

## Technology in Higher Education: Past, Present and Future

V. Balakista Reddy<sup>1</sup>

**Abstract:** The Covid-19 pandemic caused widespread upheaval in higher education across the globe. Institutions were forced to move swiftly towards digital learning—there was little time to prepare or plan. This paper considers the use of Information and Communications Technology (ICT) in reshaping higher education, with particular attention to the Indian context. It draws attention to the growing use of digital tools, online platforms, and government-led schemes aimed at expanding reach and improving standards. While technology has made remote learning possible and has widened access to education, issues persist. These include unequal access to devices and internet connectivity, the need for staff development, and concerns around the safety of personal data. The discussion also looks ahead. It considers how policies such as the National Education Policy (NEP) 2020 may change the direction of higher education in India. It also considers how artificial intelligence (AI), virtual reality (VR), and web-based instruction are likely to become more important in shaping educational experiences in the years to come. Even with new technology and more digital tools, problems continue. Without adequate infrastructure, and without basic digital skills among both students and teachers, efforts to broaden access may fall short. Inequity remains a pressing concern. Bridging the gaps—across geography, income, and digital knowledge—will be imperative if these tools are to serve everyone fairly.

**Keywords:** Higher Education, Digital Transformation; Online Learning, Covid-19, Indian Education System

### Introduction

“Technology is central to development, and India must leverage digital tools to empower education.” — Narendra Modi

Prime Minister Narendra Modi’s statement draws attention to the growing role of technology in reshaping the educational setting in India. The link between technology and education is often described as working in both directions. Digital tools have changed how students learn. They have narrowed long-standing gaps in access to education and opened new ways to design learning that better suits a variety of needs. In the present century, higher education is undergoing visible shifts due to the fast-paced technological development (Marshall et al., 2024). These changes have altered long-held teaching practices. New tools have

entered academic spaces—changing how knowledge is shared and received in higher education institutions (HEIs). Artificial intelligence (AI), virtual reality (VR), learning analytics, and digital platforms are no longer seen as add-ons. They are now central to how education is being reshaped (Hoyer et al., 2020). These tools could help make learning fit each student’s needs. They also offer ways to spark deeper engagement and prepare students for a world that is now closely interconnected. These technologies did not enter education by accident. It has been driven by the need to meet the habits and expectations of a generation raised in digital environments. There is also pressure to respond to the demands of an economy built on knowledge and information (Seth et al., 2024). HEIs are turning to these tools to build learning spaces that are more interactive. These spaces are also becoming more collaborative—and

---

<sup>1</sup> Professor of Law, and Chairman, TGCH, Hyderabad, Telangana

they are no longer restricted by the four walls of a classroom. This opening sets the groundwork for a closer look at how new technologies are shaping the direction of education. Both the opportunities and the difficulties deserve attention. The use of educational technology gained new urgency during the Covid-19 pandemic. With classrooms shut, teaching moved to online formats without warning (Mishra et al., 2020). This shift was not gradual. The crisis pushed institutions to adopt digital tools quickly—in many cases, overnight. The pandemic not only changed how learning was delivered. It also acted as a trigger for a wider turn towards technology in education. What began as a response to an emergency soon became a sign of longer-term change.

From the days of the *guru-sishya* tradition—where teaching took place under trees—to lessons held inside closed classrooms, the way education is delivered has changed in striking ways. Presentations now involve LCD touch-screen projectors. Online notes are common. Instant messages on WhatsApp have caught on among students and are now part of their daily academic exchanges. The use of ICT in education has the potential to erase boundaries set by time and place. It can open space for working together and sharing knowledge. It may also improve the standard of learning (Haleem et al., 2022). Yet, several problems remain. Access to technology is still far from equal, and many learners are left behind. Matching what technology can offer with what education truly requires is another pressing concern.

The path of technological use in Indian higher education has passed through marked stages. In the early 2000s, the focus was largely on making sure students and teachers gained basic skills in computer use. Institutions were encouraged to bring ICT into their everyday teaching practices (Bajpai et al., 2019). Various government-backed efforts were launched to push this

shift forward. One such effort was the National Knowledge Commission, which ran from 2005 to 2008. Its aim was to improve the reach and quality of education through the use of new tools (Kannan, 2005). The Commission called for a National Mission on Education through ICT (NMEICT). This mission was later introduced to make wider use of technology in higher education. It sought to widen access and raise teaching standards across institutions (Livingstone, 2011).

This paper traces how the use of technology in academia has changed over time. It also looks at how it is used now and what directions it might take in the years ahead. The discussion raises several central questions. How has technology shaped higher education so far? What do current patterns tell us about its role? And what changes might lie ahead as new tools continue to emerge? By looking at both the gains and the difficulties, this paper opens a space for thought. It brings together views that matter to teachers, researchers, and those who make decisions in education. The goal is to help them respond to the shifts now unfolding in academic life.

