

# Digital Technologies in Education: A Review of Their Role in Shaping Teaching and Learning Methods

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**Abstract:** Digital technologies have become crucial tools in achieving this goal, revolutionizing teaching and learning methods. The 2030 Sustainable Development Agenda emphasizes the importance of quality education for all. The integration of digital technologies has reshaped the educational landscape, especially during the COVID-19 pandemic, by enabling virtual learning environments and enhancing teaching and student engagement. From virtual classrooms and e-learning tools to blended learning platforms, these technologies foster a flexible, efficient, and inclusive education system. This paper reviews the key uses and challenges of digital technologies in education, explores existing research gaps, and proposes recommendations for advancing toward Education 5.0—an approach that emphasizes holistic and emotional development. The study relies on secondary data sources and concludes with suggestions for future research.

**Keywords:** Digital technologies, Virtual Classroom, Blended Learning, Educational technology challenges, Education 5.0

## TRAJECTORY

Part 1: Introduction; Part 2: Review of Literature; Part 3: Research Gap; Part 4: Objectives of the study; Part 5: Research Methodology; Part 6: Demand for Digital Tools in Education; Part 7: Virtual Classroom; Part 8: Usages of digital technologies in education; Part 9: Challenges of digital technologies in education; Part 10: Findings and Suggestions; Part 11: Limitations and Future Research; Part 12: Conclusion.

Part 1: Introduction:

Social media platforms not only facilitate information sharing at any time and from any location, but they also offer excellent networking opportunities for creating new friendships and even employment. T.A. Vakaliuk et al., (2021). Social well-being is a component of sustainable development and is dependent on education. Information technology has

developed to disseminate knowledge and is an important force behind innovations in education (J. Keengwe, M. Bhargava 2014) Education at schools and other institutions has changed as a result of the introduction of new technology-assisted learning tools such as mobile devices, tablets, laptops, smartboards, MOOCs, simulations, dynamic visualizations, and virtual laboratories (S. Dreimane, R. Upenieks 2022) One of the most economical approaches to teaching developing minds is the Internet of Things (IoT). It is also a strong system for incorporating an excellent educational experience for all (P.L. Rogers, Barriers 2000). Businesses that provide educational technology are always trying to develop new ways to give people who can't afford proper schooling more access to education. Social media has advanced significantly as an educational tool (Haddad, W. D., & Draxler, A. 2002). Social media is widely used by educators and learners alike as a vital component of the educational process. These days, it is an essential forum for information sharing regarding important subjects (C.I. Büyükbaykal 2015).

Conventional teaching methods don't offer an instantaneous learning environment, quick assessments, or increased participation. On the other hand, technology and digital learning tools fill this gap (T.A. Vakaliuk et al.,2021). Certain technologies offer efficiency that is superior to those of conventional learning approaches. Given the growing public popularity of smartphones and other wireless technology devices, it makes sense for educational institutions like schools to effectively utilize them by integrating technology into the classroom. Indeed, the versatility and non-intrusive nature of today's technologies make education more appealing to the younger generation. However, because conventional teachers are reluctant to use modern technology and gadgets in the classroom and see them as distractions rather than clever teaching tools, it could be a difficult

strategy to implement at first (B. Cavas et al.,2009). Students will find it easier to organize if we have an online classroom calendar that shows us when classes, assignments, field trips, speaker events, exams, and semester breaks are scheduled (I.O. Biletska et al., 2021). Student response systems, like clicker devices and smartphones, give teachers a quick and simple way to assess how well their students understand the material being delivered and whether further explanation is needed (S.H. Kim et al., 2005) Digital technologies have an impact on agricultural operations and may soon completely transform farming in

industrialized nations by significantly lowering water consumption and decreasing our reliance on pesticides. The COVID-19 Lockdown, quarantine, and pandemic are three terms that have just lately entered our vocabulary. People worldwide are aware of the devastation the coronavirus epidemic has created (G. Emmanuel, A. Sife 2008). Digital technologies are at least helping to keep the educational system afloat throughout this crisis. Students can learn at home in a comfortable environment (G. Kostopoulos, S. Kotsiantis 2022)

