# Understanding the role of digital technologies in education: A review

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**Abstract**
*A key element of the 2030 Sustainable Development Agenda of the United Nations is high-quality education. It seeks to guarantee that everyone has access to high-quality, inclusive education. In order to accomplish this, digital technology have become a vital instrument. Through increased energy efficiency and lower-carbon alternatives to fossil fuels, these technologies make it easy to identify the origins of emissions, stop further harm, and even eliminate excess greenhouse gases from the atmosphere. Digital technologies aim to increase productivity and efficiency while reducing or eliminating waste and pollution. The educational system has been significantly impacted by these technologies. The use of digital technology in education has become even more institutionalized after the recent COVID-19 pandemic. The whole educational system has undergone a paradigm shift as a result of these digital technologies. In addition to imparting knowledge, it also serves as a mentor, assessor, and co-creator of information. Students' lives have been made simpler by technological advancements in schooling. These days, students prepare presentations and projects utilizing a variety of software and tools rather than pen and paper. An iPad weighs comparatively less than a stack of notebooks. An e-book is easier to navigate than a heavy paperback. These techniques help to raise curiosity about research. This chapter covers the main uses and difficulties in education while providing a quick overview of the necessity of digital technology in the classroom.*
**Keywords:** *Digital technologies; Education; Students; Digital classroom; Teaching*

## I. Introduction

Social well-being is a component of sustainable development and is reliant on education. One of the main forces behind educational changes is information technology, which has developed to disseminate common knowledge. Education in schools and institutions has changed as a result of the emergence of new technology-assisted learning tools including smartphones, tablets, computers, smartboards, MOOCs, simulations, dynamic visualisations, and virtual laboratories. One of the most economical ways to educate developing brains is through the Internet of Things (IoT). Additionally, it is a strong way to incorporate a top-notch educational experience for everybody (Keengwe and Bhargava, 2014; Dreimane and Upenieks, 2022). Businesses that provide educational technology are always trying to come up with new ways to provide those who can't afford proper facilities more access to education. The use of social media as a teaching tool has advanced significantly. Social networking is a vital component of the entire e-learning experience for many educators and learners. These days, it is an essential platform for information sharing on important subjects. Social media platforms are great for creating networking opportunities to start social activities and maybe new professions, in addition to providing the capacity to share information at any time and from any location (Buyukbaykal, 2015).

More involvement, quicker assessments, and an instant learning environment are all things that traditional classroom training cannot offer. On the other hand, technology and digital learning resources cover this gap. Traditional teaching methods just cannot match some of the efficiency that these technologies provide. Since smartphones and other wireless technology devices are becoming more and more common in society, it makes sense for educational institutions like schools to use them effectively by integrating technology into the classroom. Indeed, the future generation finds learning more enticing due to the versatility and non-intrusive nature of today's technologies. However, because traditional teachers are reluctant to use modern technology and gadgets in the classroom because they see them as a distraction rather than an effective learning help, it could be a difficult strategy to handle at first (Vakaliuk et al., 2021). Students will benefit from an online classroom calendar that allows us to provide timetables for classes, assignments, field trips, speaker engagements, exams, and semester breaks. Smartphones and clicker devices are examples of student response systems that give teachers a quick and simple way to assess if students have understood the material and whether more explanation is needed (Biletska et al., 2021).

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Digital technologies have an impact on agricultural operations and may soon completely transform farming in industrialized nations, drastically lowering water use and our reliance on pesticides. COVID-19 Three new terms have entered our vocabulary: quarantine, lockdown, and pandemic. People all throughout the world are aware of the devastation the coronavirus outbreak has wrought. At least the educational system is surviving this catastrophe thanks to digital technology. In the comfort of their own homes, students are learning (Kostopoulos and Kotsiantis, 2022). When technology is implemented in the classroom, students gain from an engaging learning environment because it helps them stay focused and interested in the subject matter.

Students may find learning engaging and enjoyable if projectors, laptops, and other state-of-the-art technology are used in the classroom. By creating assignments that use technology, oral presentations, and group projects, teachers may make learning more dynamic and interesting for their students. Additionally, participation might take place outside of spoken communication (Bilotta et al., 2021).

