The Contribution of Technological Innovations to Enhance Education for Sustainable Development

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Abstract: *Technological innovations have revolutionized numerous sectors, including education, by providing new tools and methodologies that enhance learning experiences and outcomes. Governments worldwide made teaching and learning educational technology compulsory during the COVID-19 pandemic in all educational fields. Despite the numerous advantages, integrating technological innovations into the educational process is challenging. There remains a significant gap between the potential of these technologies and their actual implementation in classrooms and educational fields. Issues such as inadequate infrastructure, lack of teacher training, and resistance to change hinder the effective use of technology in education. Moreover, the rapid movement of technological advancements often exceeds the ability of educational institutions to adapt, leading to underutilization of available resources and missed opportunities for enhancing the educational process. While there is a growing body of literature on the subject, much of the existing research is fragmented and lacks a comprehensive framework that connects theory with practice. This study employs qualitative analysis to obtain information about the experiences, benefits, and discusses the challenges that may arise using educational advancements and techniques in language learning. It aims to provide teachers and educators with a better understanding of the impacts of using technology in the educational process and the development of language learning. In the paper, the researcher defines technology, in addition to Information Communication Technology (ICT), and reviews previous studies on the effective use of technological tools across educational settings. Furthermore, the study sheds light on the role of using modern technological innovations that can be effectively utilized and integrated into education, not only for learners but also for their instructors who need to achieve professional development, by increasing the engagement of using technology in educational settings, motivation, as well as improving accessibility and convenience.*

Keywords*: technology, innovations, educational technology, professional development*

INTRODUCTION

Technology is a powerful tool that can transform education and introduce new ways of learning. It has become a vital tool that has contributed to many societies, from simple tasks of writing reports and sending emails, to many other advanced functions. Young learners have regularly utilized and engaged with technology in and outside the classrooms to succeed in their future careers and learn modern technological skills (Alzankawi, 2020). According to Gurung (2020), "We live in a fast-changing world, and producing more of the same knowledge and skills will not suffice to address future challenges".

Information and Communication Technologies (ICT) tools nowadays are used enormously in teaching-learning, especially after the Covid-19 pandemic (Ingole, 2022). Governments worldwide made teaching and learning educational technology compulsory in all academic fields. Consequently, human lifestyles have changed dramatically, because of the contributions of technological advancements and education, as well as their beliefs and practices, which have increased the scope of knowledge in various ways and directions (Nwadiokwu, 2018). As a result, integrating technology with education is no longer a novel concept but a necessary component of modern educational practices.

ICT tools include all electrical devices such as radios, televisions, videos, DVDs, mobile phones, computers and related hardware and software, video conferencing, e-mails, blogs, etc. These tools have transformed traditional classrooms into dynamic learning environments that help diverse learning styles and needs (Johnson & Smith, 2018). For example, modern technological tools such as tablets, audiobooks, or e-readers can all be used to supplement the learning process and develop digital literacy and activities for learners of all ages (Alzankawi, 2020). These technologies facilitate interactive and personalized learning experiences, increasing student engagement and motivation (Reinders & Pegrum, 2018). Accordingly, technological advancements have had a profound impact on language education. Traditional language teaching methods often face limitations such as lack of immersion, limited access to native speakers, and insufficient practice opportunities. However, with the advent of technology, learners can now access a plethora of resources, engage in real-time communication with native speakers, and immerse themselves in virtual environments that simulate real-life scenarios (Godwin-Jones, 2018). This shift enhances linguistic proficiency and fosters cultural competence, essential for effective communication in a globalized world (Chen & Lin, 2020).

LITERATURE REVIEW

The use of technological tools in the educational field has increased dramatically in the last two decades, triggering changes in the academic setting (Serin, 2015). According to Serin (2015), the effective use of technological tools across educational settings provides opportunities for developing learner's skills to achieve academic goals.

Educational technology is not limited to high technology but includes anything that improves classroom learning using blended face-to-face, e-learning, multimedia learning, computer-

based instructional training, virtual education, and learning platforms (Moore, et al., 2011). Recent studies such as those by Brown and Green (2018), highlight the role of online resources in providing flexible learning opportunities, as well as providing the ability to access materials anytime and anywhere, that can accommodate different lifestyles and learning preferences, which is considered particularly advantageous in the context of lifelong learning and professional development.