Part 2: Review of Literature

Table 1: Review of Literature Summary

Authors	Year	Usages	Summary
E.Y. Barakina et al., & R. Mason	2021 & 2006	Create Virtual classroom	Learning management systems (LMS) have become a popular tool in education thanks to digital technologies. In these virtual classrooms, teachers can communicate with students in real time, share resources, give lectures, evaluate their learning, get feedback, and answer questions.
A.A. Cattaneo et al., S.S. Ovunc et al., and M. Flavin,	2022, 2021 & 2012	Convenient teaching and learning	The COVID-19 pandemic has increased the significance of technology in the lives of billions of students worldwide. In any case, the only way for the educational establishment to prosper in these trying times is through the use of digital technology. Resources for online learning are now widely accessible. The AI system has also considerably improved learning. On its own, intelligence is capable of determining a student's strengths and shortcomings. They use a personalized learning approach to make sure every student realizes their greatest potential. They occasionally may even provide greater satisfaction than formal education. The coronavirus has rocked the world, and people are gradually becoming used to it. Owing to the pandemic, employees are working from home. Everyone is impacted by this circumstance, and those from less fortunate backgrounds find it difficult to go about their everyday lives. On the other hand, students can continue their education at home by employing digital technologies.
M.W. Marek et al., S. Nikou, M. Aavakare, & L. Rueda et al.,	2021, 2021 & 2017	E-Books	Thanks to technological advancements, information may now be found by students more quickly and accurately. Search engines and e-books are replacing traditional textbooks. On the other hand, by integrating technology into the classroom, students might start to

			<p>learn how to be responsible in the digital world. Through the use of the classroom as a microcosm of the wider digital world, students can practice engaging, searching, and talking with other digital citizens. Additionally, technology has improved the chances for cooperation and communication. Traditionally, cooperation has only been allowed between students in the same building or classroom. The technology of today allows for hitherto unthinkable levels of cooperation and communication. Children can impart their knowledge to pupils in different schools across the nation.</p>
<p>J. Riel, K.A. Lawless, R. Chaker, M.A. Impedovo, H.A.C.Alario-Hoyos, et al., and C.D. Kloos et al.,</p>	<p>2018, 2021,2013, &amp; 2015</p>	<p>MOOC Platform</p>	<p>MOOCs help students advance their skills and certifications. It gives millions of students who cannot afford education access to a variety of skill-based courses, which help them improve their employability. MOOCs allow professionals in the workforce as well as students to study whenever and wherever they choose, at their level. Additionally, this platform offers lecture courses that lead to certificates that organizations and businesses acknowledge as positive steps in the correct direction. There is a substantial market for online courses offered via the MOOC platform, based on recent trends. Professional study participants and employed executives are more driven to advance their skill sets to capitalize on expanding employment prospects in niche markets. Personalized learning based on MOOCs is gaining popularity.</p>
<p>C. Giovannella, E. Sosa et al., and D.A. Harris, C. Krousgrill</p>	<p>2021,2017,&amp;2008</p>	<p>Video-based instructional learning</p>	<p>Students frequently use technology-based blended learning that combines video-based instruction and enjoyment. This kind of educational tool encourages active participation from users. This type of instruction includes eBooks, podcasts, instructional applications, and audio videos, among other materials. Kids are thrilled to learn new ideas with these digital channels. In the future, there will be a greater convergence of digital and traditional teaching-learning approaches as the Internet becomes more affordable and accessible. Freely accessible resources are offered by online education for study, instruction, and research. It creates an atmosphere for self-learning by allowing students to interact with a variety of study materials that are freely accessible online.</p>
	<p>2021 &amp; 2021</p>	<p>Creating Inclusive</p>	<p>Every student, regardless of ability level, has an equal opportunity to learn in the same location in an inclusive learning environment. Incorporating technology into the classroom through virtual classrooms, video, augmented reality, robots, and</p>

