

# A Study on E-Learning and Its Challenges and Implications in Remote Areas in India

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## Abstract

*Learning is for acquiring knowledge with the advancement in technology. e-learning, which stands for electronic learning, has become a part of learning across the world. e-learning is a teaching-based learning method that makes use of electronic media. Basically, it is defined as the delivery of educational content courses and programs over the internet or computer networks. e-learning is based on ICT (information and communication technology) and Web 2.0 technologies. According to the 2011 census, a report stated that the illiteracy rate for individuals aged 7 and above in rural areas was 32.3%. This study explains the possibility of e-learning in remote areas. It is a boon for those who want to pursue education and are deprived of getting it. So, to reduce this, we need to move towards the Web3.0 technologies like AI, ML, VR, etc. e-learning can be beneficial, as it can be used by learners who are in remote areas with fewer opportunities and a difficult demographic situation. This study explores those technologies that can be utilized for reaching the missing ones.*

**Keywords:** E-learning, ICT, technology, Web2.0, Web3.0

## INTRODUCTION

Education has played a very significant role in what India is today and how much it has developed. It is only possible because of knowledge and learning. The advent of large communication networks such as the Internet, the tools, and advanced teaching facilities made the development of learning methods possible and made it possible to cover the range of learners in different locations and the distance under the learning network [1]. Education is the right of every child, for every individual who wants to learn, and who wants to achieve their dreams. With over 1.5 million schools, India has *one of the largest* educational systems in the world and is among the nations with the most schools worldwide (Education for all in India). Distance education was defined by Bates and Moore *et al.* as the education given in a manner other than the traditional face-to-face and on-campus education [2, 3].

However, even after 75 years of independence, people who live in remote areas are unable to get quality education. They are still struggling to access education effectively, as per a survey conducted in India in 2021.

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To solve this issue, e-learning has been introduced, and technology has evolved so much that, with its help, we can easily connect with people all around the world. e-learning is the best example of it. However, many new issues are being introduced because of Web-based learning and new concepts related to it, such as virtual universities, laboratories, and classrooms [4, 5].

It is a learning format that is conducted on an electronic device with the help of an internet

connection and can be defined as e-learning. It also enables teachers to access innumerable educational resources from different internet repositories of academic resources [6].

“Effective e-learning courses require a well-thought-out pedagogical approach. An effective online pedagogy emphasizes student-centered learning, which means that active learning activities are employed in e-learning” [7].

## LITERATURE REVIEW

- *Adenugba, ‘e-learning’s purpose in education’ [6]:* The importance and effects of e-learning in the sphere of education are covered in this essay.
- *Khaldi and Ouariach, ‘scripting Tools and e-learning experience design’ [7]:* This article looks to examine the usage of scripting tools in e-learning experience design, perhaps going over its benefits and drawbacks.
- *Tsai and Li, ‘using educational technology in enterprise settings: Examining Employee Learning Behavior in Online Learning Environments’ [8]:* This research looks into how businesses use instructional technology and how staff members interact with online learning environments.
- *Nasiatin et al., ‘e-learning’s contribution to students’ learning satisfaction: A review of the literature’ [9]:* The research evaluates how well e-learning contributes to students’ happiness with their educational experiences.
- *Kannangara et al., ‘conceptualization of a wireless mesh network model for e-learning in remote areas’ [10].*

## HISTORY

In 1999, the term “e-learning” was first used in CBT System lectures to refer to a method of acquiring information and skills using digital channels such as the internet and other electronic media.

### The E-Learning Timeline

Today, technology allows social and group learning through computer conferences. Participating in group activities where students learn and practice causes a collective human effort to take place for conceptualization and meaningful learning [11]. In meaningful learning, transferring information does not matter; on the contrary, it emphasizes more on discussion. Information and communication technology relates teaching and learning quickly spread to the world outside the classroom [12].

