



The Usage of ICT in The Teaching and Learning Process

Jonias Pasaribu¹

¹ Sekolah Tinggi Theologi Amsal Medan, Medan, Indonesia
joniasgorat17@gmail.com

Abstract. The swift advancement of Information and Communication Technology (ICT) has profoundly impacted various aspects of life, particularly in the field of education. Traditional learning, which once centered on direct, face-to-face interactions in classrooms, has evolved to incorporate a wide array of information sources available online. Because of this evolution, five big changes have happened in the way we learn: from training to performance, from classroom-based learning to anytime/anywhere access, from paper-based materials to digital platforms, from physical to network-based facilities, and from interactions that happen in cycles to interactions that happen in real time. The rise of ICT has also given birth to "cyber teaching," where instructional activities are facilitated via the internet. Consequently, ICT has become a pivotal component of education, improving knowledge accessibility and enhancing educational quality. However, for ICT to be effectively integrated into teaching and learning, both educators and students must be adequately prepared. This study adopts a qualitative descriptive methodology, relying on secondary data obtained from credible sources such as scientific journals, books, and articles through literature review. The research aims to provide an in-depth understanding of ICT's impact on education, particularly its role in enhancing teaching and learning, fostering ICT literacy among teachers, and driving the development of models like e-learning, online learning, and distance education. Ultimately, the findings underline the critical importance of ICT literacy for educators in navigating and enriching the digital learning landscape.

Keyword: Education, ICT literacy, Online learning

1 Introduction

The advancement of Information and Communication Technology (ICT) has significantly influenced many aspects of human life, particularly in the field of education. The learning process, which traditionally relied solely on teacher-student interactions within the classroom, has now expanded to include diverse sources of knowledge. ICT development has brought notable changes to education, especially in teaching and learning practices. There are five main changes that can be seen: from training to performance; from learning in a classroom to learning that can happen anywhere and at any time; from paper-based resources to online or digital platforms; from physical infrastructure to network-based facilities; and from cycle-based timeframes to real-time processes [1].

Today, the internet enables efficient, rapid, and cost-effective teacher-student communication. Online platforms no longer limit interactions to traditional face-to-face meetings. Teachers can offer educational services without the need for direct physical interaction with students, while students can explore extensive information from various sources through virtual platforms using computers or internet-based tools. "Cyber teaching," an internet-based teaching method, is one of the latest advancements in this field. The application of ICT in education has become a prominent topic of discussion. To ensure the smooth implementation of ICT-based learning, both educators and students must be adequately prepared and willing to adapt [2].

2 Research Methodology

This research adopts a qualitative descriptive approach, focusing on providing an in-depth understanding of the phenomenon being studied. A literature review is used as part of the methodology. Secondary data is gathered, analyzed, and interpreted from trustworthy sources like books, academic journals, research reports, and relevant articles. This process includes a critical analysis of existing theories and prior research to identify patterns, trends, and knowledge gaps. By employing this approach, the study seeks to deliver a detailed and comprehensive perspective on the topic, supported by empirical evidence and established theoretical frameworks.

3 Discussion

3.1 Definition, Benefits and Role of ICT in education

Information and communication technology (ICT) is a comprehensive term that refers to all technical tools used for processing and transmitting crucial information. ICT consists of two primary elements: information technology and communication technology. Information technology involves processes, tools, and methods for managing, manipulating, and utilizing data. In contrast, communication technology focuses on tools and systems that facilitate the transfer of data between devices. Interconnected, these two elements function as a unified system. As a result, ICT encompasses a wide array of activities, including processing, transferring, managing, and manipulating information across various platforms.

A system or technology called ICT is used to get around limitations in space and time by making it easier to move, access, present, analyze, store, and send data, which is then turned into useful information. According to UNESCO's 2013 statement, ICT offers a multitude of essential advantages and applications in the education sector:

- a. Can increase educational equality
- b. Facilitate and provide broad access to education.
- c. It can enhance the effectiveness and efficiency of managing, organizing, and administering educational institutions.