A. Brem et al., and V. Bozalek et al.,		Learning Environments	other means creates an engaging and inclusive learning environment that encourages inquiry and cooperation while enabling teachers to gather data on student performance.
S. Lukyanov et al., and A.M. Syed et al.,	2021 & 2021	Developing teamwork and communication skills	Two essential qualities that contribute to the development of a successful professional are teamwork and communication abilities. Digital tools are crucial to the development of these abilities.
O.A. Abass et al., and Karimian et al.,	2021 & 2021	Solving educational challenges	Students use online platforms to work together to solve current educational difficulties. Hackathons have become a popular method for solving a variety of difficult issues. By exchanging ideas and views, students can collaborate on tasks and express themselves.
L. Avraamidou and T. Fenwick, R. Edwards	2008 & 2016	Enhanced access to educational resources	It is now easy to access instructional resources seven days a week, at any time. Cloud storage, lecture videos, and soft copy notes made it simple for students to access the materials whenever it was most convenient for them. Parents can examine the caliber of lectures and notes by using these resources.
Evans, T., & Nation, D. and L.M. Nkomo et al.,	2013 & 2021	Develop Online libraries	Technology has contributed to a major role in the development of online libraries, which have reduced the need for physical space and allowed researchers, educators, and students from all over the world to collaborate. Subject matter experts have been able to discuss certain subjects and review teaching methods, curricula, and pedagogy through online forums.

**Part 3: Research Gap**

By reviewing the literature, the following gaps were identified by the researcher.

- In the above studies, some authors have given credit to digital technologies, and how they helped students and teachers in virtual mode. The COVID-19 pandemic has increased the importance of technology in the lives of billions of students worldwide and with the help of artificial intelligence, students can continue their education at home by helping digital technology.
- MOOCs offer a variety of skills-based courses, for those who can't afford education to improve employability. Additionally, this platform offers lecture courses to organizations and professional study participants.
- Students frequently use technology-based blended learning (videos, E-books, audio, self-learning), and create inclusive learning

environments (virtual classes, robots, and cloud storage).

- If students are facing education challenges with online learning platforms, they can get help from hackathons and develop online libraries that have reduced the need for physical space.

Gap: Studies about effective usages of digital technologies or online learning platforms by the students and very much limited emphasis is laid down. This paper addresses the main usages and challenges of digital technologies in education concisely, explores only a review of previous studies stating the research gap, and makes recommendations for Education 5.0. which is social and emotional development and solutions that improve life in society and can also bridge educational gaps and provide quality education to remote and underserved areas. Looking into the gaps identified from the literature

review; the following research questions and objectives are set forth for the study.

#### Part 4: Objectives

1. To understand how digital technologies improve teaching and learning.
2. To find out the main challenges in using virtual classrooms and online learning tools.
3. To suggest ways to make digital education more effective and accessible for everyone.

#### Part 5: Research methodology

The purpose of this research is to acquire a deeper insight into the knowledge and role of digital technologies in education. The entire elucidation is supported by a relevant literature review. So, this study is purely based on Secondary data or desk research and adopted the Random Sampling method. Research papers and reports from various magazine databases like Springer, Scopus, web of Science, Jstor, Elsevier Emerald, Peer-reviewed journals, and government sites, etc., were considered. Based on the objectives, the papers were selected. Further, this study consolidates some suggestions.