Digital learning is a fantastic way to reduce expenses, make better use of resources, encourage sustainability, and increase both reach and impact for students and teachers. This is evident in the environmental impact of using less paper for books and handouts as well as the time savings and convenience of research (Beardsley et al., 2021). Technology is ubiquitous and entwined with many facets of contemporary culture and existence. In the field of education, the global digital revolution has started to spread. Technology is projected to improve education by making it more affordable and accessible, as it is quickly changing how students learn (Qureshi et al., 2021). A basic overview of digital technology uses in education is provided in this chapter. In addition to providing a brief overview of digital classrooms and their uses in education, the next three parts address the necessity of digital technology in the classroom. It is followed by a section discussing the difficulties posed by digital technologies in education as well as a review of these technologies' prospects.

**Need for digital technologies in education**

Digital technology use has already become necessary as a result of the globalization of education. There were online systems for administering the daily operations of academic institutions, holding classes, exchanging materials, and performing assessments. The utilization of these channels was proactive, nevertheless. In order to maintain the educational system, the COVID-19 pandemic has compelled institutions to switch to online instruction. Developed nations were prepared to handle this issue. Developing nations, however, put a lot of effort into fulfilling this demand. In this crucial era, digital technologies have come to the rescue of education (Javaid et al., 2020; Seale et al., 2021). The necessity of international integration into the educational system is highlighted by this worldwide catastrophe. Digital technologies help students build skills like problem-solving, thinking structure development, and process comprehension that will be necessary for their professional success. They are also being ready for a more uncertain and dynamic future where technology will be essential. The skills and traits that students gain will be crucial to their success in the workplace. Digital technologies and educational materials contribute to a better classroom environment and a more engaging teaching-learning process. Additionally, they allow for more curriculum customization and flexibility for each educational institution according to the needs of each individual student (Dudar et al., 2021; Kosaretsky et al., 2022).

The usage of technology in the classroom may increase student engagement. Considering how used today's youth are to using electronic devices, integrating them into the classroom would surely help to spark their curiosity and increase their levels of engagement. By incorporating technology into the classroom, teachers may create an exciting learning environment that keeps students' attention without being sidetracked. With the use of projectors, laptops, and other state-of-the-art technology in the classroom, kids may find learning engaging and enjoyable. Creating assignments in the classroom that use technology, oral presentations, and group projects may make learning more dynamic and interesting for students. Verbal communication is not the only way to participate (Penprase, 2018).

Students may take a more active part and be at the center of the process when they use computers and other devices in conjunction with digital tools (Osadchyi et al, 2021). In this method, the teacher serves as a guide and has the authority to approve learning effectiveness. Students can submit their own content or acquire the necessary information from the plethora of digital resources. Wikis, podcasts, blogs, and other web 2.0 tools help students create material, work together, evaluate one another's work, and progress toward co-learning. Using learning-optimizing strategies like flipped classrooms or gamification in the classroom is made simple by digital technology. Learning landscapes have developed into a didactic instrument that combines many approaches and allows for the presentation of unique itineraries to every learner. According to Kumar et al. (2022), technology enhances the motivation and significance of instruction.

**Digital classroom**

Digital classrooms are characterized by the use of technological tools or platforms for instruction, including mobile phones, social media, and multimedia. The use of digital technology in education has improved and changed the educational environment of today. Students may learn swiftly and efficiently using digital learning, which uses technology to fulfill the complete curriculum (Turgut and Aslan, 2021). Teaching through the use of technology is the only focus of the digital classroom. Laptops, tablets, Chromebooks, and other internet-connected devices are used by students. The majority of the curriculum is given to pupils online via an interesting and interactive platform, rather than having them take notes on what the teacher has taught. Education is essentially a form of communication despite its numerous elements. New channels of communication have emerged as a result of the internet, expanding the possibilities for the dissemination and availability of educational content. These online resources and media facilitate learning (Villagrasa et al., 2014). Fig. 1 illustrates some aspects of a digital classroom.

Digital classrooms employ educational websites and tools to help students learn more effectively. Technology and feedback loops are two essential elements of a digital classroom. For students to receive real-time feedback from their lecturers, feedback loops are crucial. Feedback loops allow teachers to give feedback based on a variety of variables, including the student, lesson, group, etc. The teaching-learning process is progressively utilizing PPTs, video presentations, e-learning techniques, online training, and other digital approaches (Ozdamli and Cavus, 2021).