- *In 1840s:* Stenography (Isaac Pitman, a professor at Wharton’s Edge, was teaching shorthand (stenography) to his students. This style of writing is designed to encourage typing speed).
- *In 1924:* “Automatic Teacher” (Sidney Pressey, a professor of educational psychology at Ohio University, created the “Educator” tool. The machine will not move on to the next question until the correct answer is selected. This way, students can know whether their answers are correct or not.
- *In 1954:* BF Skinner, a Harvard professor, created the “GLIDER” teaching device to support educational institutions in giving pupils practical experience. Skinner’s machine was made with teaching in mind, as opposed to Pressey’s, which was meant to assess pupils.
- *The 1960s:* Computer-Based Education (Now we bring the history of educational administration to the period). Although the answer to the question that created e-learning is unclear, the first computer-based training program was created with inspiration from Skinner’s GLIDER (CBT). Program Logic Auto-Mate teaching Operations was developed by developers Don Bitzer and Daniel Alpert (PLATO).
- In 1966, Professors of psychology at Stanford University, Patrick Suppes and Richard Atkinson, taught reading and math to primary school students in Palo Alto using computers.
- The first department to offer online courses was the Department of Medicine at the University of Alberta in 1968. The school used the IBM 1500 network to deliver 17 courses to more than 20,000 students.

- The Advanced Research Projects Intermediary Network, or ARPANET, was established in 1969. The ARPANET served as the backbone of Internet technology.
- Some schools were established to provide virtual courses in the early 1990s.
- Udemy was created in 2010 by three Turkish professors. From its humble beginnings, the platform has grown to become one of the biggest and most well-known online learning environments worldwide.
- 2010 is also a great year for social media education. Learning is facilitated via Facebook, YouTube, Twitter, LinkedIn, and blogs, as well as short films and documentaries.
- Andrew NG and Daphne Koller of Stanford University founded Coursera in 2012, which is now one of the world's leading online learning platforms. Around this same period, Udacity and edX both saw success.

This was the era where e-learning started to withstand and take a strong position and hold in India. "In today's rapidly changing workplace environment, self-regulated learning (SRL) plays a crucial role in employee education" [8].

The history of numerous e-learning websites in the early 2000s marked the beginning of online education in India. These platforms give users access to information and online courses, but adoption has been slow due to limited internet access.

Smart classrooms and satellite schooling were introduced in India at the same time as the country began its educational technology adventure, although this concept was not well-received. With time and technological advancements, there has been a significant increase in online education in India. Transfer has emerged as a major force behind the growth of online learning in recent years. E-learning is no longer merely a choice; it is now a need. Online education has grown significantly during the past 10 years. The two main factors behind growth and development were technology and COVID-19.

### **SCOPE OF E-LEARNING**

In recent years, e-learning in higher education has grown significantly. A Forbes analysis projects that the higher education e-learning sector will expand by 9.5% a year and reach a \$325 billion valuation by 2025. However, the work done in the development and distribution of such content, often known as "learning resources", enables students and teachers to access a wide range of content [13].

"According to Sahu *et al.*, several countries' educational institutions are transitioning from traditional classroom teaching to online teaching to provide sustainable and effective education" [14]. It is estimated that by 2028, the Indian online education industry is anticipated to have 287.6 million users (In line with statista.com).

### **The Human Resources Ministry**

Users are becoming more interested in development (Ministry of Human Resource Development (MHRD)) because of their new courses, certifications, practical, etc. The type of awareness being created by e-learning platforms is accessible to both villages and cities.

### **National Programme on Technology Enhanced Learning**

National Programme on Technology Enhanced Learning (NPTEL) was started by MHRD, or human resource development. To create NPTEL, the IIT and IISC were merged with MHRD. This portal, NPTEL, provides high-quality training courses from universities such as the Indian Institute of Science, Bengaluru, Delhi, Kanpur, Madras, and IIT Bombay. Users are drawn to NPTEL by its alluring offers, which include free video courses and certificates. After completing the entire course, the user must take an NPTEL test. Those who pass with a score of at least 90% will receive a certificate recognizing their accomplishments. Numerous courses, ranging from aerospace to biotechnology, are available to consumers via NPTEL.

