestions

In this rubric, the researcher explores which technological tools parents find most helpful in supporting their childôs learning and gathers their suggestions for improving the digital learning experience. These questions provide insight into what parentsô value in educational technology and offer practical recommendations from their daily experience with tech-based learning at home. The responses contribute to understand how technology can be better adapted to meet learnersô needs and expectations in real-world contexts.

Q10: What technological tools or programs do you find helpful in improving your childôs learning experience?

This question seeks to identify which specific platforms, applications or devices parents consider beneficial for their child's educational development.

Thematic Analysis

The responses consistently pointed to a preference for widely accessible and user-friendly tools such as YouTube (especially YouTube Kids), digital dictionaries, educational videos and interactive learning apps. Parents also appreciated devices like digital tablets and computers when used with structured educational programs. Additionally, some mentioned platforms related to religious education (e.g., Quran memorization apps), indicating that useful tools are those that align with the family's values and learning goals. These preferences show that simplicity, engagement and content reliability are key factors in what makes a tool effective in a home-learning environment.

Q11: If you have a suggestion to improve your childôs learning experience with technology, what would it be?

The aim of this question is to gather parental recommendations for enhancing the integration of technology in childrenôs educational experiences.

Thematic Analysis

Suggestions focused on formalizing and structuring digital learning experiences. Parents recommended incorporating technology directly into the classroom through digital programs tailored to each grade level and more frequent school-based tech activities. Several advocated for the use of modern tools like artificial intelligence and educational platforms to facilitate deeper, faster learning. Others emphasized the need for setting time limits to balance screen use with other activities and prevent dependency. A few responses also reflected uncertainty or a lack of suggestions, possibly indicating limited exposure to structured technology use. Overall, the recurring themes were better school-level implementation, regulated screen time and skill-based content to maximize technologyôs learning potential.

2.5. Interpretation and Discussion of the Main Results

RQ1: *To what extent are primary school teachers aware and capable of integrating technology into their English language teaching practices?*

H1: *Teachers with many years of teaching experience are less likely to integrate technology frequently in their English language teaching.*

Interpretation and Discussion

The analysis of the teachersô questionnaire responses reveals a nuanced understanding of how technological awareness and integration vary among educators in different schools.

From Question 1, it was observed that 60% of teachers had more than 10 years of experience, 30% had less than 5 years and 10% had between 5 to 10 years of experience. Despite this high level of seniority, not all experienced teachers reported frequent use of technology in their classrooms. In fact, responses to Question 3 ("How often do you integrate technology into your teaching methods?") showed that a significant number of teachers did not always or often use technology, suggesting a partial confirmation of Hypothesis 1.

Further, Question 2 revealed that while most teachers reported using some form of technology, the depth of integration varied. Some used it only occasionally or for basic tasks like presentations, rather than for interactive or pupil-centered learning.

Additionally, Question 7 highlighted a lack of sufficient training opportunities, which may explain the hesitation or limited use among experienced teachers. It is likely that younger or less experienced teachers, having been exposed to digital tools during their own training, felt more confident and motivated to integrate them regularly.

Thus, H1 is partially supported: while many experienced teachers are aware of technology, they are less frequent users compared to newer teachers, possibly due to:

- Lack of training

- Resistance to changing traditional methods
- Limited institutional support

In summary, while teachers generally acknowledge the value of technology, their actual integration practices are affected by years of experience, personal comfort and systemic barriers. This reflects a need for ongoing digital training and stronger institutional support to enable all teachers regardless of experience to use technology effectively.

RQ2*: How do parents perceive the role and impact of technology on their childrenôs motivation, academic performance and learning behavior?*

H2: *Positive parental perceptions of educational technology are associated with higher motivation and improved learning outcomes in their children.*

Interpretation and Discussion

The thematic analysis of parentsô interview indicated a strong overall agreement regarding the positive role of educational technology in enhancing childrenôs learning. Most parents described technology as engaging, time-saving and effective, particularly in supporting basic language skills, such as recognizing letters, numbers and pronunciation. This supports the first half of H2, showing that parents hold positive perceptions of technology in education.

