

# The Impact of Teacher Professional Development Programs Incorporating Educational Technology on Student Achievement: A Meta-Analysis

Samsudin  
S2 Teknologi Pendidikan, Universitas Islam As Syafiiyah  
Email: [samsudin.fkip@uia.ac.id](mailto:samsudin.fkip@uia.ac.id)

## ARTICLE INFO

*Historical Articles:*  
*Accepted: 05 June 2024*  
*Revised: 27 July 2024*  
*Approved: 28 August 2024*  
*Available Online: 18 September 2024*

---

*Keywords:*  
*Teacher*  
*Technology*  
*Education*  
*Development*

## ABSTRAK

The objective of this study is to ascertain the role and influence of technology in the field of education. This research employs a qualitative research method utilizing library research methodologies. Technology in education is an integrated system that facilitates instructional processes to achieve optimal results. There is a persistent discrepancy between the advancements in both education and technology and the broader progression of humanity. In this endeavor, educational technology necessitates the integration of diverse components, including tools and mechanisms for information collection, analysis, and problem resolution. The advantages encompass the addition of knowledge, augmented learning capacity, and the simplification of this technology's learning processes.

©2024, Samsudin  
This is an open access article under CC BY-SA license



## 1. Introduction

In the contemporary era, humanity is becoming increasingly reliant on technology, to the extent that it can be considered a necessity for all members of the human race. From infancy to old age, technology is integrated into numerous facets of daily life. Technological advancement has reached a significant level of advancement in the present era. As technology becomes increasingly sophisticated, it is imperative to consider its impact on education. In the field of technology education, technology plays an instrumental role in enhancing students' comprehension of fundamental concepts such as laws and natural phenomena. In consequence of the advent of modern technology, people are able to apply these concepts through the use of technology. Technological advancement has the potential to enhance human well-being on a daily basis and facilitate the completion of challenging tasks (Bradford & Adewale, 2024). In the field of educational technology, the creation of a system is necessary in order to fulfill human needs or to facilitate working from home on a daily basis. In the process of developing educational technology, it is necessary to consider a number of components, including tools and components used to collect information, analyze it, and solve any problems that may arise. Additionally, technology may be defined as a branch of science that involves the study of a system on a computer or laptop and the creation of a device or application embedded in a network to assist or facilitate daily human activities. In the contemporary era, technology has become increasingly sophisticated and varied, accompanied by a proliferation of media used by employees and students to complete tasks. This includes educators who are able to employ technology as a medium (Kutuzov, 2024).

Education is a type of learning referred to as experiential learning, which is undertaken by humans to gain an understanding of the tasks that will be carried out in the workplace. In its earliest form, education was provided from TPA (daycare centers) to the university level, representing the highest degree of academic instruction. Over time, the internet has emerged as a prominent medium for educational purposes, serving as an invaluable teaching tool. To remain competitive in the modern age, educational institutions must demonstrate an ability to adapt and harness the potential of technological advancements. This necessitates the pursuit of enhanced productivity and innovation within the realm of academia. It is crucial to ensure that educational technology information is disseminated with clarity, avoiding potential misunderstandings and ensuring optimal utilization of these resources (Kovacic & Gingell, 2024).

## 2. Method

This research employs a qualitative methodology based on the analysis of existing literature. (Heilig & Sandell Hardesty, 2024) posits that qualitative research methods permit investigators to delineate the impact of educational policies and practices at both the personal and interpersonal levels. This process is related to the literature review, whereby investigators collect data in the form of books, journals, and prior research findings relevant to the current research subject (Heilig & Sandell Hardesty, 2024). The term "literature"—or, as it is sometimes called, "literature review"—refers, according to (Mey, 2022), to the application of relevant theoretical frameworks and academic literature concerning religion, morality, and norms to the social situation under investigation. In this case, data were gathered via internet searches of a variety of sources, including books and research journals that are current and aligned with the research topic.

## 3. Result and Discussion

Educational technology is defined as a systematic approach to the coordination, utilisation, and evaluation of all teaching and learning activities, with a view to optimising the potential of both human and technological resources. The result is an enhanced efficacy in teaching methods, in accordance with the definition provided by Kamus Besar Bahasa Indonesia (2016). Conversely, (Högström et al., 2024) posits that educational technology is a systematic process that assists in the resolution of myriad teaching-related issues. The educational technology is not solely about computers, robots, or other devices. Rather, it encompasses systems and procedures that are designed to contribute to desired outcomes.