It gives a variety of courses on the basis of different streams, cultures, and interests. The courses offered for the studies are as follows: The courses deal with Humanities and social sciences, Engineering for mining, the field of Computer Science, Electronics and Communication Engineering, Science of the atmosphere, Engineering for aircraft, Engineering for automobiles, Biotechnology, Engineering Design, Textile Engineering, Engineering for the Oceans, the field of Electrical Engineering, Environmental Science.

### ***Swayam Prabha***

Swayam Prabha reports that the Ministry of Human Resource Development (MHRD) provided 32 digital channels. The content on Swayam Prabha was sourced from some of the most reputable and respected e-learning platforms in India, ensuring that the feed remains up to date. Through this, viewers can learn new skills and methods based on their research. Swayam Prabha drew its content from the NPTEL, IIT, UGC, CEC, and NCERT. Students made extensive use of the curriculum-based courses that Swayam Prabha provides for both undergraduate and graduate study on subjects including the arts, sciences, business, agriculture, law, medicine, engineering, social sciences, humanities, and fine arts. This Swayam Prabha teaches the latest teaching techniques to the professors. Students can gain greater clarity on the subjects when their professors receive appropriate training.

### ***Open Culture***

The world's leading institutions and open culture have partnered to give users access to the best university content. Stanford, Yale, MIT (Massachusetts Institute of Technology), Harvard, Oxford, and other universities all contribute to the creation of content about open culture. More than 1300 free courses are available for users to access on this open culture, and users can also download the courses.

### ***Udemy***

The goal of Udemy is to facilitate communication between the professional content creators and their audience. Users of Udemy can access free courses there. Users on this Udemy can tweak and personalize the courses to suit their preferences, which sets it apart from other platforms a little. With 40 million students using the site, 1.3 lakh courses, and more than 50,000 instructors, Udemy was a popular and successful platform.

### ***Coursera***

In 2012, Andrew and Koller, two software academics, developed this Coursera, a free online learning environment. World-class universities and institutions have joined forces. Massive open online learning courses are being made available to users during this course term. Among the topics addressed in this course period platform are engineering, humanities, biology, mathematics, business, and digital marketing.

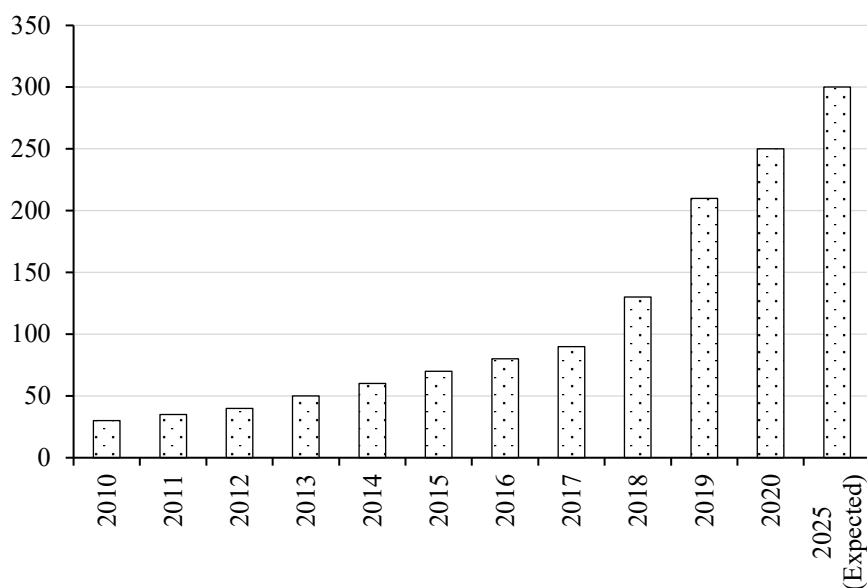
There are 33 million registered users on this Coursera platform, and there are 2,400 courses available.

*Globally available:* E-learning is globally available; anyone can easily access the world of learning at anytime from anywhere with the help of an Internet connection, even at home and in remote areas.