#### Part 6: Demand for digital tools in education

The use of digital technologies has already become necessary due to the globalization of education (M. Javaid et al., 2020). It was possible to conduct lessons, share resources, administer exams, and oversee the daily operations of academic institutions using online platforms (J. Seale et al., 2021). On the other hand, proactive use of these platforms was made. To maintain the educational system, the COVID-19 Pandemic has compelled the institutions must switch to an online teaching model (S. Burlacu 2011). Developed nations were prepared to handle this issue. Developing nations, however, put a lot of effort into meeting this criterion. In this crucial era, digital technologies have emerged as education's savior (A.C.D. Araujo et al., 2021).

This global crisis emphasizes how important it is for the educational system to be internationally linked ((C. Dufour et al., 2010). Digital technologies help kids build skills including problem-solving, thinking structure development, and process comprehension—abilities that will necessitate professional performance (V.L. Dudar et al., 2021). They are also getting ready for a future that will be more uncertain and dynamic

and in which technology will be indispensable (J.B. Lagrange et al., 2001). The skills and traits that students have gained will be crucial to their success in the workplace (B. Somekh 2004). Digital tools and educational resources contribute to enhancing the classroom environment and enhancing the teaching-learning process. Additionally, they allow for greater curriculum customization and flexibility according to the needs of individual students at each educational institution (Kosaretsky et al., 2022) our lives have been changed by digital technologies in many ways, and education is no different. Digital technologies are playing an ever more important role in education, transforming how we teach, learn, and access educational materials. The accessibility that digital technologies offer in education is one of its main advantages. Geographical difficulties are removed and chances for lifelong learning are created when learners may access educational content anytime, anyplace through online platforms and digital tools. This adaptability supports a range of learning paces and learning styles, allowing for individualized and self-directed learning experiences.

(Source: [https://in.linkedin.com/in/naveendanta?trk=article-ssr-frontend-pulse\\_publisher-author-card](https://in.linkedin.com/in/naveendanta?trk=article-ssr-frontend-pulse_publisher-author-card))

#### Part 7: The Virtual Classroom

A classroom that incorporates technology into the teaching and learning process is known as a "digital classroom." Electronics such as PCs, laptops, tablets, cellphones, interactive whiteboards, audio devices, internet connections, and software are frequently seen in digital classrooms. With digital classrooms, educators and students can: Work together on assignments; use multimedia content, textbooks, and visual learning tools; and access educational resources from any location with an internet connection. Record a presentation using tools for creating videos, or record a video with their mobile devices; Post videos to a shared area so classmates and the teacher can watch and provide comments. (Mat Pullen 2024) A digital classroom should have the following essential components:

- Devices: give students access to PCs, laptops, tablets, or cellphones so they may access digital materials, engage in interactive learning, and finish tasks.
- Internet connectivity: facilitates virtual communication, teamwork, and online material access.
- Educational apps and software: make interactive lessons, tasks, and evaluations.
- Digital

content: Provide instructional resources in a digital format. • Tools for collaboration and communication: facilitate smooth interactions and communication with internet platforms and apps. With the use of these

tools, one may increase the possibility of cooperation, increase access to materials, and carry on working outside of the traditional classroom setting.