In response to questions such as:

- ***ñDo you believe technology helps your child learn faster or more effectively?ò***
- ***ñHave you noticed any change in your child's interest in studying with the use of technology?ò***

Parents reported noticeable improvements in both learning outcomes and motivation. For example, some mentioned their child was able to grasp lessons more

quickly or had renewed interest in studying through platforms like YouTube and mobile applications.

However, the responses also reflected a cautious optimism. While parents value the educational potential of technology, they highlighted the importance of moderation and supervision to avoid distractions, overuse or dependence. These concerns were particularly clear in the answers to questions about challenges and negative effects, where screen addiction and reduced creativity were mentioned.

Despite these concerns, the overall perception remained positive, with many parents encouraging technological use, especially when guided by teachers and supported at home.

Therefore, H2 is supported. The data show a clear link between positive parental attitudes toward technology and observed improvements in:

- Student motivation
- Learning speed
- Engagement with educational content

These findings underscore the importance of involving parents in digital learning strategies and ensuring they have the knowledge to support their children effectively at home.

RQ3: *What are the key challenges that influence the integration of educational technology in primary education?*

H3: *The effectiveness of educational technology integration is significantly limited by lack of infrastructure, insufficient training and low digital literacy among teachers and parents.*

Interpretation and Discussion

The combined results from both the teachersô questionnaire and parentsô interview strongly support H3, showing that while technology is viewed positively, its effective integration is hindered by several practical and structural challenges.

On the teachersôside, responses from:

- Q7 (*Does your school provide adequate training for using educational technology?*) showed that many teachers lack sufficient training opportunities, which limits their ability to fully implement digital tools.
- Q8 (*What challenges do you face when using technology?*) highlighted issues such as lack of resources, technical problems and insufficient institutional support.

These findings indicated that teachers were willing but not fully equipped, pointing to a systemic issue rather than a motivational one. The absence of consistent school-supported training programs made it difficult for teachers to adapt to evolving educational technologies.

On the parentsôside, thematic analysis revealed parallel concerns:

- Many expressed uncertainty or limited confidence in their own ability to assist their children, especially with more advanced tools or platforms.
- Parents also raised concerns about content safety, screen overuse and a lack of clear guidance from schools or teachers on best practices.

These points were especially evident in responses to:

- ***ñ****Do you feel you have enough knowledge to support your child in using technology for learning?****ò***
- ***ñ****Do teachers provide sufficient guidance on how to use technology correctly and beneficially?****ò***

Taken together, the findings confirm that the potential of educational technology is currently undercut by:

- Insufficient digital training for teachers
- Limited digital literacy among parents
- Lack of clear institutional strategies
- Uneven access to tools and infrastructure

Therefore, H3 is fully supported. Overcoming these limitations requires:

- Consistent teacher training
- Parental engagement programs
- Improved school infrastructure
- Policy-level planning to guide and sustain tech integration

2.6. Suggestions and Recommendations

In this section, the researcher offers practical recommendations based on the findings discussed in the previous section. The aim is to improve the integration of technology in primary education by addressing the challenges identified among teachers, parents and the institutional environment in schools. The suggestions are designed to support policymakers, educators and parents in developing a more effective and inclusive digital learning ecosystem.

1. Provide Continuous Training for Teachers

One of the clearest barriers to technology integration was the lack of adequate training. Teachers should receive ongoing professional development in educational technology, including hands-on workshops, digital pedagogy courses and platform-specific training. This will increase confidence and competence in using digital tools effectively in the classroom.

2. Develop a Structured Technology Integration Plan at School Level

Schools should implement a clear strategy for incorporating technology into daily teaching. This includes investing in basic infrastructure (computers, tablets, and internet access), setting learning goals for technology use and ensuring regular system maintenance. A well-defined plan prevents uneven usage and maximizes the impact of available tools.