### **The Past: Evolution of Technology in Higher Education**

Education is a key part of how any society grows and functions. It is through formal education that future citizens gain knowledge, skills, and values. These are passed on through well-designed systems and planned instruction (Spiel et al., 2018). The way we view learning has shifted in response to the conditions of modern life. Society now pushes us to reconsider how education is shaped and delivered. Learning itself can be understood as a process of change (Darling-Hammond et al., 2019). Social development has moved from the era of industry to one shaped by digital tools. This shift—combined with the rise of artificial intelligence, which often relies on algorithms—calls for new forms of teaching.

These future settings must be designed to suit the demands of a fast-moving world. At the same time, global security has become more unpredictable. There is greater tension between major powers. Armed conflicts continue to rage. These changes are now helping decide what skills people will need for future jobs. Those entering employment today—members of Generation Z—bring with them a new set of habits and expectations. They have grown up with digital tools and fast information. This change in learner profile calls for a fresh look at old teaching styles. Learning methods must now take into account the particular ways in which digital natives absorb and respond to content. The growth of technology in Indian higher education offers a clear window into this unfolding story. It shows how the country has moved away from older teaching practices. At the same time, it reveals a growing turn towards digital education. This shift has been shaped both by changes across the globe and the needs that arise within the immediate context.

### **1950-1990: The Foundation of Technological Integration**

The years between 1950 and 1990 formed the early stage of bringing technology into Indian higher education on a national scale (NITI Aayog, 2025). When the country gained independence, it faced a major challenge—how to expand access to education while also improving its quality. During this period, institutions such as the Indian Institutes of Technology (IITs) were set up in the 1950s and 1960s. These played a decisive role in shaping the early direction of technical and scientific learning in the country (Krishna, 2019). Much of the attention during this time went to building physical infrastructure. Laboratories were established. Libraries were developed. Research centres began to take shape across academic campuses. These efforts laid the groundwork for further steps in modernising education. By the 1970s and 1980s, universities had begun using audio-visual tools. Overhead

projectors became common in classrooms. Radio broadcasts were introduced to carry lectures beyond standard teaching hours. These tools created new ways for students to engage with course material and allowed for a more interactive style of learning. In 1984, the University Grants Commission (UGC) launched the Countrywide Classroom programme. This initiative delivered educational content through Doordarshan, the national TV broadcaster. It extended access to academic material beyond the limits of the traditional classroom setting (Rao, 2018). Another important development came with the founding of the National Informatics Centre (NIC) in 1976 (Schuetze et al., 2024). This body played a part in introducing early digital systems into university administration. Though such efforts were still at a basic level, they marked the beginning of change. Higher education was still far from fully using digital tools, but the first steps had begun.

### **1990-2010: Digital Revolution and the Internet Era**

The 1990s marked the early stages of a digital shift that reshaped higher education in India (Mhlanga, 2024). Following the liberalisation of the Indian economy in 1991, there was a growing interest in Information and Communication Technology (ICT) and its place in academic life (Erumban & Das, 2015). The arrival of personal computers in universities, followed by internet access, changed how learning and research were carried out. These tools opened up new ways for students and teachers to connect and learn. In 2003, the Indian Institutes of Technology (IITs), along with the Indian Institute of Science (IISc), launched the National Programme on Technology Enhanced Learning (NPTEL). This initiative aimed to make technical education available online in an orderly and accessible format (Kant & Mehra, 2022). Another step came in 2009 with the creation of the National Knowledge Network (NKN). This project sought to link educational institutions and

research centres through high-speed internet connections (Geetha et al., 2017). The idea was to build stronger ties across the academic world and allow for faster exchange of ideas and information. During this period, private universities and engineering colleges also began to grow in number. Many of these institutions brought computer-based learning into their classrooms from the start. This marked a move towards a more digitally aware method of teaching.

The early 1990s also saw the rise of digital libraries. One of the most notable was the Information and Library Network (IN-FLIBNET). This system expanded the ways in which students and teachers could access academic material. It linked Indian institutions to global knowledge sources and offered a wider range of research tools (Wani, 2021). Yet despite these shifts, the spread of digital tools in rural and government-funded universities remained limited. Many campuses lacked basic infrastructure. Others faced financial constraints that made it difficult to adopt new systems. These gaps slowed the progress of digital education in several parts of the country.

### **2010-2020: The Rise of Digital Learning and EdTech Boom**

The period from 2010 to 2020 brought a rapid increase in the use of digital tools within Indian higher education (Alenezi, 2023). Several factors contributed to this pace of change. The spread of low-cost smartphones played a major role. So did the rise of high-speed internet—especially following the launch of Jio in 2016. At the same time, the central government expanded its focus on digital schemes that aimed to reshape the learning environment. One of the most important initiatives during this time was the National Mission on Education through Information and Communication Technology (NMEICT). This programme promoted the use of ICT in learning. It included the creation of digital content and the development of online

repositories for academic material (Dabbeeru & Gannavaram, 2024). In 2017, the launch of the SWAYAM platform marked another step. This platform offered free Massive Open Online Courses (MOOCs). These courses were produced by leading institutions and reached learners across different regions and income levels (Palvia et al., 2018).