As a result, learning is becoming more interactive in the classroom. With the use of online tools and virtual classrooms, students may now study a wide range of subjects independently. Color charts, graphs, and models are used in schools to illustrate the best teaching practices. They are currently seen as outdated approaches of teaching, nevertheless. Reading books, writing on the whiteboard to explain chapters and ideas, and taking notes in their books are no longer the only ways that students may learn in the classroom (Gurunath and Samanta, 2022).
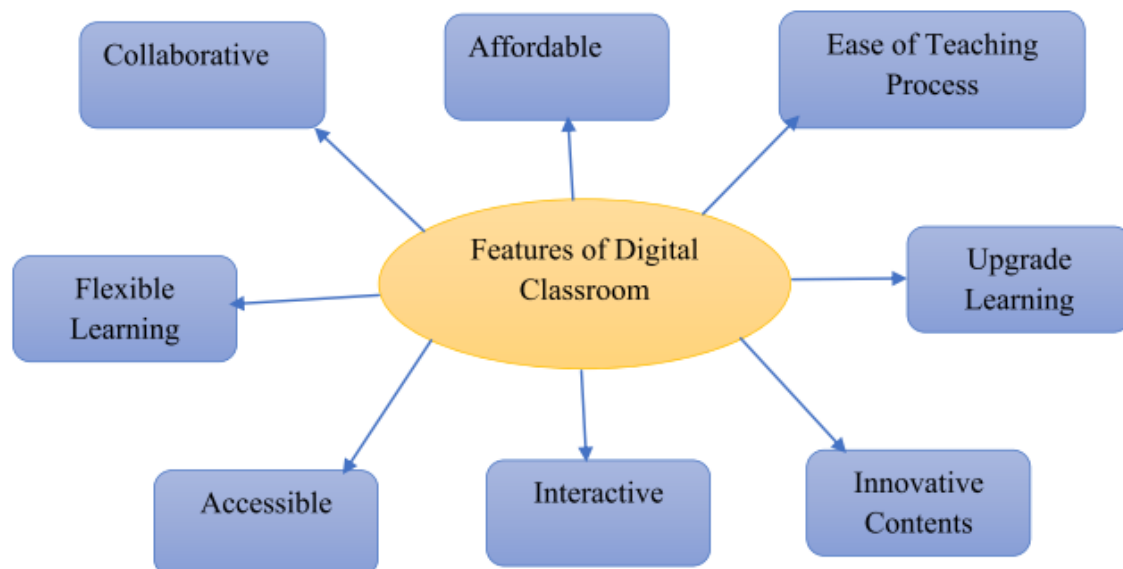


**Fig. 1.** Features of Digital Classroom.

**Applications of digital technologies in education**

Digital technologies are a potent tool that may enhance education in a number of ways, including by simplifying the creation of educational materials by teachers and by offering fresh approaches to learning and teamwork. With the widespread use of the Internet and the proliferation of smart gadgets linked to it, a new age has begun. Therefore, it will be the responsibility of educational designers and scholars to use the potential of cutting-edge digital technology to transform education so that everyone, everywhere, has access to effective and efficient education (Varea et al., 2022). Children continue to receive their education outside of the classroom thanks in large part to technology. Students who study digitally feel more creative and accomplished, which motivates them to learn more by thinking beyond the box.

It is admirable that all countries were able to use remote learning technologies by combining web, mobile, radio, and television platforms. Education became more participatory, knowledge sharing got simpler, and learning passion grew as a result of these factors, which also make material easier to obtain, easier to retain, easier to store, and better presented (Grainger et al., 2021).