3. Involve Parents through Digital Awareness Programs

Since parental support plays a critical role in pupilsô engagement, schools should create awareness and guidance sessions for parents, helping them understand how to supervise and support their childôs digital learning at home. This also improves digital literacy at the family level and reduces misuse of devices.

4. Encourage Balanced Use of Technology

To address concerns about screen addiction and reduced creativity, it is important to promote balance between traditional learning and digital tools. Teachers and parents should be encouraged to limit screen time, include breaks and use technology purposefully e.g., for research, interactive learning or skill-building not just for passive content consumption.

5. Customize Digital Tools to Different Learning Levels

Students at various grade levels have different cognitive and digital readiness. Schools should adopt grade-appropriate apps and platforms that match each childôs developmental stage. Younger learners, for instance, may benefit more from gamified apps, while older learners may engage better with productivity and research tools.

6. Foster Collaboration between Stakeholders

A successful integration of technology requires collaboration among school administrators, teachers, parents and external partners (e.g., EdTech providers). Regular meetings, feedback systems and joint planning can ensure all voices are heard and all needs are addressed when implementing digital tools.

2.7. Conclusion

In this chapter, the investigator has presented a comprehensive overview of the research methodology, data analysis and interpretation of findings regarding technological awareness in primary education. By adopting a mixed-methods approach, the study explored both quantitative data from a teachersô questionnaire and qualitative insights from a parentsô interview, offering a balanced view of how technology is currently perceived and utilized in the learning environment.

The findings revealed that while both teachers and parents acknowledge the importance and potential benefits of educational technology such as improved engagement and personalized learning also the faster access to information; several obstacles hinder its effective implementation. These include insufficient training for teachers, limited digital literacy among parents and inadequate infrastructure and institutional support.

The research also confirmed that factors such as teaching experience, parental involvement and school policy significantly influence how technology is adopted and applied in the classroom. Despite some positive practices already in place, the study emphasizes the need for more structured planning, targeted training and stakeholder collaboration to create a fully supportive and effective digital learning ecosystem.

Ultimately, the study contributes to a growing body of knowledge on educational technology in developing contexts and provides practical recommendations for improving the quality and accessibility of technology-enhanced learning in Algerian primary schools.

General Conclusion

The present study set out to explore technological awareness in primary schools, focusing on the perspectives of both teachers and parents. By examining the integration of educational technology in the Algerian context, the research aimed to assess how digital tools are used, perceived and supported at the primary level.

The study employed a mixed-methods approach, combining quantitative data collected from 20 teachers from the primary school of Techouar Sid Ahmed and other schools while qualitative insights obtained through interviews with four parents. The findings revealed that while there was a growing awareness of the importance of technology in education, its implementation remained inconsistent due to several barriers. Teachers generally recognized the benefits of digital tools for enhancing language learning but often faced challenges related to limited training, lack of infrastructure and institutional constraints. Similarly, parents appreciated the value of technology in motivating and supporting their childrenôs learning but expressed concerns about screen overuse, lack of guidance and insufficient personal expertise in managing digital tools effectively.

Three key themes emerged from the analysis. First, professional experience and training play a significant role in how frequently and effectively teachers use technology in their classrooms. Second, parental attitudes are closely linked to their childrenôs engagement with digital learning. Third, both teachers and parents require more structured support systems to ensure the safe and meaningful use of educational technology.

Based on these conclusions, the study offers several practical recommendations. These include providing continuous training for teachers, improving school infrastructure, involving parents in digital literacy initiatives and promoting balanced, developmentally appropriate technology use.

In summary, this research highlights the potential of educational technology to enhance primary-level learning in Algeria, while also drawing attention to the gaps

that must be addressed to achieve successful, inclusive and sustainable digital integration in schools. The findings may serve as a valuable reference for educators, policymakers and researchers seeking to advance technology-driven education in similar contexts.