Another study by Liu, Tsai, & Huang (2015) has examined how learners can integrate technology into instruction. Based on the research, integration can be done using content and pedagogical knowledge to evaluate professional development. Moreover, the researchers found that integrating technology in educational settings enhances learning efficacy, increases learners' motivation, and promotes creativity. Unsuccessful experiences in the use and adoption of technology inhibit learners' motivation. Thus, there is a need to establish successful educational setting experiences that enhance technology integration.

Technology is defined as the systematic application of scientific or other organized knowledge of practical tasks (Robinson et al., 2007). Educational technology, on the other hand, is defined as the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (Richey, 2008). In addition, Robinson et al. (2007) claim that "Educational technology is the use of both physical hardware, software, and educational theoretic to facilitate learning and improving performance by creating, using, and managing appropriate technological processes and resources" which reflects the intellectual and technical development of educational technology. It includes computer-based training, online training, and where mobile technology is used. Hence, educational technology refers to all valid and reliable applied equipment, and processes derived from scientific research, through integrating technology into educational settings, to promote a more diverse learning environment (Hamad et al. 2018).

The Importance of Using Technology in the Educational Process

The importance of educational technology is related to using technology to improve the educational process and activate the role of effective teacher-learner participation through using various technological means available to the student, to allow him/her to diversify the experience offered through observation, listening, practice, and reflection, and then to continuously evaluate and review the teaching materials (Garrison & Anderson, 2003). In addition, using educational technology in the educational process ensures that permanent upgrades are regularly and effectively integrated resulting in higher educational efficiency (Hamad et al., 2018). Studies by Johnson and Aragon (2020) found that adaptive learning technologies provide personalized learning experiences that cater to individual student needs, improving learning outcomes. Accordingly, the benefits of using educational technology can be summarized as follows:

1. Shortening the time specified for instructions given by the teacher in the classroom.
2. Expanding the database of any subject to provide information to learners in all fields of science.

3. Enabling the learners to solve the challenges faced during the learning process.
4. Improving the learner's linguistic output through the scenes and attitudes, including learning new English terms.
5. Assisting teachers in changing their approaches, as teachers' pedagogical experiences and rationales can influence their use of ICT, which will affect student's achievement (Ingole, 2022).
6. ICT tools help teachers create a learner-centered environment, which is important for moving from traditional teacher-centered teaching methods to more student-centered ones (Ingole, 2022).
7. The use of educational applications improves learning outcomes. Pre- and post-tests show that using apps on mobile devices minimizes the achievement gap between struggling and average students (Cassidy, 2004).
8. One of the most significant benefits of technological innovations is their ability to facilitate individualized learning. Adaptive learning software and language learning apps provide personalized feedback and allow students to progress independently. This customized approach caters to the diverse learning needs within a classroom, offering additional support to struggling students and more challenging content to advanced learners. According to Johnson and Aragon (2020), adaptive learning technologies effectively improve learning outcomes.

Some educational applications improve group work by providing students with feedback on their answers and encouraging teamwork in problem-solving. According to recent E-learning studies, using E-learning systems in university contexts increases productivity and allows learners to fulfill their tasks effectively (Nwadiokwu, 2018).

Using Technology in the Development of Language Learning

In today's world, young learners have experienced a technological development that has completely changed how people interact and communicate. These digital integrators weave technology into their lives in an effortless manner. Additionally, they have witnessed how the Internet has grown and changed and how social media and information sharing have been gradually incorporated into daily life (Alzankawi, 2020). Consequently, English teaching methods have been significantly influenced by the use of technology. Technology is crucial in assisting foreign language teachers by facilitating language learning for their students.

There are various ways in which technology is being incorporated and used in the development of language learning. One of the ways of incorporating technology is using videos to conduct mini-lessons. In addition, lesson plans can be developed and implemented better through videos for specific topics, as they add a multimedia component to the lessons, which benefits learners significantly. Moreover, Animated videos have an important impact on the development of language learning programs in several areas of competence, such as creativity, memory, and critical thinking. Furthermore, multimedia elements can be added to presentations, enabling learners to be attentive and observant. Graphs, images, podcast clips, and pictographs are examples of those elements.

Technology is also used to incorporate learners' input and collect their feedback during learning development program sessions. Numerous technological applications enable learners to provide feedback during a session. Robinson & Latchem (2004) assert that polling applications can be used to create polls and gather input, allowing the learners to know whether they are struggling to understand a specific topic, as learners take part in the polls using smartphones. In addition, Moore et al. (2016) affirm that another way of using technology in language learning is through gamification; the application of gaming mechanics adds fun to the learning process. For example, competitive models can be used during an activity or exercise, and learners can be urged to search for some facts, and the ones who get the right answers are rewarded. This approach is important because it helps motivate learners and enhances their learning experience.