## **GROWTH OF E-LEARNING**

E-learning has been growing rapidly, and it has been seen that E-learning is emerging as a billion-dollar market, and projected growth will be US\$12.77 billion by 2028. In developed countries, ICTs, in education, helped to establish a 100% ICT-based University, which is known as a Virtual University [2, 15, 16].

*Components of e-learning:* Ten primary components serve as the primary classification for the fundamental needs of e-learning courses (Figure 1).



**Figure 1.** Flowchart of the e-learning market.

Included in these components are a variety of materials, including URLs (10.00%), voice over (10.00%), power points (10.00%), images (10.00%), practical learning (3.33%), tests (6.67%), graphics (6.67%), quizzes (13.33%), index (13.33%), and presentations (6.67%).

Hence, interaction is fundamental to creating learning communities. With the increasingly rapid growth of information and communication technologies, fundamental concepts, knowledge, communications, and social sciences have been experiencing great changes. In the era of electronic communication, such concepts have undergone extensive changes, such as the interaction [17].

Numerous companies have carried out surveys of e-learning courses in various parts of India. It is interesting to note that five courses: artificial intelligence (25%), UX (User Experience) design (20%), analytical reasoning (20%), cloud computing (15%), and people management (20%), are listed as important e-learning courses.

Naturally, mobile phones possess good connectivity; moreover, other than voice, Internet data traffic between the phone and a remote service can also be accessed [18, 19].

The graph in Figure 1 shows the rise of the e-learning market, and the values are in US billion dollars.

### NEED FOR E-LEARNING IN REMOTE AREAS

As the name suggests, it means learning with the help of electronic media. It transformed education by increasing accessibility, flexibility, and inclusivity of learning.

According to Bahri *et al.*, “The development of digital literacy skills through learning media can play an important role in providing access to diverse learning resources and enabling students to develop self-regulated learning skills. The students’ independence affects their critical problem-solving skills” [20].

1. *Access to education:* E-learning provides access and gives equal opportunity to people living in rural as well as in urban areas, while traditional educational institutions may be scarce or inaccessible. It gives an opportunity to the learners of remote areas to get the education that is accessible and at their own pace.
2. *Flexible learning options:* The demographic condition of the remote areas, like hills and deserts create hurdle in the physical presence of the learners. E-learning offers freedom to students in

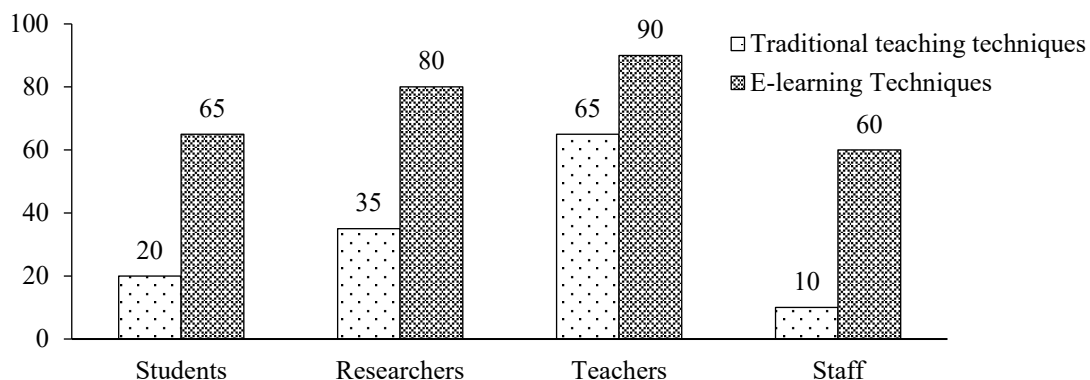
how, what, when, and where they learn. It also gives flexibility to balance education and the responsibilities of their work.