Bibliography

Bakar, T., &ķahin, L. (2022). Technology integration in teaching English as a foreign language. *Journal of Educational Technology & Online Learning, 5*(1), 204ï 222. https://files.eric.ed.gov/fulltext/EJ1330632.pdf

Belabed, N. S. (n.d.). *The breakthrough of educational technology in the Algerian EFL context: Challenges and prospects*. University of Mostaganem. https://e-biblio.univ-mosta.dz/bitstream/handle/123456789/17604/BELABED%20Nassrine%20Safia%20Thesis%20%282%29.pdf

BMZ. (n.d.). *Education in developing countries*. Federal Ministry for Economic Cooperation and Development. https://www.bmz.de/en/issues/education-a-human-right/education-in-developing-countries-197598

Bouklikha, W. (2016). *Practice of the reading skill in an ESP context using web-retrieved material: The case of engineering students at Tlemcen University* [Unpublished doctoral dissertation]. University of Tlemcen.

Bridge Education Group. (2024). *How technology is revolutionizing English language teaching*. Bridge TEFL. https://bridge.edu/tefl/blog/how-technology-is-revolutionizing-english-language-teaching/

Bridge, S. (2024). *Transforming ESL learning through technology integration*. ArchwayPublishing. https://www.archwaypublishing.com/en/bookstore/bookdetails/862396-transforming-esl-learning-through-technology-integration

Bryman, A. (2012). *Social research methods* (4th ed.). Oxford University Press.

Butler, I. (2006). *Integrating language and literature in English studies: A case study of the English 100 course at the University of North West* [Doctoral dissertation, University of South Africa].

Butler, J. (2006). *Investigating the classroom experience*. Routledge.

Bibliography

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.

Collegenp. (2024). *Primary education in developing nations: Overcoming challenges*. https://www.collegenp.com/article/primary-education-in-developing-nations-overcoming-challenges/

Continental Press. (2022). *How to use technology to help ELLs achieve language mastery*. https://www.continentalpress.com/blog/how-to-use-technology-to-help-ells/

Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed methods approaches* (4th ed.) . SAGE Publications.

Denscombe, M. (2017). *The good research guide: For small-scale social research projects* (6th ed.). Open University Press.

Djouiba, C. (2024). *Transforming primary school education in Algeria through artificial intelligence: Enhancing personalized learning and addressing challenges*. ERIAC Laboratory, University of Rouenï Normandy. https://www.researchgate.net/publication/384671018

Edutopia. (2021). *Using technology to support young English language learners in a hybrid classroom*. https://www.edutopia.org/article/using-technology-support-young-english-language-learners-hybrid-classroom/

Gardner, K. (2021). *Using technology to support young English language learners in a hybrid classroom*. Edutopia. https://www.edutopia.org/article/using-technology-support-young-english-language-learners-hybrid-classroom/

Grove, S. K. (2003). *The practice of nursing research: Conduct, critique and utilization* (4th ed.). Saunders.

Jiménez Sierra, L., Torres Muñoz, M., &AguilarSánchez, V. (2023). *Technology integration and digital learning in primary education: Global perspectives and strategies*. Educational Insights Press.

Karaferye, F. (2022). Digital teaching and learning: Exploring primary school teachersô approaches, sources of concern & expectations. *Journal of Educational Technology & Online Learning*, *5*(4), 808ï 824. https://files.eric.ed.gov/fulltext/EJ1378873.pdf

Kvale, S., &Brinkmann, S. (2009). *InterViews: Learning the craft of qualitative research interviewing* (2nd ed.). SAGE Publications.

Loveless, A. (2002). *Literature review in creativity, new technologies and learning*. Futurelab.

McKernan, J. (1991). *Curriculum action research: A handbook of methods and resources for the reflective practitioner*. Kogan Page.