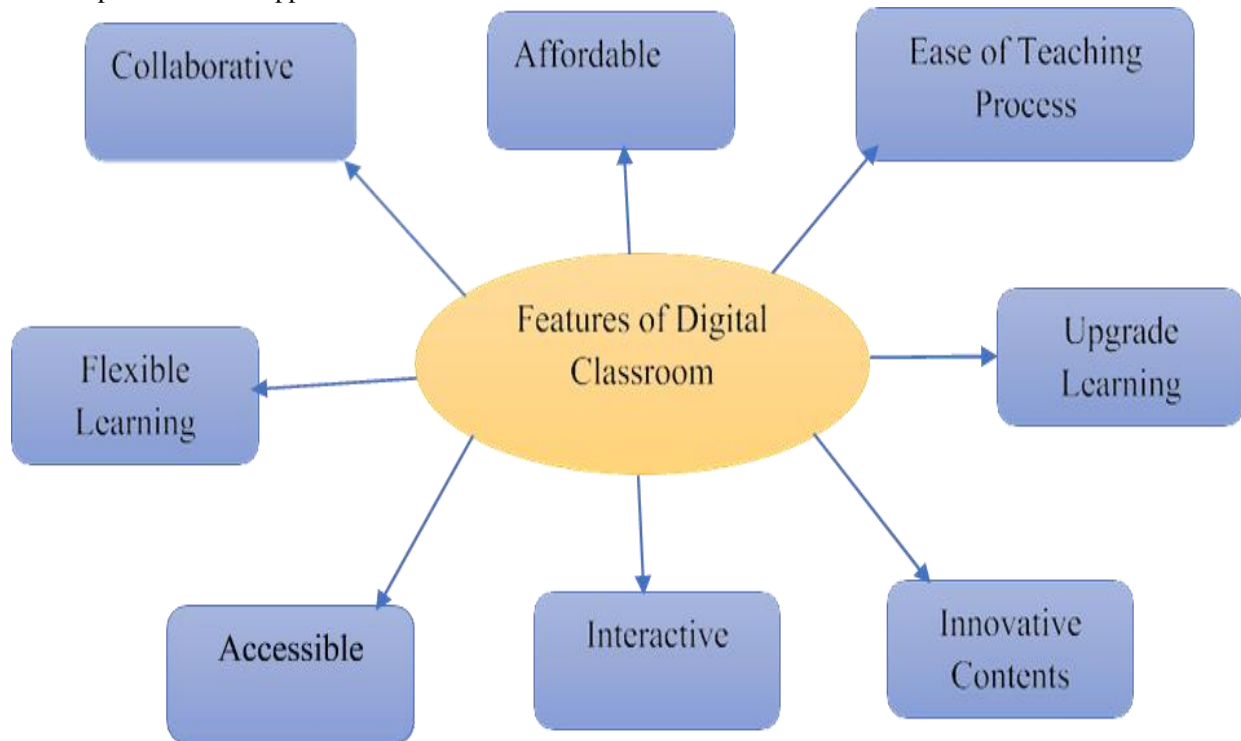


Fig. 1. Features of Virtual or Digital Classroom.  
 (Source: A. Haleem, M. Javaid, M.A. Qadri et al.2022)

Part: 8; Usages of digital technologies in education  
 The use of digital technology in education has completely altered how people teach and learn, and it offers a host of advantages that might be an effective supplement to the field of education. Education is more readily available and flexible when digital technology is used. Computers, tablets, and smartphones are just a few devices that can access digital textbooks and instructional apps. Students can choose their academic path and participate in self-paced learning because of this flexibility. In addition, the durability and adaptability of digital textbooks minimize the need for bulky luggage packed with traditional paper textbooks. Students can access digital content through smart ICT laboratories and digital libraries, which enhances their educational experience. These instructional resources give students a wealth of information and interactive elements, allowing them to research and learn independently. Teachers can enhance their lessons and engage students with

various multimedia resources by using digital libraries.  
 Considering the rapid advancement of technology, educators must become proficient in using various devices, including tablets and smartphones, or risk becoming marginalized. To make sure that their teaching materials are current, interesting, and dynamic, educators must also make full use of all online resources. There's more to technology than just watching animated movies and playing video games. The benefits depend on how educators, parents, and students use technology to advance learning (C.C. Lewis et al., 2013). Students' interest in learning increases and the quality of the educational experience is enhanced when technology is employed effectively. One of the main factors contributing to the accessibility and quicker adoption of digital learning has been the development of e-learning systems that are connected to new smart devices, such as smartphones and tablets. Further included are specialized learning products including games,

animation, and AI-powered edutainment systems. Innovations made possible by technology have made learning easier for people of all ages and subject areas. One crucial but frequently neglected aspect of education technologies is the significance of big data and the application of analytics to education (N. Bergdahl J. Nouri 2021). It is great that all countries were able to use remote learning technologies by combining web, mobile, radio, and TV platforms. These make information easier to obtain, easier to remember, easier to store, and easier to show. Education also became more interactive, knowledge exchange was made simpler, and learning excitement was raised (E. Lacka, T.C. Wong 2021).