Another advance came with the growing use of Learning Management Systems (LMS). Platforms such as Moodle, Blackboard and Google Classroom became common in universities. These tools helped organise course materials, made assessments easier, and offered new ways for students to interact (Marshall & Sankey, 2023). The decade also witnessed the growth of virtual laboratories. Projects like the Virtual Labs initiative by the IITs gave science and engineering students the chance to carry out experiments online. This was a major shift, especially for learners who had no access to physical lab spaces.

Digital libraries also expanded during this period. The National Digital Library of India (NDLI) and e-ShodhSindhu offered access to millions of academic texts and journals. These resources gave new strength to research work and made it easier for students and teachers to draw on global sources. Another important step was the launch of the National Academic Depository (NAD). This system allowed degrees and certificates to be stored securely without the need for paper copies. It used blockchain technology to guard against tampering or loss (Gupta & Gupta, 2017).

### **Covidisation and Technology**

Covidisation describes a sweeping shift in life brought on by the Covid-19 pandemic. Modelled on the word '*globalisation*,' it refers to the rapid and borderless spread of new habits, routines and work patterns. Since the pandemic began, covidisation has spread to every part of society. It has

reshaped how countries, communities and institutions relate to one another—much like what globalisation did earlier. One of the most noticeable effects has been on the state of education across the world—a shift that brought about nameless, faceless and borderless classrooms. Covidisation has created a global village through a borderless world and opened access to education across national frontiers. People from the remotest corners of the planet could now take part in online seminars, webinars, workshops and classrooms—something previously unthinkable on this scale. Covidisation—in other words—has changed how the education system has been viewed in the past five years.

As the Covid-19 pandemic raged, universities and colleges shut down without warning and were forced to adopt digital tools at great speed to keep learning going (Dhawan, 2020). This sudden shift changed how education was delivered. It also reshaped how it was accessed and how it was experienced by both faculty and students. Moving from face-to-face teaching to digital formats entailed serious problems. Teachers and learners had to adapt quickly to new tools and unfamiliar methods (Yun, 2023). Teachers were expected to meet new demands. They had to reshape their teaching practices and find ways to keep students engaged through screens.

Information and Communications Technology (ICT) includes a wide variety of tools and systems for dealing with information. These tools are used to create, share, store, and manage knowledge. Over time, ICT has grown to cover a broad range of digital systems. It has become an important and inescapable part of modern education (Caba-leiro-Cerviño & Vera, 2020). When computing and communication technologies come together, they form what is known as Information Technology (IT). This allows for the production, sharing, and storage of knowledge. In the wake of Covidisation, technology no longer remained a passive

aid—it emerged as the very mode through which education continued. During the pandemic, IT became central to education—institutions relied on it to keep academic life going.

Traditional classroom learning came to a halt almost overnight. Online education took its place. This was one of the fastest changes ever in higher education. Many universities had little experience with digital teaching. They had to adjust posthaste. Virtual classrooms became the new norm. Institutions turned to platforms such as Zoom, Microsoft Teams, and Google Meet. Learning Management Systems like Moodle and Canvas also became widely used (Singh et al., 2022). This shift was not merely logistical—it changed the way people thought about the space of the classroom itself. This fast shift helped see what digital tools can do and where they do not work all that well.

Digital learning gained unprecedented popularity during this period. Platforms such as SWAYAM and NPTEL, along with other MOOCs, saw a sharp rise in enrolments. Many students and teachers turned to these platforms in search of flexible and reachable options. In science and engineering, virtual laboratories, simulations, and augmented reality tools were used to support learning. These tools came to be regarded as ways to offer practical lessons without physical labs (Al-Ansi et al., 2023). Technology also removed some of the barriers of place. Students from remote areas could now access lessons from top institutions (Kumar & Shobana, 2024). Digital testing methods, AI-based invigilation tools, and systems for issuing digital certificates grew more common. These tools helped maintain academic processes and supported integrity in assessment. Covidisation made it amply clear that classrooms need not be bound by geography—teaching and learning could now move across borders and time zones with ease.

However, the sudden shift to online education also led to serious problems. In India, the digital divide created large gaps in access. Many students—especially those in rural or lower-income areas—did not have stable internet, smartphones, or computers. This meant they could not take part in online classes on equal terms (Afzal et al., 2023). Teachers also faced difficulties. Many had never worked with digital tools before. They had to learn new systems while also continuing to teach (Gratz & Looney, 2019). The loss of in-person contact raised worries about student focus, emotional well-being, and the depth of learning. Covidisation, while opening new doors, also brought to light the inequalities that run through the digital world. It laid bare the gap between access and participation—between having a device and using it meaningfully.

Notwithstanding these issues, the current digital age has brought major changes to education. Indian universities and colleges are now part of this shift (Desk, 2023). Technology and new teaching methods are reshaping how learning takes place. Artificial Intelligence is being used to tailor lessons to the needs and learning style of each student. Virtual Reality and Augmented Reality are being brought into classrooms. These tools are used to build more interactive and hands-on learning spaces. Online platforms and MOOCs have made it easier for students to access study material. High-quality courses are now within reach—regardless of where students live. This kind of reach allows learners to study at a pace that suits them.