- d. It can enhance the level of professionalism among educators in the field of teaching.
- e. Enhance the effectiveness and efficiency of learning interactions between teachers and students.
- f. The use of ICT in education significantly aids in visualizing abstract concepts, enhances the learning process and comprehension of materials delivered by teachers, and fosters positive interactions between teachers and students in the classroom.
- g. The presentation of certain materials can be made more engaging. ICT serves as a curriculum and content resource with unlimited potential, providing enhanced access to knowledge.
- h. Mastering ICT is an essential skill that all teachers must possess as a competency standard in this digital age. ICT plays a crucial role in supporting the administrative management of educational institutions by addressing various administrative challenges. Through the use of ICT features, schools and other educational organizations can deliver more precise information, enabling more effective and well-targeted decision-making in school policies.

ICT provides significant advantages and benefits in enhancing the quality of education systems. It enables students to access a wealth of information and insights related to the provided materials through advanced technological tools. By leveraging sophisticated technology, educators can incorporate images or videos that complement the teaching materials, thereby enhancing students' understanding compared to traditional methods. The contribution of ICT in education is substantial in advancing the quality of education. At a minimum, ICT can improve the competitiveness of school graduates. Furthermore, ICT fosters motivation and introduces dynamic, engaging learning methods that capture students' interest [3].

ICT as a repository of knowledge. ICT serves primarily as a repository of knowledge, providing access to diverse sources of information. These sources include fundamental scientific concepts, materials for school education, and resources that enhance learning activities. Within this role, the internet plays a significant part by offering extensive access to digital libraries, countless e-books, articles, journals, and various other knowledge repositories.

ICT as a learning tool. The second function of ICT is as a tool to support learning. This indicates that the current education system can be implemented more effectively with the assistance of ICT. The purpose is to bring the outside world into the classroom and make it accessible to all students using various ICT tools, such as multimedia and other educational media created with computer technology, including graphs, photographs, illustrations, posters, visual displays, and other forms of graphic media. Apart from that, this includes the use of learning videos, interactive CDs, multimedia presentations, and e-learning.

ICT as an educational facility. The third function of ICT is as a means to enhance educational facilities. In this regard, ICT plays a role in supporting the school's function as an educational institution by providing various electronic-based facilities, including computer labs, language labs, multimedia rooms, sound recording studios, music production spaces, video production and editing equipment, and many other similar resources.

ICT as a standard competence. The final role of ICT is as a standard of student competency. That means, ICT is used as one of the lessons that we currently known as ICT subjects. This subject has certain competency standards.

3.2 Learning ICT For Teaching

The widespread adoption of information and communication technology (ICT) in education highlights the growing importance of ICT literacy. This term refers to the ability to effectively utilize information and communication technologies. Experts describe ICT literacy as encompassing computer literacy, which connects to aspects such as information literacy, ethical literacy, media literacy, and skills in teaching and learning. According to Wijaya (p. 31), ICT literacy involves five key aspects:

- a. Access refers to being aware of and understanding how to gather or acquire information.
- b. Manage: apply a classification scheme to the information obtained
- c. Integrate: interpret and re-describe information.
- d. Evaluate: decide about the quality, relevance, usefulness, or efficiency of the information.
- e. Create: creating new information by adopting, applying, designing, creating or writing information.

Educators, as the cornerstone of the learning process, play a crucial role in possessing ICT literacy skills. But why is it essential for teachers to be proficient in ICT literacy? Below are some key reasons highlighting the importance of ICT literacy for teachers [4].