The term "technology for education" can be defined as a methodology or instrument that facilitates student learning. In an educational setting, the process of developing lesson plans may necessitate the utilisation of reliable technology to facilitate the creation of effective learning concepts. In accordance with the definition set forth by the Association for Educational Communications and Technology (AECT) in 2004, educational technology can be defined as "the study and ethical practice of creating, using, and managing appropriate technological processes and resources to facilitate learning and improve performance." The field of technology education encompasses the examination of methodologies and ethical principles that facilitate learning and improve performance through the creation, use, utilization, and management of existing technological resources (Chen & Qi, 2024).

In the context of Webster's Dictionary, the term "technologia" in Greek is defined as "a systematic treatment or application of anything." In contrast, technology is the foundation of technology and refers to intelligence, ability, knowledge, or the acquisition of knowledge.

Accordingly, educational technology can be defined as the tools or methods of implementing teaching in a systematic manner. In anticipation of acquiring knowledge, the tools utilized in educational methodology may alter the role of the instructor. This is because the instructor applies these tools in the classroom, allowing students to utilize both sophisticated and existing technologies to demonstrate their knowledge through these same tools, which may take the form of media or other means. Moreover, teacher guidance remains essential in the classroom, as the objective of technology is to facilitate learning, not to replace teacher guidance altogether (Dong & Hu, 2024).

The deployment of educational technology represents a viable strategy for cultivating employee loyalty in the workplace. This approach is perceived as a valuable instrument for facilitating student growth. It is, therefore, incumbent upon school administrators and teachers alike to give close consideration to the relationship between educational technology and the formal, as well as the filtered, learning environment. As a consequence, educational technology is evolving as a tool for both theoretical and practical instruction. It offers a means of analysing human processes, systems and summaries, facilitating their development, implementation, assessment and evaluation.

To illustrate, the quantity of data that must be gathered is not excessive, yet still significant. The advancement of educational technology is significantly shaped by the mounting demands of an evolving landscape, which in turn informs the advancement of technological science as a vital component of human-made creations. Information and communication are regarded as constraints on technological advancement. Consequently, it can be posited that educational technology is a system employed to direct pedagogical processes in order to attain the desired outcomes. There is an ever-increasing disparity between the advancement of education and technology and that of humanity. Education is a highly expeditious method of moulding personality. It must continually undergo modifications that are more efficacious and robust than those of the preceding era, given the evolving landscape of education (Saepurrohman & Erihadiana, 2024).

Technological advancement has become an integral aspect of human existence, particularly within the realm of academia. The advent of technology has made information more readily available to students and teachers than it was previously, superseding the use of books and print media. Students have the ability to access the most recent information from a multitude of online sources, including databases, electronic journals, and websites. This enables them to gain a more profound and comprehensive understanding of a multitude of subjects.

The use of technology in the learning process has been shown to facilitate the acquisition of knowledge and skills. Educators can furnish students with learning materials or assignments via email or other online platforms, thus facilitating their access to and completion of the assigned work. This allows for a more flexible approach to learning that can be adapted to meet the specific needs of each student. The integration of technology in education can enhance the learning experience, reducing stress and increasing engagement. The dissemination of information through advanced technology, such as animated videos, simulations, and interactive presentations, can foster greater attention and engagement in the learning process. The use of technology in education can benefit students and teachers in numerous ways. When used appropriately and responsibly, technology can contribute to the improvement of education standards and foster the development of a more intelligent and compassionate younger generation (Aina & Abdulwasiiu, 2023).

In the field of education, technology is regarded as a valuable instrument that can be employed to facilitate the accomplishment of learning objectives. Those who are adept at leveraging technology in an educational setting are better positioned to enhance their knowledge base. In the context of education, technology is expected to provide support to both students and teachers in the execution of their classroom activities. To illustrate, educators can facilitate students' presentations of their work to parents without having to await the conclusion of the students' learning activities for the purpose of evaluating their outcomes (Wei et al., 2019).

The contemporary era of technological advancement, frequently designated the "millennium era" or the "modern era of globalization," relies significantly upon information technology to address a multitude of issues that impact both secondary and post-secondary education. The advent of globalization has prompted the educational sector to continually evolve in order to align itself with the latest technological advancements. This necessitates a transformation in the way classroom teaching is approached to accommodate these developments. The application of technology in the field of education offers a number of significant advantages, including the following.