Teachers, too, have gained from this shift as administrative tasks have been reduced through digital systems. They can now invest more time in student interaction and classroom preparation. Data tools have also gained ground. Learning analytics and similar technologies help track student progress. These systems help teachers adjust their methods and spot problems early. The

aim is to improve student work and support learning outcomes.

Covidisation has thus not only changed the way education is delivered—it has reshaped the idea of education itself. What was once defined by walls and timetables is now shaped by screens and signals. Yet the full reach of Covidisation is not known. Its true weight may lie in the years ahead—as new ways of interaction continue to form and grow across the world. What we have seen so far may well be only the beginning of changes yet to come.

The Government of India has launched several schemes to expand digital learning and improve skills in this area (ToI-Online, 2022). SWAYAM offers free courses from school level up to postgraduate studies. It uses printed material, online tests and forums for discussion. SWAYAM PRABHA broadcasts lessons on 32 television channels. These are meant for students who cannot access the internet. The National Digital Library of India (NDLI) holds more than 72 lakh digital books. The National Academic Depository provides secure storage for certificates and degrees (Singh, 2022). E-PG Pathshala contains academic material in several Indian languages. E-Yantra supports learning in robotics and embedded systems (Shrivastava & Shrivastava, 2022). The FOSSEE project aims to move away from paid software. Spoken Tutorial offers free lessons in programming and software, in many languages. Virtual Labs gives students access to digital experiments—cutting down the need for expensive laboratory space. E-Shodhsindhu (eSS) connects users to over 15,000 journals and databases. The Annual Refresher Programme in Teaching (ARPIT) offers training for college staff (Shrivastava & Shrivastava, 2022). Plagiarism Detection Software is used to maintain academic honesty. VIDWAN serves as a record of experts and researchers. DigiLocker allows people to store important documents online. The National Digital Educational Architecture (NDEAR) supports the

digital systems behind these efforts (Hidalgo et al., 2018). The National Scholarship Portal (NSP) helps students receive funding through a clear and centralised process. These projects aim to widen access to higher education in India—and to raise its quality across different regions.

### **Future Implications**

India can legitimately claim to be the home to one of the largest higher education systems in the world. It has seen a sharp rise in the number of institutions, enrolments and public initiatives aimed at increasing access and raising standards. Yet the task is not only to expand education—it must also keep pace with rapid changes in technology.

Alvin Toffler (1970), writing in *Future Shock*, warned that traditional education systems rely too heavily on past knowledge. He argued that this focus leaves students unprepared for an uncertain future. Toffler believed that education should face forward—it ought to prepare learners for what is coming, not only for what has already happened. He called for constant change and adjustment. His view is more important now than ever before. Technology is now a central part of education—it is not just an extra feature. With the rise of artificial intelligence, data analysis, virtual reality and other digital systems, there is a growing need to rethink how courses are built and how lessons are delivered. Institutions must move away from memorisation and adopt new methods that support skill development, flexibility and original thinking.

The Covid-19 crisis sped up this shift. But keeping it going will require policy reform, investment in digital tools and a lasting commitment to lifelong learning. The National Education Policy (NEP) 2020 supports this direction. It promotes learning across disciplines and encourages the use of technology. By doing so, it echoes Toffler's call for education that focuses on the future instead of staying stuck in the past.

As pointed out already, the Indian higher education system ranks among the world's largest. By 2022, the country had more than 1,100 universities and over 45,000 colleges. This is based on data from the All-India Survey on Higher Education (AISHE) (Government of India, 2022). The numbers have grown from 651 universities and 31,324 colleges in 2013 (Government of India, 2022). The system includes central, state and private institutions. It also covers deemed-to-be universities and institutes of national importance such as the IITs, IIMs and AIIMS. Enrolment figures have also increased. The Gross Enrolment Ratio (GER) reached 28.4% in 2021-22. This is up from 26.3% in 2018-19. The total enrolment has crossed 4.14 crore students—or 41.4 million students (Government of India, 2022). Female enrolment has also seen a strong rise. Women now make up nearly 49% of the total student population. This points to progress in closing the gender gap.

During the pandemic, vast numbers of students turned to online and distance learning. Over 10% of all enrolments now come through Open and Distance Learning (ODL). These courses are offered by institutions such as IGNOU and the state open universities (Jena, 2020). Online platforms like SWAYAM and NPTEL have gained popularity. They offer Massive Open Online Courses (MOOCs) to large numbers of students. The National Education Policy (NEP) 2020 seeks to bring more change. It sets a target to raise the GER to 50% by 2035. It also supports a shift toward broader learning and increased use of digital tools (Mahalakshmi & Radha, 2020). The NEP allows foreign universities to open campuses in India. This is expected to improve academic standards and give Indian students wider exposure. The Study in India initiative is another key step. It aims to draw international students and establish India as a global hub for education.