Technology is also used to administer online assessments. According to West & Graham (2005), learning Management Systems (LMS) have offered an opportunity to design and execute evaluations online. Learning management systems have become a database where information and activities can be stored and distributed easily, and access can be provided to shared resources within the system. As such, technology not only makes it more convenient for young learners to use but also saves time that could be used for other essential matters and activities.

The Impact of Educational Technology on English Language Teaching and Learning

The use of technology today is an urgent need for teaching and learning the English language. Consequently, educators and students require additional tools to achieve their objectives. Moreover, utilizing technology is crucial to language learning activities, enabling learners to enhance their language skills. Accordingly, several research studies have highlighted the positive impacts of incorporating technology into language instruction and learning. Ahmadi (2017) pointed out that technology is a helpful tool for assisting the learning process in today's digital era. He stated that teacher methods in their classes significantly facilitate language learning. Moreover, technology is important in promoting learners' activities and significantly affects teachers" teaching methods. Thus, teachers need to fully know these technologies in teaching language skills (Shukr & Jameel, 2022), and they should model the use of technology as well, to support the curriculum so that learners can increase the true use of technology in learning their language skills (Costley,2014). In addition, Gençlter (2015) emphasized the process of motivating learners by their teachers to discover suitable tasks by utilizing computer technology in language learning.

Nowadays, lecture-based classes are less effective than a technology-enhanced teaching environment, as teachers should find methods of applying technology as a practical and useful teaching medium for their students. Thus, the application of technology has considerably changed English teaching methods, providing many alternatives to making teaching interesting and more productive in terms of advancement (Patel, 2013).

However, there are many advantages of using technology in language teaching and learning, such as:

1. Multimedia teaching improves the teaching process and improves class time. It also breaks the 'teacher-centered' technique into 'student-centered', which provides interaction between teachers and learners, helps learners develop thinking skills, and promotes their independence and confidence.

2. Using technological devices primarily increases class efficiency, as it is difficult for students to communicate through many classes (Shukr & Jameel, 2022).

3. Technology helps learners to collaborate on global projects, provides authentic materials, and is a good way to improve writing, listening, and communication skills.

4. Using technology increases learners' motivation to learn a foreign language effectively and improves their communication abilities through the support of a computer network (Shukr & Jameel, 2022).

5. Using technology for teaching media has also changed English teaching methods. It provides many alternatives, such as making teaching more exciting and productive. Moreover, using multimedia texts in the classroom helps learners quickly become familiar with vocabulary and language structure (Anjana, 2020).

6. Using technology in language learning classes can be useful for educators and students, as it is argued that using technology-based English language education tasks enhances collaborative language learning and allows them to apply language in communication (Harmer, 2007) proficiently.

7. Computer tasks assist language students in accessing data and valid content rapidly, although the consistency of using the Internet encourages students to do more learning (Gençlter, 2015).

8. Technology provides many advantages such as making education fascinating and more effective regarding improvements. Using technology facilitates students' engagement and learning based on their favorites (Zhang, 2022).

In a study by Hidayat et al. (2022), to examine the experiences of young Indonesian students undertaking online English learning, using a survey of 496 students enrolled in a university in Jakarta, the findings showed that online activities, skills, and perceived usefulness were positively correlated with positive experiences of learning English online. The researchers

stated that the perceived usefulness of the Internet and the ability to use different functions of digital devices and applications had a stronger correlation with increased benefits of online English learning.

The Role of Information and Communication Technology (ICT) in Teachers'

Professional Development

Professional development is crucial in assuring educators to maintain developments in complete learner fulfillment criteria, learn new education approaches within the content domains, discover ways to learn modern educational technologies for education and learning in the best way, and make their education adaptive to the changing school setting and an increasingly different learner population (Lawless and Pellegrino, 2007).

The main purpose of utilizing ICT in education is to improve the teaching methods used by the teachers, the students' ability to study, and the quality of education. If educators fail to use technologies in their education, they will fail to keep pace with such methods. Therefore, educators must have complete information about those technologies when instructing language competencies (Gilakjani, 2017). Research claims that educators who combine academic technology with in-class instruction remarkably affect their education efficiency and learner success, particularly in instructing English students (Jabbari et al., 2017). Thus, it has reconsidered merging technology into educational programs and focusing on its integration into education to help with the learning procedure. As a result, technology has become an essential component of the learning experience and an important issue for educators, from the start of preparing the learning experience to the process of learning and instruction (Altun and Khurshid Ahmad, 2021).