Part 9: Challenges of digital technologies in education  
Low-tech interventions for "instruction at the appropriate level" have also been shown to have a major impact on learning. Thorough research is needed to determine if high-tech or low-tech solutions are superior because low-tech solutions are less expensive and financing is limited in developing countries. While teachers can instruct through video, this does not always mean that their performance is any better than it would be in person (K. Masters et al., 2016). Even more MOOCs are being provided and enrolled in, many of them are not intended for primary education and do not address the problem of learning. Children in low-income homes cannot get the technology and connectivity that are required at home. Gamification and other techniques could motivate children to spend more time studying. Lastly, keep in mind that successful learning outcomes can be achieved without the use of educational devices (A. Başal, A. Eryılmaz 2021).

There are challenges with educational technology, particularly in terms of adoption and implementation. Concerns about technology justice, excessive screen time, and the effectiveness of instructors' use of technology are also brought up. The significance of the content has increased due to the COVID-19 issue. Teachers need to create their content and provide commentary on it online, pushing students to consider a subject from a variety of perspectives. Additionally, although some students succeed in online learning environments, others have difficulties for various reasons, such as a lack of support. A pupil who has suffered in face-to-face situations in the past, for instance, might suffer far more in the present scenario.

These individuals may rely on services that are no longer available. However, especially in places where it is still not commonplace, online learning could pose challenges for educators (S. Bennett al 2012 & B. Shilpa et al.,2022).

While they are learning online, some students are facing challenges. Some students suffer while attending college since they come from low-income families and don't own cell phones. Simply put, millions of children do not have access to the internet at home. Even with early access to this advanced technology, students under the age of sixteen suffer eye issues and backaches (C. Njoku 2015). Teachers are also facing challenges, as many have no prior expertise with digital technologies. Still, parents make every effort to provide their kids with an education through online learning. The challenges faced by college students who take more practical than theoretical courses are comparable because practical knowledge cannot be acquired through online programs (S. Criollo-C. et al., 2021). Even while technology can be seen as just another way for students to cheat, assignments and tests can be created in a way that makes this impossible. Exams with no books, however, can be utilized to prioritize proficiency and problem-solving over memory. Technology can speed up difficult tasks like monitoring student attendance and performance. Interaction tools are objective, so they can help speed up the grading process for participation, writing assignments, and conversations. They can also answer common questions from students. Students cannot engage in distance education without the necessary ICT equipment, internet/mobile network connectivity, instructional materials, and instructor preparation. Students from low-income homes, remote rural areas, and resource-poor places are more likely to lag. Students with particular challenges or those whose native tongue is not English in their homes will need more specialized help.

#### Part: 10: Findings and Suggestions

With the help of digital technologies, students can travel the world and distant locations while comfortable on their computers. A great way to add some flavor to any lesson plan is to invite a guest speaker to share their knowledge with the class. No matter where they are, video conferencing tools make it easy to bring a subject matter expert in person to our

classroom. It is not difficult to set up a video conference in the classroom with students from another university. Digital tools such as online surveys encourage participation from all students, even the shy ones who might not normally raise their hands in class. Regular check-ins with students to get feedback on assignments and course materials are 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 rewarding students for their class participation, student response systems help to foster active digital citizenship in the classroom. Our communities depend heavily on colleges, and closing them would have an immense adverse effect on the mental health of many families and children. This is an issue that digital technologies can easily meet. Students can explore course material freely, pause and restart videos, and learn at their level using online learning.