Yet many challenges remain. Quality is still a concern. A large number of institutions lack proper facilities, skilled staff and research infrastructure. The problem of employability continues. Many graduates leave with degrees but often lack the skills that employers seek. This shows the need to focus more on skill-based and vocational learning. There are also yawning gaps between regions. Urban areas often have better infrastructure and more options. Rural students tend to have fewer opportunities. Faculty shortages—especially in technical or specialist fields—also weaken teaching and research. While India ranks high in total research output, there is still a need to raise the quality of that work. This is one reason for the launch of the National Research Foundation (NRF), which aims to support deeper research and original ideas (Aithal & Aithal, 2020).

The private sector plays an important part in Indian higher education. It accounts for a major share of enrolments and offers a wide range of courses in areas such as engineering, management and medicine (Jhurree, 2005). But concerns remain about profit-driven models and weak quality checks in private institutions. There is growing focus on skill development to address these issues. Programmes such as the National Skill Development Mission promote partnerships between universities and industries. These links aim to improve student preparedness for work (Mehta et al., 2024). The pandemic also accelerated the shift to digital tools. Institutions began using Learning Management Systems (LMS), online testing methods and virtual laboratories (Chukwuere, 2024). Yet the digital divide remains a serious barrier. Rural areas still face poor connectivity—this limits access to education. India's higher education system has seen large-scale expansion. Enrolment has grown. New policies have been introduced. But problems with quality, fairness and job preparation remain. The NEP 2020 offers a path forward. It supports research, new ideas and digital systems.

These may help tackle the problems that still exist. Long-term progress will depend on steady work. There must be efforts to make education open to all, to raise teaching standards and to link learning with the demands of the modern workplace (Datta & Mete, 2021).

### **Issues and Challenges of the Use of Technology in Higher Education**

Technology has brought many helpful changes to higher education. Yet it has also raised a number of serious concerns that must be met if its full potential is to be realised. One of the most urgent of these is the digital divide. Not all students have equal access to computers, smartphones or steady internet connections. This problem is especially pronounced in rural areas and among communities stricken by economic hardship. The gap is widened by social and financial conditions. Students from low-income households often struggle to afford the tools they need. This leads to unequal chances in learning (Afzal et al., 2023).

Many universities and colleges also lack proper infrastructure. Some do not have fast internet or up-to-date digital equipment. These limitations make it harder to carry out online learning in a meaningful way (Kumari, 2022). Tight budgets add to the strain. Institutions often find it difficult to buy or maintain advanced equipment when resources are already stretched. Another major concern is the readiness of teaching staff (Alcaide-Pulido et al., 2025). Many faculty members still lack basic digital skills. Without proper training, it becomes difficult for them to work with learning platforms or digital tools. This can lead to delays, frustration and reluctance to adopt new methods. Ongoing training is need of the hour. It helps staff stay informed about tools that might change how they teach—and how students learn (Keese et al., 2023).

For students, it is often harder to stay motivated in online classes. Without direct

contact with teachers, students can lose interest. Participation tends to fall. Online study also asks a lot from students. They must manage their time well and stay focused without much supervision. Not everyone finds this easy. The matter of quality in online education is another cause for concern (Haleem et al., 2022). The quality of digital content varies quite a lot. This is especially true in subjects that rely on hands-on experience. Science, engineering and medicine often need physical practice—not just theory.

There are also questions about honesty in online exams. Cheating and plagiarism are easier when there is no one in the room. Keeping assessments fair has become more difficult. Protecting student and staff data is another serious challenge. Cyberattacks and breaches of privacy are growing threats (Fidas et al., 2023). Tools used to watch students during exams—such as remote proctoring software—also raise ethical concerns. Many of these tools track behaviour in ways that some view as intrusive. Consent and privacy are not always treated carefully. A further problem lies in how quickly technology changes. New tools emerge so fast that older systems soon feel outdated. This creates pressure to keep buying and updating. It also leads to problems with compatibility. Systems from different providers do not always work well together—and this slows down progress.

The mental and physical health of both students and teachers is also at stake. Long hours in front of screens can cause eye strain, headaches and fatigue. The lack of personal contact can lead to isolation. Many students and faculty report feeling disconnected and alone. Policy and regulation add another layer of difficulty. Institutions must deal with legal demands on data safety, intellectual rights and online learning rules (Bernate et al., 2024). Many policies do not yet cover the unique problems that online and blended learning bring. Cultural resistance within institutions can also hold

back change. Some universities—especially older ones—are slow to accept new tools. Fear of change or loyalty to tradition makes it harder to move towards digital models. Transitioning to a new way of teaching often demands a total change in mindset. This takes time. Access to digital resources remains uneven. Students in remote or underserved regions face more obstacles. They often lack the devices, support and content that others take for granted. Language is another barrier. Much online content is available only in English. This puts students who are not proficient in English at a disadvantage.