With the advent of mass media, particularly electronic media, as a source of knowledge and educational materials, such as the Internet, computer labs, and other digital platforms, the landscape of education has undergone a significant transformation. New pedagogical methods have emerged that facilitate a more efficient and effective teaching process. The education system has become increasingly reliant on digital technologies, allowing for a shift away from solely face-to-face interactions. Technological advancements have enabled the integration of various multimedia applications, including platforms like Google Classroom and Zoom, which enhance the delivery of instruction and promote more dynamic and engaging learning environments (Dr Shaheen Parveen & Shaikh Imran Ramzan, 2024).

The concept of true education is one that has the potential to be perceived as a continuous and enjoyable social process, one that contributes to the advancement of humanity. It is not necessary for the learning process to occur within the confines of a traditional classroom setting. Educators can leverage the capabilities of internet technology and a multitude of technological applications to enhance the teaching and learning process. In the meantime, as (Herasymenko, 2023) posits, technology can be defined as the advancement of a medium or equipment that can be utilized in a more efficacious manner to process and organize a given problem. It can be posited that technology can facilitate an enhancement in the capacity for individuals to adapt to and navigate change.

One of the advantages of technology is that it can be used to overcome existing problems. It is regrettable when an individual exhibits a lack of interest or engagement with the presence of technology. Consequently, the individual is left behind and unable to adapt to the changing environment. The role of technology in the field of education is a significant one. As defined by the KBBI, educational technology is a systematic approach to the planning, implementation, and assessment of all educational and learning activities, with a focus on the observation of technical and interactive processes to ensure the optimal delivery of knowledge. The application of educational technology serves to enhance the learning process and foster performance improvement by leveraging appropriate processes and technologies (Satari et al., 2024).

In the context of a this era, technology assumes a pivotal role. As a result, all activities that were originally conducted in person are now being conducted via technology. In light of these circumstances, the government has enacted stringent policy measures aimed at halting

the spread of the virus. These include recommendations for physical distancing, frequent handwashing, and the closure of non-essential businesses, including schools. In light of these regulations, it is evident that technology is the sole viable avenue for compliance. The advent of this technology has rendered it relatively simple for students to continue pursuing their studies, even if only through virtual means.

Information and communication technology plays a pivotal role in the contemporary educational landscape. In this context, technology serves as a conduit through which educators can disseminate instructional materials to their students. The aforementioned technology facilitates the acquisition of information and other benefits, including the use of online-based learning media, for all members of society. The advent of technology has rendered the online learning process considerably more accessible. A plethora of technological media applications, including Google, Zoom, Google Meet, Google Classroom, and numerous others, can be leveraged to facilitate the learning process. These applications facilitate the learning process. This can be considered an optimal solution with regard to the policy that requires educators and students to organize online learning (e-learning). E-learning represents a significant departure from conventional educational practices, which typically require educators and students to interact in person within a traditional classroom setting. In contrast, e-learning allows students to engage in learning activities at their own pace and in a variety of locations, effectively training them to become independent learners. Consequently, educators must possess a comprehensive understanding of the essential elements required for effective e-learning implementation (Omotosho, 2015).

The application of technology in education has a demonstrably advantageous impact on the advancement of learning. It is imperative that teachers, as the primary agents of education, possess the capacity to innovate and adopt technological advancements. This is essential to ensure that the teaching and learning process is not only effective but also engaging and inspiring. It is incumbent upon teachers to remain abreast of the latest developments in their field and to utilize technology in a manner that enhances the competencies required by law. The primary regulatory framework for enhancing an educator's efficacy in facilitating learning is the ability to comprehend pedagogical competence, personality competence, professional competence, and social competence.

The advent of educational technology has afforded educators a plethora of tools to enhance their professional competence, thereby facilitating more effective and efficient pedagogical practices (Tissa Maharani, 2023). Professional competence can be defined as the teacher's proficiency in understanding and utilizing a range of resources to facilitate education, including the capacity to comprehend scientific concepts and information and communication technology in alignment with contemporary standards. Teachers occupy a pivotal position in the educational process. Consequently, it is beneficial for them to possess the requisite knowledge, expertise, and technological capabilities to support the educational process.