Another active learning method that education technology may support is the use of assessments. Using interactive whiteboards, social media, and other technologies, students can start working on a project together in class and then easily collaborate, communicate, and launch ideas off of one another. Students can work together at any time and from any location as long as there are no social or physical barriers. Additionally, technology has made it possible for students to participate in informal discussions and get prompt responses to any problems or inquiries they may have about a subject. Due to individual differences and self-paced learning, students almost always finish their work at different times. When this occurs, it's easy to keep students' interest by providing them with interactive learning resources, course-based activities, or instructional videos. This eliminates the need for slower-paced students to feel pressured to finish their work quickly and eliminates the need for faster-paced students to wait for all of the other students to finish before continuing their studies. Future schools will use this Education 4.0 program to enhance instruction and better prepare the talented generation that lies ahead. Artificial intelligence will also improve the efficiency and lower emissions of driverless cars. Artificial Intelligence is being used by material scientists to create biodegradable plastic alternatives and methods to clean our oceans. Despite reusing and recycling might seem like simple processes, they are quite powerful tools for advancing

environmental initiatives. Recycling is a game-changer for sustainability, whether it is through businesses creating new products out of discarded items or consumers reusing bottles to reduce plastic waste. Furthermore, Education 5.0 is the use of new technologies to provide more humanized teaching, with a focus on students' social and emotional development and solutions that improve life in society.

#### Part 11: Limitations and Future Research

This paper addresses the main uses and challenges of digital technologies in education concisely, explores only a review of previous studies stating the research gap, and makes recommendations for Education 5.0. The whole of this study analyzed usages and challenges that are prevailing in society from the perspective of Education 4.0 and Industry 4.0. We have seen a tremendous increase in digital transformation and new technologies in our daily lives over the past few decades. Data processing, the Internet of Things, artificial intelligence, and other technologies have become fundamental in both businesses and daily life. Life became increasingly digital after the COVID-19 pandemic, and schools were no exception. Everyone had to adjust to the realities of online learning and remote learning, which were no longer just fads. Beyond technology, however, the pandemic shows the necessity of preparing people for hardship and developing emotionally intelligent individuals capable of using digital transformation as a tool for social transformation. I recommend further research required for upcoming young aspirants from the perspective of Education 5.0 is a chain that links digital and technological knowledge to human social and emotional skills to promote well-being, and to encourage lesser environmental impact with greater health and safety and can also bridge educational gaps and provide quality education to remote and underserved areas with the support of Industry 5.0.

#### Part: 12 Conclusion

In the context of education, "digital technology" refers to a range of programs and devices designed to support students with specific accessibility requirements. The best method to cut down on the amount of time-consuming, repetitive tasks teachers have to complete is to incorporate technology into the classroom. By automating or partially automating routine tasks like



attendance tracking and performance monitoring, educational technology apps can save a significant amount of time and energy. Students receive instruction on responsible and strategic use of technology, which can aid in decision-making and the development of self-discipline. Students who use technology in the classroom can better prepare for lifelong learning. With the help of these technologies, students can access digital content in a way that best suits their learning preferences and experience a virtual environment. Students can study at their own pace because digital content development tools allow for the customization of teaching and learning. The digital classroom integrates technology into education by using electronic devices and software to instruct students. Using computers and the Internet, a typical classroom can be converted into a digital classroom. With the aid of modern technology and sophisticated equipment, students may learn more effectively and monitor their progress. These technologies will be successfully incorporated into education shortly to improve the performance and digital learning environment for students. When it comes to complex data management and analysis, modern technology has been crucial in helping decision-makers make long-term choices about issues like climate change, biodiversity preservation, air and water security, disaster resilience, etc. These technologies are examples of innovation that promote social and economic advancement while simultaneously taking into account natural resources. These seek to create a long-lasting product while significantly decreasing sustainability and risk to the environment. These methods lessen pollution, degradation of the environment, and other negative implications. Digital technologies can also have negative effects, such as concerns about data privacy, digital distractions, and the need for human interaction in the learning process.

Data availability: The data is available to anyone for review.

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