## **Conclusion**

The use of technology in higher education has brought major changes to the learning environment. This shift became especially clear during the Covid-19 pandemic. Digital tools and online platforms have widened access. They have also made learning more flexible for many students. Yet these changes have brought new concerns to the surface. The digital divide remains a serious problem. Not all students have the same access to technology or stable internet. Many teachers, too, are still adjusting to digital methods. Concerns about how personal data is collected and stored have also gained attention.

In India, the government has introduced several schemes to support digital learning. Platforms such as SWAYAM and NPTEL, along with policies like NEP 2020, have played an important role in promoting online education. These efforts have helped expand learning opportunities across the country. Even so, major gaps remain. Many institutions still lack basic infrastructure. Internet access is uneven. Equipment is often outdated or missing. Questions about fairness and the quality of education continue to arise. These problems need to be monitored closely so that digital learning works for all students, not just a select few.

As higher education continues to shift, new technologies such as artificial intelligence, virtual reality and data analytics are set to reshape how teaching and learning are carried out. These tools have the power to change not only how knowledge is shared but also how students interact with content and with their teachers. To make this shift work in practice, institutions will need to place firm attention on digital skills. Staff training must remain a strong focus. So must efforts to keep students involved and active in their learning. Meeting these needs will require more than isolated efforts. Changes in policy must be considered. Public and private bodies will need to work together. Digital strategies must be broad enough to include all students—not just those with access to the latest tools or strongest connections. Only by doing so can higher education become more open, flexible, and future-ready.

## References

- Afzal, A., Khan, S., Daud, S., Ahmad, Z., & Butt, A. (2023). Addressing the digital divide: Access and use of technology in education. *Journal of Social Sciences Review*, 3(2), 883–895.  
<https://doi.org/10.54183/jssr.v3i2.326>
- Aithal, P. S., & Aithal, S. (2020). Implementation strategies of higher education part of National Education Policy 2020 of India towards achieving its objectives. *International Journal of Management Technology and Social Sciences*, 5(2), 283–326.  
<https://doi.org/10.47992/ijmts.2581.6012.0119>
- Al-Ansi, A. M., Jaboob, M., Garad, A., & Al-Ansi, A. (2023). Analyzing augmented reality (AR) and virtual reality (VR) recent development in education. *Social Sciences & Humanities Open*, 8(1), 100532.  
<https://doi.org/10.1016/j.ssaho.2023.100532>
- Alcaide-Pulido, P., Gutiérrez-Villar, B., Ordóñez-Olmedo, E., & Pérez-Escolar, M. (2025). Analysis of faculty readiness for online teaching: assessing impact and adaptability in diverse educational contexts. *Smart Learning Environments*, 12(5).  
<https://doi.org/10.1186/s40561-024-00353-2>
- Alenezi, M. (2023). Digital learning and digital institution in higher education. *Education Sciences*, 13(1), 1–18.  
<https://doi.org/10.3390/educsci13010088>
- Bajpai, N., Biberman, J., & Sharma, A. (2019). Information and communications technology in the education sector in India (*ICT India Working Paper No. 3*). Center for Sustainable Development, Earth Institute, Columbia University. <https://www.econstor.eu/bitstream/10419/249792/1/ICT-India-Working-Paper-03.pdf>
- Bernate, J., Fonseca, I., García, Z., Agudelo, M., & Zambrano, E. (2024). Challenges and technological inclusion in higher education of the 21st century. *Revista De Gestão Social E Ambiental*, 18(8), 1–13.  
<https://doi.org/10.24857/rgsa.v18n8-188>
- Cabaleiro-Cerviño, G., & Vera, C. (2020). The impact of educational technologies in higher education. *GiST Education and Learning Research Journal*, 20, 155–169.  
<https://doi.org/10.26817/16925777.711>
- Chukwuere, J. (2024). Rapid review of the COVID-19 pandemic's impact on the digitalization of higher education. *Research on Education and Media*, 16(1), 1–9. <https://doi.org/10.2478/rem-2024-0002>
- Dabbeeru, R., & Gannavaram, K. (2024). Digital transformation in education: Adoption trends of digital technologies in contemporary education sectors. *International Journal of Innovative Research in Technology*, 10(8), 563–572.  
[https://ijirt.org/publishedpaper/IJIRT167380\\_PAPER.pdf](https://ijirt.org/publishedpaper/IJIRT167380_PAPER.pdf)

- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2019). Implications for educational practice of the science of learning and development. *Applied Developmental Science, 24*(2), 97–140. <https://doi.org/10.1080/10888691.2018.1537791>
- Datta, R., & Mete, J. (2021). Digital initiatives of National Education Policy 2020 on higher education in India. *Asian Journal of Managerial Science, 10*(2), 44–50. <https://doi.org/10.51983/ajes-2021.10.2.3169>
- Desk, I. T. E. (2023, July 18). Embracing the digital revolution: Transforming higher education in India. *India Today*. <https://www.indiatoday.in/education-to-day/featurephilia/story/embracing-the-digital-revolution-transforming-higher-education-in-india-2408069-2023-07-18>
- Dhawan, S. (2020). Online learning: A panacea in the time of Covid-19 crisis. *Journal of Educational Technology Systems, 49*(1), 5–22. <https://doi.org/10.1177/0047239520934018>
- Erumban, A. A., & Das, D. K. (2015). Information and communication technology and economic growth in India. *Telcommunications Policy, 40*(5), 412–431. <https://doi.org/10.1016/j.tel-pol.2015.08.006>
- Fidas, C. A., Belk, M., Constantinides, A., Portugal, D., Martins, P., Pietron, A. M., Pitsillides, A., & Avouris, N. (2023). Ensuring academic integrity and trust in online learning environments: A longitudinal study of an AI-Centered proctoring system in tertiary educational institutions. *Education Sciences, 13*(6), 1–30. <https://doi.org/10.3390/educsci13060566>
- Geetha, P., Cherukulath, W. K., & Sivakumar, R. (2017). Facilitating e-learning through National Knowledge Network. *DESIDOC Journal of Library & Information Technology, 37*(2), 91–97. <https://doi.org/10.14429/djlit.37.2.10958>
- Government of India. (2022). *All India survey on higher education 2021-22* [AISHE]. <https://cdnbbsr.s3waas.gov.in/s392049debbe566ca5782a3045cf300a3c/uploads/2024/02/20240719952688509.pdf>
- Gratz, E. & Looney, L. (2020). Faculty Resistance to Change: An Examination of Motivators and Barriers to Teaching Online in Higher Education. *International Journal of Online Pedagogy and Course Design (IJOPCD), 10*(1), 1–14. <https://doi.org/10.4018/IJOPCD.2020010101>
- Gupta, S. B., & Gupta, M. (2017). National Academic Depository: A step towards digital India vision. *Indian J.Sci.Res., 13*(1), 204–207. <https://ijsr.in/upload/33305099537.pdf>
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers, 3*, 275–285. <https://doi.org/10.1016/j.susoc.2022.05.004>
- Hidalgo, S., Koebernik, M., & Williams, K. (2018). Transformational learning in higher education settings: A case study of “Teaching Teachers to Teach.” *International Journal of Education, 10*(4), 20–30. <https://doi.org/10.5296/ije.v10i4.13750>
- Hoyer, W. D., Kroschke, M., Schmitt, B., Kraume, K., & Shankar, V. (2020). Transforming the customer experience through new technologies. *Journal of Interactive Marketing, 51*(1), 57–71. <https://doi.org/10.1016/j.intmar.2020.04.001>
- Jena, P. K. (2020). Impact of pandemic Covid-19 on education in India. *International Journal of Current Research (IJCR), 12*(7), 12582–12586. <https://doi.org/10.31235/osf.io/2kasu>
- Jhurree, V. (2005). Technology integration in education in developing countries: Guidelines to policy makers.

- International Education Journal*, 6(4), 467–483.  
<http://files.eric.ed.gov/fulltext/EJ855000.pdf>
- Kannan, G. (2005). National Knowledge Commission (NKC) of India: An overview. [http://eprints.rclis.org/7462/1/National\\_Knowledge\\_Commission\\_Overview.pdf](http://eprints.rclis.org/7462/1/National_Knowledge_Commission_Overview.pdf)
- Kant, P., & Mehra, A. (2022). A critical evaluation of the National Programme on Technology Enhanced Learning (NPTEL): The flagship Indian massive open online courses (MOOCs) programme. *The European Conference on Education 2022: Official Conference Proceedings* (pp. 529–547). IAFOR. <https://doi.org/10.22492/issn.2188-1162.2022.43>
- Keese, J., Ford, D. J., Luke, S. E., & Vaughn, S. M. (2023). An individualized professional development approach for training university faculty in using a technological tool. *Education and Information Technologies*, 28(11), 14577–14594. <https://doi.org/10.1007/s10639-023-11792-8>
- Krishna, V. V. (2019). Universities in the national innovation systems: Emerging innovation landscapes in Asia-Pacific. *Journal of Open Innovation Technology Market and Complexity*, 5(3), 1–21. <https://doi.org/10.3390/joitmc5030043>
- Kumar, J. S., & Shobana, D. (2024). EdTech in India: Challenges and opportunities for transforming education in a digital ERA. *International Journal of Advance Studies and Growth Evaluation*, 3(11), 13–19.
- Kumari, M. (2022). Challenges and opportunities for online education in India. *International Journal of Advanced Engineering Management and Science*, 8(12), 49–53. <https://doi.org/10.22161/ijaems.812.6>
- Livingstone, S. (2011). Critical reflections on the benefits of ICT in education. *Oxford Review of Education*, 38(1), 9–24. <https://doi.org/10.1080/03054985.2011.577938>
- Mahalakshmi, K., & Radha, R. (2020). Covid 19: A massive exposure towards web-based learning. *Journal of Xidian University*, 14(4), 2405–2411. <https://doi.org/10.37896/jxu14.4/266>
- Marshall, S., & Sankey, M. (2023). The future of the learning management system in the virtual university. In M. D. Sankey, H. Huijser, & R. Fitzgerald (Eds.), *Technology-enhanced learning and the virtual university* (pp. 1–22). Springer. [https://doi.org/10.1007/978-981-19-9438-8\\_16-1](https://doi.org/10.1007/978-981-19-9438-8_16-1)
- Marshall, S., Blaj-Ward, L., Dreamson, N., Nyanjom, J., & Bertuol, M. T. (2024). The reshaping of higher education: Technological impacts, pedagogical change, and future projections. *Higher Education Research & Development*, 43(3), 521–541. <https://doi.org/10.1080/07294360.2024.2329393>
- Mehta, J., Bhatt, P., & Raval, V. (2024). Skill development in India: Challenges, current, and future perspectives. *The Scientific Temper*, 15(Spl-2), 116–122. <https://doi.org/10.58414/SCIENTIFIC-TEMPER.2024.15.spl-2.19>
- Mhlanga, D. (2024). Digital transformation of education, the limitations and prospects of introducing the fourth industrial revolution asynchronous online learning in emerging markets. *Discover Education*, 3, 32. <https://doi.org/10.1007/s44217-024-00115-9>
- Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of Covid-19 pandemic. *International Journal of Educational Research Open*, 1, 100012. <https://doi.org/10.1016/j.ijedro.2020.100012>
- NITI Aayog. (2025). Expanding quality of higher education through states and state public universities. <https://www.niti.gov.in/sites/default/files/2025-02/Expanding-Quality-Higher-Education-through-SPUs.pdf>