In the future, teachers will be required to address four significant issues: In order to remain competitive on a global scale, educators must be prepared to enhance the quality of their work, embrace innovation, and provide exemplary service. Additionally, they must be equipped to navigate the complexities of knowledge and opportunity mergers and acquisitions. Finally, educators must demonstrate proficiency in network-based information technology. Three categories of technology implementation in education are identified. Firstly, teachers must utilise technology in the design of lessons. Secondly, teachers employ technology in the delivery of presentations. Thirdly, teachers utilise technology for administrative tasks related

to their profession, including evaluation, record keeping, reporting, and management tasks (Krasa, 2023).

Nevertheless, it is pertinent to inquire as to the potential consequences of a teacher's lack of proficiency in technology with regard to the learning process. The term "technology stuttering" is used to describe an individual who is unable to operate technology effectively due to a lack of knowledge about current technological advances. The results of various research studies and published works indicate that between 70 and 90 percent of teachers utilize information and communication technology (ICT) in the educational process (James Eburikure et al., 2024).

However, a significant proportion of teachers, estimated at between 10 and 30 percent, are still considered to be experiencing difficulties with technology. Consequently, educators, as intermediaries in the field of education, are obliged to enhance their professional standards in conjunction with the rapid advancement of technology across all domains, including that of education. Teachers are expected to adhere to the standards set forth in the pertinent legislation and to integrate technology into their pedagogical practices, thereby fostering high levels of student engagement and significantly influencing both student learning outcomes and overall academic achievement.

The implementation of educational technology can facilitate the learning process, thereby eliminating potential obstacles. In the context of teacher-led learning, the process of delivering instruction is of paramount importance.

Technology represents an optimal solution for all stakeholders, particularly students, due to its numerous advantages and flexibility. It is well-positioned to support independent learning in the present circumstances. Given their central role in the educational process, teachers are obliged to demonstrate proficiency in the use of information technology. As a result of the teacher's ability to utilize and excel in the field of information technology, the teacher is able to demonstrate proficiency in the competencies outlined in the legislation that has been established. Conversely, a teacher's lack of IT proficiency will impede their ability to implement the requisite competencies, thereby reducing the professionalism of their teaching. The impact of information technology (IT) on educators is significant in the field of education. As technology advances, educators must adapt their skills to keep pace with the changing landscape of education. The ability to recognize and utilize IT is a crucial competency for educators in today's digital age.

The success of educational activities in a school is influenced by a number of factors, including the input of teachers, the engagement of students, the curriculum, the social context, and so forth. Teachers constitute a significant aspect of the educational process, with the primary objective of assisting students in acquiring knowledge in accordance with their individual needs and interests. The pursuit of enhanced learning quality is ongoing, with ongoing research into the potential of various learning components. These include curriculum revisions and improvements, instructional materials, evaluation systems, instructional management, learning seminars, teaching and learning processes, and facilities and infrastructure that support the smooth running of academic activities with the objective of improving learning quality. One potential avenue for enhancing educational outcomes is the integration of information and communication technology (ICT) in the learning process. The utilization of appropriate media, including various forms, has immediate value. It can overcome limitations of student experience, concretize abstract messages, instill fundamental concepts, and bring uniformity to enhance the quality of learning. It can also improve the

usability and efficiency of educational activities, thus enhancing the quality of education (Febrina & Setiawan, 2024).

The growth of technology and communication (ICT) has had a significant impact on the world of learning, particularly in the context of the education process. As Rosenberg (2001) observed in the journal article cited by Ibnu Rusydi (2017), the increasing use of ICT has resulted in five notable shifts in the educational process. These include: (1) a transition from training to performance, (2) a shift from the traditional classroom setting to one that is accessible from anywhere and at any time, (3) a move from paper-based to digital or online resources, (4) a change from physical to network-based facilities, and (5) a shift from scheduled, synchronous learning to real-time, asynchronous learning. The use of communication media, including telephone, PC, internet, and email, is an attempt to facilitate learning through communication. The interaction between teachers and students is not limited to face-to-face communication; it also encompasses the use of various media.