As technology advances, educators must learn to use a variety of devices, including smartphones and tablet PCs, or risk becoming marginalized. Educators must also make use of all internet resources to make sure their materials are current, interesting, and lively. There is more to technology than just watching animated movies and playing video games. The benefits depend on how educators, parents, and students use technology to enhance learning. The educational experience is enhanced and pupils show interest when technology is employed successfully for teaching purposes. Making e-learning platforms compatible with modern smart devices, such smartphones and tablets, has been crucial to the accessibility and quick adoption of digital learning. There are also specialized learning products like games, animation, or AI-powered systems made just for edutainment. Innovations made possible by technology have made it easier to learn about a variety of subjects and age groups. One crucial but sometimes disregarded aspect of educational technology is the significance of big data and the use of analytics in the classroom (Bergdahl and Nouri, 2021). As they increase their use of online tests, e-learning platforms, and virtual classrooms, educational institutions and schools recognize the importance of thorough data on student and instructor performance.

**Challenges of digital technologies in education**
There are challenges with educational technology, particularly when it comes to use and implementation. Concerns about technology justice, the effectiveness of teachers' use of technology, and excessive screen time are also brought up. Due to the COVID-19 issue, the material has gained greater importance. Teachers are required to create and comment on online learning materials, especially urging students to examine a subject from several perspectives. Additionally, some students do well in online learning environments, but others find it difficult for a variety of reasons, such as a lack of support. A pupil who has previously suffered in face-to-face situations, for instance, could suffer far more in the present one. It's possible that these individuals relied on now-inaccessible resources.
But for teachers, online learning may be challenging, especially in places where it hasn't been common (Shilpa et al., 2022).

Numerous individuals are aware of some of the causes of learning crises. The inadequate quality of training is one important contributing element. Teachers are often poorly trained and lack subject-matter competence. There are technological solutions for this, and they may be useful for teaching students as well as for training teachers. In-service training or a mix of online and in-person training can be offered via technologies. Furthermore, there is proof that teachers need more incentives. They are capable of teaching, but they are not motivated to do it. Although education has always taken place outside of the traditional classroom, the magnitude and shifting conditions of digital and remote environments necessitate a great deal of participation, preparation, support, and adaptability. Attentional learning and teaching may be facilitated by little to no interaction with students, reconsidering involvement, reaching out to students, adapting teaching strategies, motivating students, managing competing time demands, and adjusting to limited environments (Gromova, 2021).

Low-tech interventions for "instruction at the appropriate level" have also been shown to have a major impact on learning. Careful research is necessary to determine if high-tech or low-tech solutions are superior since low-tech solutions are less expensive and financing is limited in developing countries. Even when they are teaching via video, teachers are not always more effective than those who are in front of a class. Although there are more massive open online courses available and being enrolled in, many of them are not for elementary school and do not deal with the problem of learning. Children in low-income households cannot obtain the technology and connectivity it requires at home. Other tactics, like gamification, could motivate kids to spend more time learning. In conclusion, keep in mind that successful learning outcomes can be achieved without the use of educational technology (Masters et al., 2016).

Because of this online education, some pupils are struggling. Some pupils suffer in school because they come from low-income households and don't have cell phones at home. Simply put, millions of children lack access to the internet at home. Although they learn this sophisticated technology early, students under the age of 15 suffer from back pain and impaired vision. Teachers are also struggling since some of them have no prior experience with digital tools. Nevertheless, parents make every effort to educate their kids via online courses. Because practical knowledge cannot be obtained through online programs, college students who study more practical than theoretical topics have comparable difficulties (Criollo-C et al., 2021).

Even if technology presents yet another opportunity for cheating, tasks and tests may be created to make this improbable. Open-book tests, on the other hand, can be utilized to prioritize mastery and problem-solving skills above memory. Automation may expedite laborious procedures like monitoring student attendance and performance. Engagement tools can help speed up grading for writing assignments, discussions, and participation since they are objective. They can also answer common questions from students. Students cannot participate in distance learning without the necessary educational materials, instructor preparation, internet/mobile network access, and information and communication technology equipment. Students from low-income homes, remote rural regions, and resource-poor locales are more likely to lag behind. Learners with disabilities or who speak a language other than English at home will require additional individualised assistance.

**Impact of Digital Technology**

Students may travel the world and visit distant locations from the comfort of their laptops thanks to digital technologies. Adding a guest speaker to your lesson plan is a great way to introduce the students to their area of expertise. Bringing a subject matter expert in person to our classroom is made easy via video conferencing solutions, regardless of their location.