Some teachers can use ICT confidently, but many fear using it and are reluctant to use it in the teaching process. To solve this problem:

1. Early exposure to ICT can be an essential tool in promoting teachers' professional development, and teachers should be encouraged to actively participate in continuous professional development programs in various ways, such as promotions, salary increases, and paid leave to attend the programs regularly. As a result, the effective use of ICT in education increases the need for teacher training and professional development, due to the daily educational growing needs.

2. A successful continuing teacher professional development model can be divided into three phases:

   - Pre-service, focusing on initial preparation in pedagogy, subject mastery, management skills, and various educational tools, including ICT.
   - Include in-service, structured, face-to-face, and distance teaching opportunities, based on pre-service training and directly related to teachers' needs.

- Consistent formal and informal pedagogical and technical support for teachers to meet their everyday needs and challenges, enabled by ICT (Ingole, 2022).

3. Teachers must prepare much more to familiarize themselves with technological skills that help them in their teaching process.

Examples of Modern Technological Innovations in Education

In modern classrooms, interactive technologies have replaced traditional blackboards and books, creating an engaging and dynamic learning environment. Examples of these interactive technologies are as follows:

1. Interactive Whiteboards: Interactive whiteboards in language classrooms can enhance engagement, interactivity, and multimedia integration (Johnson & Smith, 2018). Many recent studies have explored innovative uses of interactive whiteboards, such as virtual language labs, real-time collaborative writing activities, and interactive language games, to foster communicative competence and cultural awareness (O'Dowd & Dooly, 2021).

2. Mobile Learning: The emergence of mobile learning technologies and their implications for language education (Stockwell & Hubbard, 2019), such as the use of mobile apps for vocabulary acquisition, language immersion experiences through augmented reality applications, and the integration of mobile devices into blended learning environments to promote anytime, anywhere language practice.

3. Virtual Reality (VR) and Augmented Reality (AR): The applications of VR and AR technologies in language education, focusing on their potential to create immersive and interactive learning experiences (Merchant et al., 2020). Many recent studies have investigated the effectiveness of VR and AR simulations for language immersion, cultural competence development, and virtual language exchanges, exploring their impact on motivation, engagement, and language proficiency (Hsin & Cigas, 2013).

4. Adaptive Learning Systems: The role of adaptive learning systems in personalized language instruction, and the recent advancements in adaptive learning research, such as the integration of machine learning algorithms to personalize language learning pathways, the development of intelligent tutoring systems that provide real-time feedback and adaptive content recommendations, and the use of learning analytics to inform instructional decision-making and learner support strategies (Rienties et al., 2019).

5. Additionally, Learning Management Systems (LMS) such as Moodle, Teams, Zoom, and Google Classroom were recently added to the interactive technologies for their organizational benefits and ease of access to resources, which reflected a rapid transition to online learning platforms and a significant increase in the use of digital

tools. While initially challenging, this shift led to greater familiarity and comfort with technology among teachers and students.

Challenges Related to Technological Literacy and Infrastructure

Despite the positive impacts of using ICT in the educational process, technological literacy and infrastructure challenges remain significant. Variability in technological literacy among teachers and students and infrastructure issues such as unreliable internet connections and lack of access to devices hinder the effective implementation of technology in education (Alenezi, 2018). Alenezi (2018) discussed the digital divide and its impact on educational equity. The variability in technological literacy among teachers and students and infrastructure issues remain significant barriers to implementing technology in education. However, addressing these challenges requires comprehensive professional development for teachers and substantial investments in technological infrastructure to ensure equitable access to digital tools. Accordingly, Robinson & Latchem (2004) states that one of the problems is the emergence of new technological trends, which have completely changed the field of education. The rise of the latest trends in technology presents a significant challenge because young learners might be unable to adapt to it. As a result, the applicability of technology in education becomes challenging, and the goals of using it are not achievable. Another challenge is the failure to personalize learning; a gap exists between the desire to deliver differentiated instruction and the technology that can facilitate this approach. Although young learners want to implement personalized learning, they do not get access to the tools needed to attain it.