The effective facilitation of educational activities necessitates the utilisation of a medium that is capable of supporting the comprehensive absorption of data. As the era progresses, data technology serves as a conduit for accessing a multitude of data sources pertaining to the lesson modules being taught. In addition to proficiency in information technology, educators must possess the ability to comprehend the pedagogical concepts underlying their students' learning processes. This enables them to present lessons in a manner that is more readily comprehensible to their students. It is of great consequence that educators comprehend the concept of learning, for if they are proficient in IT but the students are unable to grasp the fundamental principles of learning, the results will be similarly unsatisfactory. It is therefore incumbent upon the teacher to be able to design the optimal learning process, as students are not only presented with video content but also guidance on how to comprehend the learning concept. (Hamidaturrohmah & Mulyani, 2020).

From the aforementioned sources, it can be concluded that the influence of IT teachers in the field of education is as follows: Firstly, the continuous advancement of technology has resulted in alterations to the manner in which educators engage in the learning process, with the utilisation of projectors and laptops becoming increasingly prevalent. Secondly, the learning process itself has also undergone a transformation. Traditionally conducted within the confines of the classroom, it has now been largely supplanted by distance learning and online-based instruction. By leveraging technology-enabled learning applications that facilitate synchronous communication between students and educators. Thirdly, the advent of increasingly sophisticated technology has resulted in the development of novel and innovative learning models and methodologies that facilitate students' engagement with the learning process, guided by their educators. Fourth, the advancement of technology has precipitated a period of rapid transformation in the field of education. In order to align with the evolving landscape of an increasingly sophisticated era, the education curriculum has also undergone a significant shift. Consequently, students must demonstrate the capacity to adapt to these changes.

The various influences of IT on learning during this pandemic are evident. It has a beneficial impact because, in the context of a pandemic, the ability to use technology is crucial, particularly for individuals who perceive technology as a barrier to continued learning, development, and adaptation. Not only are students expected to demonstrate technological proficiency, but educators must also demonstrate the capacity to adapt to the prevailing circumstances in order to facilitate optimal learning through online media.

The beneficial impact of technological developments in the domain of education, As stated by (Nirmala Grace Rani, 2023), information technology facilitates the process of accessing information related to education. It encompasses systems and methodologies, including hardware, software, and useware, that manipulate, transfer, secure, enhance, and produce data in a readable format.

The potential for experiential learning, as exemplified by e-learning, is to facilitate the learning process. It is imperative to reduce the technological debt of developing countries. There is the potential for improvement in the standard of living of humanity in terms of education and technological knowledge. Technology can be conceptualized as a system that provides support for the educational process. It is possible to access written material without the need to purchase physical copies, provided that one is able to utilise the internet. It is possible to communicate with subjects in an online capacity.

The enhancement of educational facilities can facilitate the expeditious fulfillment of students' requisite needs. Conversely, the adverse consequences of technological innovations in education include:

Plagiarism can have severe consequences for an educational institution if there is a systemic failure to address it effectively. The program is, for all intents and purposes, fully functional and accessible.

The advent of information technology has had a profound impact on the field of education. The emergence of internet networks and laboratories has been a significant contributing factor. Computers and other technologies in schools serve as a source of learning and educational media.

The consequence of this is that, despite students having received material provided by the instructor, educators are also able to seek out supplementary learning materials and search for learning resources via the Internet. The advent of technology has enabled educators to pursue avenues of knowledge expansion, thereby ensuring that learning transcends the limitations of traditional didactic approaches. The pursuit of diverse learning resources facilitates a more profound and comprehensive understanding of the subject matter. The role of the teacher extends beyond the mere transmission of knowledge and the provision of learning materials. It also encompasses the guidance of students in the constructive utilisation of technology and communication media.

Secondly, the advent of IT has given rise to a plethora of sophisticated learning methodologies that are designed to assist both teachers and students in the learning process. The advent of IT has given rise to a plethora of innovative learning methods that enhance the learning process and facilitate comprehension of complex concepts. These methods employ the use of technology to vary the learning approach, thereby making the learning experience more engaging and enjoyable. The advent of novel pedagogical approaches can be attributed to educators who are constantly striving to adapt their methods to align with the evolving landscape of education.

Thirdly, the advent of IT has enabled the learning process to be conducted remotely, obviating the necessity for face-to-face interaction. The learning process has hitherto been conducted in person. However, the advent of the pandemic and the concomitant increase in the sophistication of technology has precipitated a shift towards the utilisation of technology-based learning media for the remote or online conduct of the learning process.