With children from another institution, we can quickly set up a video chat in the classroom. All pupils are involved, including shy children who wouldn't often raise their hands in class, thanks to online surveys and other digital tools. Asking students for feedback on projects and course materials on a regular basis is made possible by online engagement tools. It is also possible to use student insights to pinpoint areas in which students could be having difficulty.

By enabling students to interact in class and get rewards, student response systems encourage digital citizenship in the classroom. Our communities depend on schools, and closing them has a significant negative impact on the mental health of many families and kids. This difficulty can be readily taken up by digital technology. Students may study at their own pace, pause and replay videos, and independently study course material when they learn online.

Another active learning technique that education technology may support is the use of quizzes. Using social media, interactive whiteboards, and other technologies, students may start working on a project in class and then easily collaborate, communicate, and bounce ideas off one another. Students can work together at any time and from any location due to social and physical limitations. Students may now participate in impromptu conversations and get prompt solutions to any concerns or problems they may have about a subject thanks to technology. Due to individual differences and self-paced learning, students will almost always finish their work at different times. When this occurs, providing students with interactive learning resources, informative movies, or course-based activities is all that is needed to keep their interest. Slower-paced students are therefore no longer tempted to rush through their work, while faster-paced students are no longer required to wait for all of their peers to finish before continuing their studies. Future schools will use this Education 4.0 approach to enhance instruction and better prepare the potential of the upcoming generation. Additionally, artificial intelligence will lower pollutants and improve the efficiency of autonomous vehicles. AI is being used by material scientists to create biodegradable plastic alternatives and methods for cleaning our oceans. Despite their seeming simplicity, recycling and upcycling are quite powerful tools for boosting sustainability initiatives. Recycling is a game-changer for sustainability, whether it's businesses turning discarded items into new commodities or individuals reusing bottles to reduce plastic waste.

**Future of technologies in education**

Education technology firms of all sizes have begun to proliferate in the future and are providing academic institutions with a range of innovative digital solutions. This will raise the standard of the nation's digital infrastructure, enabling more people to access cutting-edge educational technologies. We anticipate that all linguistic barriers will be eliminated, and that learning materials in regional languages will be more readily available online. Programs for e-learning and m-learning give teachers and students access to a wealth of knowledge. Even while technology will be crucial in determining how education develops in the future, a new generation of teachers who recognize the value of interpersonal interactions in the classroom will be needed to make sure that new teaching resources are used successfully. These can result in a fulfilling and interesting career in teaching. In order to maximize their benefits both now and in the future, students acquire the information and abilities needed to use innovative instructional technologies. As internet and network bandwidth increase, education trends will follow suit, making it simpler to integrate cutting-edge technology into the classroom. However, offline (classroom) instruction and learning cannot be fully replaced. As a result, we are now in the era of hybrid teaching and learning, which is anticipated to result from the adoption of Education 4.0 and involves the integration of both online and offline methods to improve results.

## II. Conclusion

In the classroom, "digital technology" refers to a variety of devices and software designed to support students with specific accessibility requirements. Using technology in the classroom is the most efficient approach for teachers to cut down on the amount of time-consuming, repetitive tasks they perform. By automating or partially automating routine tasks like performance monitoring and attendance tracking, educational technology apps may save a significant amount of time and effort. The responsible and strategic use of technology is taught to students, which can aid in decision-making and the development of self-discipline. Students can be better prepared for lifetime learning with the use of technology in the classroom. With the help of these technologies, students may access digital content in a virtual world that suits their learning preferences. Students may study at their own speed because of digital content creation tools that allow for customization of instruction and learning.

The digital classroom integrates technology into education by using electronic devices and software to teach pupils. With the use of computers and the Internet, a traditional classroom may be converted into a digital one. With the use of technology and advanced equipment, students may study more effectively and monitor their progress. These technologies will be effectively incorporated into education in the next days to improve the performance and digital learning environment for students. In order to make long-term choices in sectors like climate change, air and water security, biodiversity conservation, disaster resilience, etc., modern technology have proved crucial for complex data analysis and administration. These technologies are examples of innovation that supports social and economic advancement while taking into account natural resources. These aim to dramatically decrease environmental and ecological concerns while producing a long-term product. These technologies reduce degradation, pollution, and other negative environmental effects.

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