The other challenge is the inability to use technology while delivering formative assessments. According to Inoue (2007), it is evident that assessments are significant drivers and determinants of educational changes. In the recent past, formative assessments have become common in instructional practice and training sessions. However, there is a gap because educational institutions cannot implement new skill demands. It has become challenging for young learners to use simple digital tools that would be helpful in assessment and training. Using technology in training sessions is also difficult when inadequate infrastructure and ICT support exist. As highlighted by McDermott (2019), the success of technology in educational settings is determined by the availability of infrastructure and ease of access to technical support. When these resources are inadequate, it becomes challenging for instructors to train learners. Further, the inadequacy of the needed infrastructure implies that the development of those sessions will become compromised. Controversy also emerges from the fact that some educators do not believe in technology, as some believe face-to-face instruction is the most effective approach to teaching or training. This means it is challenging for young learners as they would not align with the learning goals or portray any commitment to embracing technology as an instructional strategy.

CONCLUSION

Technology plays an essential role in the educational process. Technology is helpful not only to learners but also to instructors who need to achieve professional development. Thus, learners should have adequate knowledge of the current trends in technology and how they can be used

in education. Accordingly, technological innovations have the potential to significantly enhance English language education by increasing student engagement and motivation, facilitating individualized learning, and improving accessibility and convenience. However, to fully realize these benefits, it is essential to address the challenges related to technological literacy and infrastructure. By investing in professional development for educators and ensuring equitable access to digital tools, educational institutions can create a more inclusive and effective learning environment.

The insights gained from this study contribute to the growing body of literature on the role of technology in education and provide practical recommendations for educators, administrators, and policymakers. As technology continues to evolve, ongoing research and adaptation will be crucial to leveraging its full potential in enhancing English language education. By embracing technological innovations and addressing the associated challenges, a more engaging, personalized, and accessible learning experience can be created for all students.

Implications for Practice

The practical implications of this study for English language education are significant. To maximize the benefits of using technological tools in education:

1. Educators can utilize technological innovations to create dynamic and engaging learning environments that support the individual students' needs. Educators can enhance student motivation and participation by integrating interactive tools and multimedia resources into their teaching practices, ultimately fostering more effective language learning experiences.

2. Training programs should not only focus on the technical aspects of using technology but also on pedagogical strategies for effective integration into language instruction. By equipping educators with the necessary skills and knowledge, educational institutions can ensure that technology is supported to its full potential in enhancing the educational process.

3. Educational institutions must invest in reliable technological infrastructure to support the effective implementation of technology in education. This includes ensuring sufficient access to devices and reliable internet connectivity for all students. Policymakers and administrators should prioritize closing the digital divide to promote inclusivity and equitable access to educational resources.

4. The design and selection of technological tools should be guided by principles of user-friendliness and adaptability. Tools that are easy to use and can be tailored to individual learning needs are more likely to be effective and widely adopted. Developers should consider feedback from both teachers and students to create tools that meet their specific needs and preferences.

Recommendations for Future Research

Building on the insights gained from this study, several areas for further future research emerge in determining the uses of technology in language learning development and education. The study presents literature showing that as technology continues to evolve, so does the need to stay constantly informed and updated with it. One area for further investigation is the longitudinal impact of technological innovations on language learning outcomes, which could provide valuable insights into the sustained effects of technology integration over time and its influence on the educational process and academic achievement.

More research is needed to identify best practices for integrating technology in diverse educational contexts. Comparative studies across different regions, educational levels, and types of institutions could reveal important variations and help tailor strategies to specific settings. Research should also investigate the effectiveness of different types of technological tools and their impact on various aspects of language learning skills, such as speaking, listening, reading, and writing skills.

Furthermore, research focusing on the intersection of technology and language acquisition for specific learner populations, such as English Language Learners (ELLs) or students with disabilities, could provide valuable insights into tailored approaches to technology integration. Understanding how technology can be effectively adapted to meet the diverse needs of these learners is crucial for promoting inclusivity and equitable access to language education. Accordingly, it is necessary to incorporate new forms of ICT into education effectively, as educational planners, teachers, and curriculum makers must be able to make many decisions in various fields, such as training, technology, finance, education, communication, etc. (Ingole, 2022). Thus, this study recommends the following:

1. Young learners should actively take part in being constantly aware of the developments and changes in technology.

2. Because technology has proven to be an important tool in helping young learners learn productively and efficiently, schools and universities must continuously find ways to support the use of technology in educational settings.

3. Instructors must be motivated to provide educational resources that are relevant to the process of teaching and learning.

4. Higher education fields should all include educational technology centers for pre-service teachers, to get them involved compulsorily in development training programs.

5. Building and equipping modern educational technology centers is necessary to provide opportunities for adequate production and utilization of educational resources.

6. Further research should focus on this important issue, namely, how teachers can acquire the IT skills that can be used to facilitate their student's learning by applying a range of technological tools.

Acknowledgment

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