A fifth notable aspect is the implementation of a technological system for the input of assessment results. The advent of technology has had a significant impact on the processing of assessment data. The time-consuming and laborious task of analyzing assessment data



individually has been replaced by a more efficient and expedient process facilitated by technological media such as laptops and computers. These devices are capable of processing data according to the specific requirements of the application, extending beyond the mere processing of assessment data. Furthermore, the results of a study can facilitate the analysis of results through the use of technological media. Sixth, the fulfillment of facilities and infrastructure needs can be achieved expeditiously due to the presence of technology. In the field of education, a number of preparations are required. One such example is the necessity for the availability of files, including those containing exam questions. The expeditious processing of this considerable volume of data necessitates the utilisation of a photocopying machine. One can readily envisage the considerable time investment that would be required if all processes were to be conducted manually. However, the increasing sophistication of technology will facilitate the completion of these tasks in a relatively short time. In the context of learning activities, the advancement of science and technology offers a number of advantages. These include: 1) Enhancing the effectiveness and appeal of learning; 2) Providing explanations for complex or challenging concepts; 3) Speeding up the learning process for lengthy or intricate topics; 4) Presenting events that are uncommon or potentially dangerous (Pooja Yadav & Prof. Charu Vyas, 2024).

The inappropriate application of technology, for example, the use of technology for criminal purposes. The objective is to reinforce the utilisation of technology for those residing in rural areas. The influence of information technology (IT) on education is both beneficial and detrimental. While its positive impact is well documented, its negative impact may be overlooked. As IT continues to advance in terms of sophistication and complexity during the occupation process, it is likely to cause further challenges. These challenges include: Firstly, the advent of technology and e-learning in education will result in the gradual marginalisation of the role of the teacher as an educator.

As a result of their growing dependence on the internet, students will increasingly rely on technology as a source of information and support. Furthermore, distance learning may result in students developing a more individualistic approach due to the lack of social interaction. Furthermore, there is a possibility of a lack of ethical conduct and a lack of concern for others. Secondly, the influence of technology has the potential to both positively and negatively impact education. One concern is that frequent internet usage may lead students to access inappropriate content, rather than utilizing technology in a constructive manner. Furthermore, students may engage in activities such as accessing pornographic videos, excessive gaming, and other content that is not aligned with educational objectives. It is therefore essential that parents provide supervision and guidance in the use of technology. Thirdly, the consequence of excessive technology use, or what might be termed an information overload, is a relentless pursuit of data, which can ultimately result in dependence and a willingness to invest time in activities such as playing with mobile phones, driven by the desire to gather information or engage in gaming. This, in turn, can have adverse effects, particularly in relation to pornography, and may also lead to the expenditure of funds due to the ease of access to the internet. This phenomenon can be attributed to the addictive nature of the internet, which often leads individuals to spend money on subscriptions or quotas in order to access games and other non-educational content. Fourth, excessive use of the Internet can lead to addiction among students. This issue may arise when students lack the ability to discern between reliable and unreliable sources of information. In particular, in the context of cyberspace (the Internet), individuals have indirectly entered an environment that is, in many ways, unregulated and unfiltered. It is therefore highly beneficial for individuals to adopt the

two aforementioned behaviors as a means of protecting themselves from the vast array of data sources that are available to them. Furthermore, it is equally important to note that parental attention and supervision plays a significant role in instilling religious values as a guiding principle in one's life. A fifth consequence of the internet's presence in education is the potential for criminal activity, or 'cyber crime'. This can take the form of the theft of important documents or assets belonging to an educational establishment that are actually confidential and must be secured (such as documents relating to final or state exams) through internet media. A sixth consequence is the fostering of apathetic behavior among individuals, whether students or teachers/lecturers. This phenomenon can be observed in the context of a virtual learning system, otherwise known as e-learning. In cases where the learning process is conducted remotely or via digital platforms, there is a potential for ineffectiveness and suboptimal outcomes. This is due to the lack of direct, face-to-face interaction between educators and students, which is crucial for fostering engagement and motivation in the learning process (Mutiawati et al., 2024)