- Palvia, S., Aeron, P., Gupta, P., Mahapatra, D., Parida, R., Rosner, R., & Sindhi, S. (2018). Online education: Worldwide status, challenges, trends, and implications. *Journal of Global Information Technology Management*, 21(4), 233–241.  
<https://doi.org/10.1080/1097198x.2018.1542262>
- Rao, V. J. (2018). Educational television in India: Challenges and prospects. *The IAFOR International Conference on Education - Hawaii 2018* [Conference-proceeding]. The International Academic Forum. [https://papers.iafor.org/wp-content/uploads/papers/iicehawaii2018/IICEHawaii2018\\_39078.pdf](https://papers.iafor.org/wp-content/uploads/papers/iicehawaii2018/IICEHawaii2018_39078.pdf)
- Schuetze, H., De Vries, W., & Alvarez Mendiola, G. (2024). Digitalization of higher education: An introduction. *Journal of Comparative & International Higher Education*, 16(2), 6–12.  
<https://doi.org/10.32674/jcihe.v16i2>
- Seth, S., Sharma, S., Lowe, D., & Galhotra, B. (2024). Technological integration in higher education: Insights from the Indian context. *Journal of Informatics Education and Research*, 4(2), 2654–2657.  
<https://doi.org/10.52783/jier.v4i2.1129>
- Shrivastava, S. K., & Shrivastava, C. (2022). The impact of digitalization in higher educational institutions. *International Journal of Soft Computing and Engineering (IJSCE)*, 11(2), 7–11.  
<https://doi.org/10.35940/ijscce.b3536.0111222>
- Singh, J., Singh, L., & Matthees, B. (2022). Establishing social, cognitive, and teaching presence in online learning—a panacea in Covid-19 pandemic, post vaccine and post pandemic times. *Journal of Educational Technology Systems*, 51(1), 28–45.  
<https://doi.org/10.1177/00472395221095169>
- Singh, S. (2022). Role of National Digital Library of India (NDLI) for facilitating open access resources (OARs): An investigation on Covid-19 research repository. *Digital Library Perspectives*, 38(4), 493–507.  
<https://doi.org/10.1108/dlp-08-2021-0072>
- Spiel, C., Schwartzman, S., Busemeyer, M., Cloete, N., Drori, G., Lassnigg, L., Schober, B., Schweisfurth, M., Verma, S., Bakarar, B., Maassen, P., & Reich, R. (2018). The contribution of education to social progress. *Rethinking society for the 21st century: Report of the International Panel on Social Progress* (pp. 753–778). Cambridge University Press.  
<https://doi.org/10.1017/9781108399661.006>
- Toffler, A. (1970). *Future shock*. Random House.
- ToI-Online. (2022, October 1). Government initiatives for digital education in India. *The Times of India*.  
<https://timesofindia.indiatimes.com/education/online-schooling/government-initiatives-for-digital-education-in-india/articleshow/94532897.cms>
- Wani, G. A. (2021). Digital library initiatives: An overview of national and international scenario. *IP Indian Journal of Library Science and Information Technology*, 6(2), 66–72.  
<https://doi.org/10.18231/j.ijlsit.2021.015>
- Yun, W. S. (2023). Digitalization challenges in education during Covid-19: A systematic review. *Cogent Education*, 10(1), 1–17.  
<https://doi.org/10.1080/2331186x.2023.2198981>