- a. At present, the education system heavily relies on information and communication technology (ICT).
- b. Utilizing information and communication technology (ICT) has the potential to enhance the efficiency and effectiveness of the educational process.
- c. Teachers as educational facilitators must have the ability to use information and communication technology (ICT).
- d. Teachers with proficient ICT literacy skills can effectively incorporate information and communication technology (ICT) into the educational process.
- e. Teachers With Proficient Ict Literacy Skills Can Effectively Incorporate Information And communication technology (ICT) into the educational process.
- f. Educators have the ability to filter and organize diverse information sourced from information and communication technology (ICT), selecting the most relevant and appropriate content to enhance the learning process.

- g. Teachers can easily process information obtained from information and communication technology (ICT).
- h. Teachers will not be trapped by hoaxes in seeking and receiving information obtained from information and communication technology (ICT).
- i. Educators can enhance their teaching skills by utilizing information and communication technology (ICT).
- j. Teachers can leverage information and communication technology (ICT) to facilitate interactions on a global scale.
- k. Educators can effectively utilize information and communication technology (ICT) to streamline the completion of their administrative tasks related to learning.
- l. Educators can utilize information and communication technology (ICT) to develop learning materials more efficiently.
- m. Instructors can leverage information and communication technology (ICT) to efficiently perform learning evaluations.

Given the numerous benefits provided by information and communication technology (ICT) in the teaching and learning process, it is essential for educators to possess ICT literacy skills. These skills empower teachers to deliver lessons more effectively and efficiently in the current digital age [5].

3.3 The Role of ICT in Effective Learning

The use of Information and Communication Technology (ICT) in learning activities serves three primary functions (Anon., n.d.), which are:

- a. Technology serves as a tool, with ICT in particular being utilized by users or students to support learning activities. It can be applied to tasks such as word processing, numerical data management, graphic design, database creation, and the development of administrative programs for students, teachers, and staff, including managing personnel data, finances, and other related functions.
- b. Technology serves as a branch of science. In this context, technology is an integral part of scientific disciplines that students are required to master. For instance, various university programs, such as informatics, information management, and computer science, explore computer technology. Similarly, school curricula, especially the 2006 curriculum, teach ICT as a scientific subject, expecting students to fully acquire its competencies.
- c. Technology acts as both a learning resource and a tool (literacy). In this context, it serves as both instructional content and a means to develop computer-based skills. Computers are programmed to guide students step by step, applying the mastery learning approach to ensure competency development. In this capacity, technology takes on a role comparable to that of a teacher, functioning as a facilitator, motivator, communicator, and evaluator.

3.4 Several Models of Using ICT as a Learning Aid

Computer Assisted Learning (CAL), also referred to as Computer Assisted Instruction (CAI), involves learning activities that primarily utilize computers as the main tool.

We categorize this approach as an offline instructional program, as it doesn't necessitate internet access. The computer system facilitates direct learning by allowing students to interact with pre-programmed materials within the system, a process often termed computer-assisted teaching. CAL serves as a method of delivering educational content, tutorials, and feedback on students' progress by leveraging computer technology.

Computer-Assisted Learning (CAL) or Computer-Assisted Instruction (CAI) refers to a learning approach that utilizes computers as the primary tool for instruction. This method operates offline, meaning it does not require internet access. Computers are capable of directly delivering lessons to students by interacting with content that has been pre-programmed into the system, which is commonly referred to as computer-assisted teaching. CAL involves the use of computer systems to present educational materials, provide tutorials, and offer feedback on students' learning progress. It represents a structured approach to integrating technology into the learning process.

Computer-based activities, conducted interactively and concurrently, are commonly associated with e-learning. According to Darin E. Hartley, e-learning refers to a teaching and learning approach that enables the delivery of instructional materials to students through the Internet, intranet, or other computer network platforms. Learn-Frame.com's Glossary of eLearning Terms gives a more general view of e-learning by saying that it is an educational framework that uses electronic applications to make teaching and learning easier over the Internet, computer networks, or standalone computers. While computers serve as tools for accessing and delivering learning materials, they are not necessarily the primary source of the content. Nonetheless, maintaining a stable network connection is crucial to ensure the smooth execution of e-learning activities. The concept of e-learning parallels the functionality of email, which involves sending messages electronically via computers and networks. Similarly, e-learning operates through computers and networks (including the Internet and intranet). Unlike traditional methods, e-learning distributes content through a comprehensive computer system that includes both hardware and network infrastructure, negating the need for rigidly structured materials.