#### 4. Conclusion

In light of the aforementioned explanation, it can be posited that the impact of teachers' IT proficiency on the quality of learning is significant. In the current context, where IT proficiency in learning is becoming increasingly crucial, especially in the wake of the ongoing pandemic, the influence of teachers' IT mastery on the quality of learning cannot be understated. The use of information and communication technology can facilitate more effective and efficient learning processes. The growing influence of IT in the field of education provides a valuable opportunity to enhance the remote teaching and learning process. In the context of a pandemic, technology assumes a pivotal role. As a result, all activities that were originally conducted in person are now being conducted almost entirely through technology. Consequently, the influence of IT on teachers can prevent any hindrance to the learning process. It is imperative that educators, as the primary agents of learning, possess the capacity to innovate and integrate technological advancements in order to ensure that the learning process is not only engaging but also intellectually stimulating. A teacher who is adept at navigating the digital landscape will be better equipped to combine their pedagogical expertise with innovative and creative approaches to learning. Consequently, it is crucial for educators to possess proficiency in information technology in order to facilitate a seamless learning experience. It is not solely the field of information technology that influences pedagogical advancement; the duration of a teacher's teaching experience also plays a role. As the duration of a teacher's experience in the field of education increases, the quality of the teaching process tends to improve. This, in turn, enhances the perception of the teacher's professionalism and reliability in fulfilling their assigned duties. The researchers concluded that pedagogical competence may be affected by two factors: the mastery of IT and the length of the teacher's teaching experience. The impact of information technology (IT) in education is not solely beneficial; it can also have adverse effects. Among the positive influences of IT in the field of education is the advent of internet networks, computer laboratories in schools, and other technologies that serve as sources of learning and educational media. The advent of technology has facilitated a shift in pedagogical practices, enabling educators to pursue knowledge in ways that transcend the limitations of traditional didactic approaches. The advent of IT has led to the development of more sophisticated learning methods, facilitating learning for teachers and students alike. The negative influence of technology in education, particularly in e-learning contexts, is a growing concern as it risks undermining the traditional role of teachers. As

students become increasingly dependent on digital resources, there is a risk that educators' guidance and support may be overlooked. Distance learning can also foster a sense of individualism, potentially leading to a lack of social interaction. Furthermore, the digital divide could lead to a decline in moral standards and a reduced sense of social responsibility.

## 5. Acknowledgement

The authors express their sincere gratitude to their colleagues, institutions, and all individuals who provided assistance in the course of this research.

## 6. References

- Aina, J. K., & Abdulwasiiu, A. A. (2023). Teachers' Effective Use of Educational Resources and Their Effect on Students' Learning. *ÜNİVERSİTEPARK Bülten*, 12(2). <https://doi.org/10.22521/unibulletin.2023.122.4>
- Bradford, O. A., & Adewale, G. A. (2024). Technical Vocational Education Training and Entrepreneurship Redesigning a Pathway for Female Students in Technological Institutions in Southwest Nigeria. *International Journal of Research and Innovation in Social Science*, VIII(VIII), 284–291. <https://doi.org/10.47772/IJRISS.2024.808023>
- Chen, X., & Qi, W. (2024). *How "Technology" Reshapes Education* (pp. 313–340). [https://doi.org/10.1007/978-981-97-0277-0\\_14](https://doi.org/10.1007/978-981-97-0277-0_14)
- Dong, G., & Hu, L. (2024). Exploring the Pathways of Intelligent Media Technology Intervention in the Reform of Aesthetic Education in Higher Education. *Transactions on Economics, Business and Management Research*, 8, 139–144. <https://doi.org/10.62051/gg1y2q77>
- Dr Shaheen Parveen, & Shaikh Imran Ramzan. (2024). The Role of Digital Technologies in Education: Benefits and Challenges. *International Research Journal on Advanced Engineering and Management (IRJAEM)*, 2(06), 2029–2037. <https://doi.org/10.47392/IRJAEM.2024.0299>
- Febrina, V., & Setiawan, D. (2024). Analysis of the Use of Learning Media on the Learning Interest of Learning Science Students and Environmental Themes. *Jurnal Penelitian Pendidikan IPA*, 10(8), 5702–5709. <https://doi.org/10.29303/jppipa.v10i8.7497>
- Heilig, L., & Sandell Hardesty, K. (2024). Acceptable Thresholds: Learning From Critical Disability Methodology to Inform Embodied, Qualitative Research. *International Journal of Qualitative Methods*, 23. <https://doi.org/10.1177/16094069241257938>
- Högström, P., Gericke, N., Wallin, J., & Bergman, E. (2024). Teaching Socioscientific Issues: A Systematic Review. *Science & Education*. <https://doi.org/10.1007/s11191-024-00542-y>
- James Eburikure, O., Uche, O., J E, E., & Jennifer C, E. (2024). Influence Of School Enviorment On The Learning Experience Of Stutterers In Inclusive Education In Owerri. *Global Journal of Educational Research*, 23(2), 215–222. <https://doi.org/10.4314/gjedr.v23i2.10>
- Kovacic, K., & Gingell, G. (2024). Effects of an Experiential Learning Curriculum on Systems-Thinking. *Journal of Medical Education and Curricular Development*, 11. <https://doi.org/10.1177/23821205241262210>