3. *Cost effectiveness*: By opting for the e-learning method, many expenses are cut down by the learners, like transportation, stationery, dresses, and time. Online programs or institutions are often more cost-effective than constructing them in a physical infrastructure. Online courses generally have lower tuition fees and other expenses than offline. Students can gain greater clarity on the subjects when their professors receive appropriate training.
4. *Customized learning*: The term “Customized learning” describes customization and a variety of instructional techniques meant to meet each student’s unique learning demands. It is beneficial for students in remote areas with diverse educational backgrounds and abilities. It gives learners an opportunity to take up courses like certificates, diplomas, and a degree, as per their needs and time availability.
5. *Skill development*: To compete in the competitive world, for the students of the remote areas, e-learning provides opportunities for improving skills in a more efficient and effective way. It enhances your technical and communication abilities, which are necessary for success in the current world.
6. *Empowerment*: E-learning empowers learners in remote areas by providing them with the knowledge and skills necessary to pursue higher education, career opportunities, and personal development, thereby improving their quality of life. The hands-on training, after getting the education, helps them to empower and increase their earnings.
7. *Continuity of education*: Learners can continue their learning at any stage in their lives. This is a boon in disguise, where they can restart learning as per their comfort level. It allows us to ensure continuity of education despite weather conditions, conflicts, or health crises that may disrupt traditional schooling.
8. *Technology exposure*: E-learning exposes students to provide immersive and interactive learning experiences. Additionally, it imparts digital literacy skills, which are becoming more and more crucial in today’s society.
9. *Cultural preservation*: It can help tremendously in cultivating a learning culture throughout an organization. It can preserve indigenous knowledge and heritage in remote communities (Figure 2).

### CHALLENGES IN E-LEARNING IN REMOTE AREAS

There are many different remote learning challenges while taking electronic learning. Here we discuss some of the challenges we might often face during e-learning:

According to Aung and Khaing, “Compared to developed countries, it was found that developing countries face many challenges in applying e-learning, including poor internet connection, insufficient knowledge about the use of information and communication technology, and weak content development” [21].



**Figure 2.** Traditional teaching techniques.

According to Aljawarneh, Lara *et al.*, and Lizcano *et al.*, “The provision of content such as video and advanced applications is still a new thing for many educators, even at the higher education level in developing countries” [22–24].

### ***Lack of Resources***

- One of the major problems is Electricity due to which many students are unable to use e-learning. Unreliable and recurring power outages will pop up as the biggest hurdle for students attending online classes in rural areas. As it will adversely affect the concentration of a person.
- The biggest challenge in rural areas in the e-learning system is poor internet connectivity. It is the biggest obstacle in the online learning process, as studying through electronic means is not possible without an internet connection. Countries like South Africa and states like Jammu and Kashmir, with frequent internet prohibitions and network problems, hinder pupils’ ability to learn.
- Lack of proper infrastructure and accommodations will hamper the focus of a student in rural areas. The lack of local language support for services to rural regions may have a long-term negative impact on their viability since fewer people will be interested in utilizing them.

### ***Lack of Personal Training***

Regardless of the debate, which of these three elements is at the core of education, the learning process (teaching and learning) can interact with all three elements of teacher, student, and content [25].

- Lack of skilled and qualified teachers and professors in rural areas can be seen as another notable factor that affects the spread of online education. As they are not trained, they are unable to transfer knowledge or information to students.
- Lack of real-time management with teachers hinders collaboration, question–and–answer sessions, and immediate feedback on progress for students.

### ***Lack of Hands-On Practice***

- As there are very few institutes in rural areas of India, students find difficulty in learning, as their hands-on experience is very limited compared to people living in urban areas.
- Without hands-on practice, theoretical knowledge may remain abstract and disconnected from real-world scenarios, making it harder to understand and apply concepts effectively.

### ***Other Challenges***

- It will significantly affect our physical and mental health. It will worsen our sleep cycle, body pain, eye strain, and headaches. It will cause damage to our body posture and also to our study-life balance.
- Ineffective time management is the incapacity to manage one’s time efficiently in order to finish activities or reach objectives.