OECD. (2020). *Digital strategies in education across OECD countries: Exploring policies and practices*. https://one.oecd.org/document/EDU/WKP%282020%2914/en/pdf

Premier TEFL. (n.d.). *Technology in the TEFL classroom*. https://premiertefl.com/blog/technology-for-tefl-classrooms/

Teach the World Foundation. (n.d.). *Digital learning in developing countries*. https://www.teachtheworldfoundation.com/subject-page-digital-learning-developing-countries

UNESCO. (2022). *Technology in education: A tool on the rise ï Global report on the state of digital learning in primary schools*. United Nations Educational, Scientific and Cultural Organization.

UNICEF. (2021). *Effectiveness of digital learning solutions to improve educational outcomes: A review of the evidence*. https://www.unicef.org/media/103246/file/Effectiveness%20of%20digital%20learning%20solutions%20to%20improve%20educational%20outcomes%20-%20A%20review%20of%20the%20evidence.pdf

World Bank. (2020). *World development report: Learning in the digital age*. World Bank Group.

Appendix A: Teachersô Questionnaire

Teacher Questionnaire on Technological Awareness in Primary Schools

This questionnaire aims to gather information about English teachers' perspectives on using technology in primary schools to enhance learning and teaching practices. Please answer the following questions:

Section 1: General Information

1. **How many years of teaching experience do you have?**
   - ☐ Less than 5 years
   - ☐ 5ï 10 years
   - ☐ More than 10 years

2. **Do you use technology (e.g., computers, tablets, interactive boards) in your English classes?**
   - ☐ Yes
   - ☐ No

3. **How often do you integrate technology into your teaching methods?**
   - ☐ Always
   - ☐ Often
   - ☐ Rarely
   - ☐ Never

Section 2: Technology in Teaching

4. **What types of technology do you primarily use in your classroom?**

   ☐ Computers

   ☐ Tablets

   ☐ Interactive whiteboards

   ☐ Other: _____

5. **Do you think technology helps improve students' engagement and learning outcomes?**

   ☐ Yes

   ☐ No

6. **How effective do you find technology in teaching English skills (e.g., reading, writing, speaking, listening)?**

   ☐ Very effective

   ☐ Somewhat effective

   ☐ Not effective

7. **Does your school provide adequate training for using educational technology?**

   ☐ Yes

   ☐ No

8. **What challenges do you face when using technology in your teaching?**

   ☐ Lack of resources

   ☐ Technical issues

   ☐ Lack of training

   ☐ Other: _____

Section 3: Suggestions and Feedback

9. **What are the most significant benefits of using technology in teaching English?**

10. **What improvements or resources would you like to see to enhance the use of technology in your teaching?**

11. **How can technology be better integrated into English language teaching in primary schools?**

Appendix B: Parentsô Interview

Parent Interview on Technological Awareness in Primary Education

Note: The following questions were translated into Arabic to ensure accessibility for parents who do not speak English.

This interview aims to gather insights from parents regarding their perceptions, experiences and challenges related to their children's use of technology in primary education.

General Information

1. What is your child's grade level?
2. Does your child have experience using technology?

The Use of Technology in Education

3. How do you view the role of technology in your child's education?
4. Do you believe technology helps your child learn faster or more effectively? Why?
5. Have you noticed any change in your child's interest in studying with the use of technology?

Challenges Faced by parents

6. What challenges do you face as a parent when your child uses technology for educational purposes?
7. Do you think there are negative effects of using technology on your child?

Support and Guidance

8. Do teachers provide sufficient guidance on how to use technology correctly and beneficially?
9. Do you feel you have enough knowledge to support your child in using technology for learning?

Opinions and Suggestions

10. What technological tools or programs do you find helpful in improving your childôs learning experience?
11. If you have a suggestion to improve your childôs learning experience with technology, what would it be?

Appendix C: Parentsô Interview Translated