- Krasa, E. A. (2023). Teacher assessment of school adaptation problems of younger adolescents with educational communication difficulties. *Science and School*, 5, 109–126. <https://doi.org/10.31862/1819-463X-2023-5-109-126>
- Kutuzov, A. v. (2024). INTRODUCTION OF ARTIFICIAL INTELLIGENCE AND NEURAL NETWORK TECHNOLOGIES INTO FORENSIC SCIENCE. *LEGAL ORDER: History, Theory, Practice*, 41(2), 103–108. <https://doi.org/10.47475/2311-696X-2024-41-2-103-108>
- Mey, G. (2022). *Qualitative Methodology* (pp. 1–26). [https://doi.org/10.1007/978-3-030-26248-8\\_22-2](https://doi.org/10.1007/978-3-030-26248-8_22-2)
- Mutiawati, N., Jamaluddin, & Mallisa, S. (2024). Effect of Food Safety Education on Knowledge, Attitude, and Behavior of School Community and Retail Community in Ampibabo Sub-district. *Tadulako Science and Technology Journal*, 5(1), 60–70. <https://doi.org/10.22487/sciencetech.v5i1.17179>
- Nirmala Grace Rani, S. (2023). Use of Information and Communication Technologies (ICT) for Inclusive Education. *Shanlax International Journal of Arts, Science and Humanities*, 11(S1i2-Nov), 36–41. <https://doi.org/10.34293/sijash.v11iS1i2-Nov.7313>
- Omotosho, T. V. (2015). Impact of Online Education in Making Global Learning Accessible. *Àgídígbo: ABUAD Journal of the Humanities*, 3(2), 183–191. <https://doi.org/10.53982/agidigbo.2015.0302.08-j>
- Pooja Yadav, & Prof. Charu Vyas. (2024). Challenges and Opportunity of Online Education for Home Science : A Comprehensive Review. *International Journal of Scientific Research in Science and Technology*, 207–213. <https://doi.org/10.32628/IJSRST52411123>
- Saepurrohman, A., & Erihadiana, M. (2024). The Concept of Qudwah and its Implications for Teacher Personality Competence in Islamic Education. *Jurnal Pendidikan Islam*, 14(2), 90–102. <https://doi.org/10.38073/jpi.v14i2.1806>
- Satari, C., Wiji, W., Widhiyanti, T., & Mulyani, S. (2024). Systematic Literature Review: A Fun Organic Chemistry Learning Experience with Educational Games. *Jurnal Penelitian Pendidikan IPA*, 10(7), 377–487. <https://doi.org/10.29303/jppipa.v10i7.6855>
- Tissa Maharani. (2023). UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGY MEDIA IN DISTANCE LEARNING IN THE UPPER GRADE OF ELEMENTARY SCHOOL. *International Journal Multidisciplinary Science*, 2(2), 05–10. <https://doi.org/10.56127/ijml.v2i2.657>
- Wei, F.-Y. F., Lundy, A., & Wilson, C. (2019). A new method of using student self-assessment: Bridging gaps between teaching content and student learning. *Communication Teacher*, 33(4), 315–328. <https://doi.org/10.1080/17404622.2019.1575436>
- Herasymenko, O. (2023). USE OF INTERACTIVE TECHNOLOGIES OF COLLECTIVE AND GROUP LEARNING (ON THE EXAMPLES OF STUDYING SCHOOL COURSES OF GEOGRAPHY AND NATURAL SCIENCE «GETTING TO KNOW NATURE»). *Collection of Scientific Papers of Uman State Pedagogical University*, 3, 88–94. <https://doi.org/10.31499/2307-4906.3.2023.289897>