### **How to Overcome the Challenges We Faced**

From the above points, we already learnt that this problem needs to be solved. Here are some strategies for developing e-learning in remote areas:

- *Mobile learning platforms:* These types of platforms are intended for use on mobile devices alone. Many outlying locales have more robust cell phone networks than fixed-line internet connections do. Mobile apps or websites optimized for low bandwidth can make it easier for more people.
- *Offline access:* Students should be allowed to download resources and materials offline that they need for their studies and access them anytime needed when there is no internet connection. This could be a module, video, or PDF that students can retrieve without accessing the web.
- *Community classrooms:* Build community classrooms with computers and internet facilities. They are potential spaces for e-learning to occur, where students can do online learning, get help from teachers, and involve themselves in teamwork.

- *Digital literacy programs*: Provide digital literacy programs that will enable students to use e-learning effectively through the platforms and tools they have. Such programs can assist in surmounting cultural obstacles as well as resistance to technology adoption.
- *Public-private partnerships*: Collaborate with private sector players such as telecommunication companies so as to enhance connectivity of the Internet in remote areas. This may entail infrastructure investments, online support, or creation of specialized data arrangements for e-learning needs.

For many years, e-learning has been based on several different technologies, which also do not work for it because of various factors. It is time to advance, that is, move toward Web 3.0 technology. In order to improve user engagement, these are built on natural language processing and semantic Web ideas. Furthermore, Web3 can facilitate the development of more personalized learning opportunities for students with impairments, guaranteeing that they get high-quality education. Machine learning and artificial intelligence are two of the most powerful technologies.

As Artificial Intelligence and machine learning are already in great use, their use case in remote areas are very limited. Implementation of AI in rural areas is not done properly. Now I think AI and ML with combination with VR/AR, can create a huge impact in this sector.

According to Morris, “different artificial intelligence (AI) based tools and techniques (such as rough sets, fuzzy sets, neural networks, machine learning, etc.) can be integrated with the e-learning applications to support intelligence” [26].

By using virtual reality or Augmented reality:

- It makes learning more engaging and immersive.
- Assists pupils in acquiring problem-solving and critical thinking abilities.
- More customized curriculum for students.
- The AI-powered tools offer personalized learning experiences.

It can improve connectivity, providing better access to communication networks and the internet. AI-driven virtual classrooms simulate real-life interactions, creating an immersive and engaging learning environment. Students can participate in discussions, collaborate on projects, and even work together in virtual groups.

According to Kannangara *et al.*, “We can also use a mesh network-based model for distance learning, especially where there is a lack of internet access. Mesh networking is a way to send and receive data between all nodes” [10].

“A decision support system (DSS) is an interactive information system that provides models, data manipulation tools, and information. DSS helps to make decisions in semi-structured and unstructured situations” [27].

“By offering such an approach, the education system could play a much better for student centric operation towards positive improvement of their performance” [28].

Blockchain technology offers an information recording mechanism that prevents recorded data from being altered, hacked, or tampered with inside the system. It is employed in the development of decentralized educational systems. This supports the sharing of knowledge and collaborative creation among not only the young and old but also students and experts. Further, it takes place inside and outside of educational institutions and other organizations [29].

With the help of these platforms, rural students may access top-notch learning materials and courses from any location with an internet connection.

## CONCLUSION

Looking back to the early days of e-learning, we can see that its methods and surroundings have grown along with the advancement of networks and the Internet in the late 20th century. E-learning began with giving kids basic information and has developed to now give students of all ages access to important information anywhere and at any moment. These certificates/courses continue to be valued highly by many companies, particularly when it comes to enhancing employee skill sets.

The application of electronic learning in education and business demonstrates how last year contributed significantly to the current state of e-learning development and brought about a number of intriguing developments.

As we see, e-learning was founded in the 2000s, but it has not been correctly implemented in many areas (especially rural)/states in India or has not been taken because of traditional techniques. Traditional methods have often hindered its adoption, making learning and implementation of education more challenging. Therefore, a comprehensive approach involving government support, infrastructure development, community engagement, and innovative solutions is necessary to ensure equitable access and effective implementation of e-learning in remote areas.

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