A web browser (such as Internet Explorer, Mozilla Firefox, Opera, Netscape, etc.) delivers teaching materials in web-based learning. This encompasses situations where we package the learning content using CD-ROMs or other storage media. Web-based learning displays the materials in a web browser, delivering the actual content in a web-friendly format. You can compare this form of learning to traditional textbooks, as the materials follow the structure of books, novels, or reports. It also shares similarities with Computer-Based Training (CBT) programs that are downloadable.

Learning materials stored in web format are not always classified as web-based learning unless they include comprehensive educational content. Typically, web-based learning resources are accessed via websites; however, web-based learning does not always depend on an internet connection or computer network. For instance, a CD-ROM containing all the necessary learning materials can deliver web-based learning. Students simply need to insert the CD into the CD-ROM drive to access it as a learning medium. This method can be more effective in environments such as

schools, homes, or communities without internet access, enabling web-based learning to remain accessible [6].

Online learning utilizes computer-accessible and readable teaching materials. The internet, web platforms, or local storage on a CD-ROM or a computer's hard drive can make these materials available. This type of learning is associated with online support, documentation, and services. It provides resources that allow students or users to directly engage with the content via computer devices. Essentially, online learning enables access to educational materials relevant to the subject being studied. Furthermore, learning content shared over a computer network is also categorized as online learning. Interestingly, the concept predates the introduction of the web and the presentation of educational materials online. Web-based learning that is accessed directly from its source is considered a form of online learning. However, applications or resources where materials are dispersed or not fully accessible do not qualify as online learning unless they offer complete, well-structured, and easily readable content [7].

Distance learning facilitates interactions between teachers and students across long distances, allowing teachers to monitor their students directly. Merely delivering learning materials without interaction does not qualify as distance learning, as it requires active communication and feedback from students. This method is one of the earliest forms of education and originally did not depend on computers or digital networks. Historically, open universities used non-electronic means, such as mailing learning modules to students. Today, however, most institutions offering distance learning utilize electronic media for distributing materials and conducting the learning process, aligning it with the concept of e-learning. Despite this evolution, many open universities continue to use the term "distance learning" due to its historical significance and familiarity. This educational approach connects individuals or groups separated by physical distance and enables meaningful interaction between teachers and students. While earlier methods relied on TV broadcasts or exchanging letters and files, modern distance learning integrates e-learning tools, including live online sessions, video conferencing, chats, scheduled discussions, and email communication [8][9].

4 Conclusion

The impact of globalization is becoming increasingly evident through the growing number of information channels in various forms, including electronic and non-electronic media such as newspapers, radio, magazines, television, telephones, computers, the internet, and communication satellites. The continuous advancement of communication and information technology significantly affects various aspects of life, including education. Specifically, people need to learn how to use technology because (a) education and training systems are shifting from focusing on teachers and institutions to focusing on students; (b) open and distance learning is growing and becoming more popular; (c) there are more and more learning resources available; (d) global quality standards are needed to keep up with global competition; and (e) life-

long learning is becoming more and more important. Therefore, conventional education systems must adapt and embrace new, technology-rich alternative learning methods.

ICT-based learning offers the most straightforward access to diverse educational needs. Various types of information are readily accessible on the internet. As the key drivers of the learning process, teachers play a crucial role in developing effective lesson plans. Given the numerous advantages provided by the integration of information and communication technology (ICT) in teaching, it is essential for teachers to possess ICT literacy skills. These skills enable them to enhance their efficiency and effectiveness in facilitating learning in the digital age. With the help of the internet, obtaining information and learning resources becomes remarkably easy.

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