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An empirical study on impact of online learning outcomes

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Abstract

Online learning has an impact on a range of educational outcomes, including academic performance, student engagement, satisfaction, and retention. With the rapid expansion of online education, particularly accelerated by the global pandemic, understanding the effectiveness of this mode of learning has become increasingly critical. Through a mixed-methods approach, the study combines quantitative data from student grades and course completion rates with qualitative insights from surveys and interviews. Overall, the study demonstrates that while online learning can achieve comparable academic results to traditional in-person instruction, it is often associated with lower levels of engagement and satisfaction. However, certain instructional strategies, such as interactive content, peer collaboration, and timely feedback, can mitigate these challenges and enhance student success. The study provides practical recommendations for educators and institutions to optimize online learning environments and improve student outcomes across diverse learner populations.

Keywords: Online learning, outcomes, engagement

Introduction

E-Learning is one of the thrust area identified by MeitY for imparting education using educational tools and communication media. It is the learning facilitated and supported by Information Communication technologies (ICT). The broad objective is to develop tools and technologies to promote e-learning in the country. E-learning mode and the related tools provide a platform for enhanced learning, cost effective delivery, flexibility of learning at the convenience of the learner, uniform quality content delivery, re-usability of the content etc. The Department has been financially supporting R&D projects in the area of E-Learning at various academic educational institutes, R&D Labs etc. MeitY, in the past, has been providing grant-in-aid for R&D projects in the area of content development, R&D/Technology development projects, Human Resource Development projects & Faculty Training to improve literacy through distance education using Information and Communication Technology (ICT) Tools (Computers, Multimedia and the Web). Later the projects were initiated in the area of both hardware and software development for e-learning tools, technologies and pedagogy etc. While developing new tools and solutions, efforts were made by creating impact through already designed technologies through their roll-out for use.

Indicating upcoming new e-learning tools and technologies are identified as under

- Development of a framework for qualitative online testing;
- Development of a framework/standard for quality assessment of e-Learning content;
- Development of new technologies, applications and tools for Microlearning, Artificial Intelligence(AI), Gamification;
- Development of Simulations, Interactive Experiments including 3D Labs;
- Development of mobile compatible e-content packaging and delivery systems;
- Development of curricula content using AR/VR;
- Adaptive Learning; Personalized e-Learning; and
- Big Data Reporting and Learning Analytics i.e. measurement, collection, analysis and reporting of data about learners and their contexts (Government of India, 2024).

What is e-learning?

e-learning can be described as using all electronic media and technologies, including the internet, intranet, extranet, satellite broadcasts, audio/video tape, interactive television, CD-Rom and video-conferencing, to delivery instructional content and to create, foster and facilitate learning experiences.

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E-learning is commonly referred to the intentional use of networked information and communications technology in teaching and learning. Several phrases have been used to describe e-learning. They include Technology Based Teaching (TBT), Computer Aided Learning (CAL), Computer Based Learning (CBL) and Technology Enhanced Learning (TEL).

Fundamentally, they all refer to educational processes that utilize information and communications technology to mediate asynchronous as well as synchronous learning and teaching activities. E-learning is comprised of the following elements. 1) Content delivery methods which have three methods i.e. live broadcasting, video on demand and interactive communications. 2) Authoring tools which are software products to create content and 3) Learning management systems which allows learner to check and assess individual progress and performance.

Characteristics of e-learning

Some characteristics can describe an e-learning course which is listed below:

1. **Access:** This characteristic feature focuses on how individuals can access and use the course material. They are of two types:
 - **Online:** By using smartphones, laptops and tablets connected through the internet.
 - **Offline:** By using hard disks, pen drives DVDs; CDs learners/students can access various offline content. Furthermore, this mode is more effective as it is free from all net connectivity distractions as sometimes they landed up with unrelated sites.
2. **Student Count:** This function check whether proper communication established among the students or not.
 - **Individual:** Interaction between students/learners will not be established for interaction, learner will interact with the tutor and the task will also be completed on a one-one basis only.
 - **Group:** A Group of learners/students will communicate among themselves through discussion boards, open forums, e-mails and chat rooms. Peer interaction is prominent between the learners whenever they feel the course doesn't suit them, they may drop.
3. **Time:** It defines the actual time of information access by the students.
 - **Synchronous:** In this process, the content will be delivered in real-time to the students through virtual platforms like teleconferencing and conference calls. The main limitation of this platform is differences in time zones because the learners are geographically scattered across the world.
 - **Asynchronous:** In this method, accessibility of the content has no time restriction, it can be accessed at any time. open forums and discussion boards are the main means for communication. It is helpful to get rid of the incompatibility of different time zones.
4. **Content format:** It defines which type of data and its format is being delivered.
 - **Static:** It means that the delivered content is through Programme/course/module is the same all the time. Here the continuity of the content can be well maintained. But still few learners/students withdraw as their needs may not be fulfilled through it.

- **Dynamic:** In this process, it is possible to respond more specifically to student/learner requirement, this overcomes the problem static nature, data or information can be modified and delivered to the respondents as and when it is required effectively. But it poses a challenge in creating new content every time and to sustain it for the long run (Renu Gangwar, D.K. Singh and Anil Kumar Singh, 2023).

E-learning content delivery method

There are a variety of ways to deliver e-learning content. The new formats of teaching and learning include classroom training, self-paced e-learning and live e-learning.

Classroom training

This is the traditional training where the students and teacher meet in a classroom. This face-to-face training is effective in giving a personal touch, but it requires everyone to be in the same place at the same time. Classroom training is good for workshops, job training, and coaching. Exercises, feedback on activities and paper-based tests are used in the classroom.

Self-paced e-learning

Self-paced e-learning is that done at the learner's convenience with a CD-ROM or via the Internet. The CD-ROM allows for more multimedia effects, but neither includes much interaction. Sometimes a chat room or email correspondence is included in this type of learning. Self-paced e-learning is good for simulations, online case studies and interactive learning modules. E-mail, bulletin boards and online assessments can be used in self-paced e-learning when presented as a WBT. If the material is a CBT, the learning is purely individual.

Live e-learning

New technologies allow sessions to be delivered live, with students accessing the class through their own Internet connection. This allows for interaction between the students and the instructor, as well as among themselves. Typically the class includes audio, video, and text chat. Live e-learning is good for application exercises, online coaching and interaction between students. Online feedback, assessment, chats and instant messaging are advantages in this type of teach (Prakash B. Gambhir, 2008) [7].

Early years of online education in India

Around 15 years back, it was a big challenge to develop a proper mode of imparting online education. In 2008, the education industry witnessed the entry of some private players in the domain of e-learning. Till now, the technology of smart classrooms was being used in some educational institutes. Even after that, people were not showing much inclination towards the concept of e-learning because it was difficult to initiate substituting traditional face-to-face learning with online education. It was only in 2015 when the country saw the emergence of various EdTech platforms, and that year proved to be game-changing for the EdTech Industry. Till this time, many people had realised that online education could be the biggest and best innovation in the domain of education. With the Covid-19 pandemic, Online education took a new turn in India and the game changed completely (Piyush Bhartiya, 2021).

Importance of e-learning

Learners today are seeking education from advanced, self-paced, mobile, and customized learning apps. The importance of e-learning can be stated as follows:

- The application of e-learning at various stages of learning has helped the students learn more quickly.
- The interactive methods of teaching adopted by the smart education industry have helped the students in grasping concepts fast because of the audio-visual medium.
- The learners can get access to up-to-date content at any point in time and be at par with their counterparts in any part of the world. The content on the platforms is updated regularly and with the influx of constant innovations, the platforms never run out of new content.
- E-learning has helped the learners access the material and lectures any number of times, which reduces the chance of the learner missing out on some concept or topic.
- The audio-visual medium has helped in the easier assimilation of knowledge.
- E-learning has helped the students reach out to the best tutors from any part of the world. E-learning has also helped the tutors to significantly expand their student base and hence, multiply their earnings.
- The learning apps have eliminated any kind of discrimination based on the place of residence, every student has access to the same kind of resources.
- E-learning has eased the process of obtaining a degree or completing a certificate skill course without ever having to attend a school, college, or training institution.
- The learners can choose to attend the classes required to obtain the degree at the time and place of their convenience.
- E-learning is cost-effective because the process of learning is fast and convenient (<https://xseededucation.com/blog/the-growing-importance-of-e-learning-in-india>).

Inclusivity in online learning

Access to the e-learning platforms is largely determined by factors like the availability of reliable electricity, access to internet devices, and high-speed internet. India's internet penetration still hovers around 55 percent (much of it being mobile devices with the boom occurring within the past decade) with one of the lowest internet speeds, which is a significant hurdle considering that most educational content is on-line lectures. Again, India has highly unreliable electricity without ages lasting hours in rural areas, and it often leaves out 'last mile' consumers. (Heynen, 2019) In 2015, an NSSO (National Sample Survey Office) report titled "Education in India" pointed out that there has been almost a 175 percent increase in the annual private expenditure on general education between 2008-14.

The traditional brick and mortar education system is also unable to fulfil the rising demand, especially since the government aims to increase the Gross-Enrolment ratio to 30percent by 2020. Here online platforms can look like an attractive option given it's cheaper and is accessible to many but the catch is that all of the existing platforms only act as a supplementary resource and are still expensive to a vast majority. Not to mention the scaling up of these online platforms require significant investment in physical infrastructure and human capital, which are available only to

as select few public institutions and private players. Also, online platforms are cheaper but again unaffordable to many and doesn't solve the structural issue with India's educational system.

More than 90 percent of the content in the existing on-line platforms are in English. Hence, it fails to cater to the needs of a linguistically diverse audience and lower-income socio-economic group who don't have access to the internet and capital in India making it accessible only to a selected group. The cultural obligations within the South-Asian communities, generally restrict the use of modern technology to women and further one can see how the on-line pedagogy model fails to imbibe gender parity as studies show how interactive classes by women could have a major impact on how young people view the role women should play in society (Hanaaya Varyani and Navaneeth M S).

Present education system (Before Nep 2020)

In India around 600 Million Peoples are living in rural area. There are a number of issues Indian education system is facing, and one is rural-urban gap; poor infrastructure; most rural schools lack good infrastructure, including well-trained teachers. This leads to poor quality of education being imparted.

1. **Poor Teacher-student ratio:** Huge no. of students in a class are tackled by a single teacher, which leads to less focus on each child. In addition, students are not encouraged to ask questions or clarify their doubts.
2. **Shortage of training:** no or very less emphasis is given to teacher training in our schools.
3. **Our educational system is of General Education in nature:** The development of technical and vocational education is quite unsatisfactory. So our education is unproductive. Hence the number of educated unemployed persons is increasing day by day. This has become a great concern for the government.

The moral and high value teaching which are required to build character, completely missing in our Education System.

The crimes against women are increased since last few years and we are facing a lot challenges to cope up with these situation (Sunil Sonare, 2021).

Overview of the india e-learning market (2024-2029)

The India e-learning market, which was valued at USD 10.24 billion in 2023, is anticipated to surge to USD 28.46 billion by 2029, with a Compound Annual Growth Rate (CAGR) of 18.57%. This substantial growth is primarily driven by the increasing accessibility of affordable smartphones and extensive internet connectivity, which have made e-learning widely available to both urban and rural learners.

Driving forces behind market growth

- **Government Initiatives:** The Indian government's Digital India initiative and the National Education Policy (NEP) 2020 have been instrumental in promoting digital education and integrating technology into learning, significantly boosting the e-learning market.
- **Skill Development Needs:** With the job market's evolving requirements, there is a critical need for continuous skill development. Reports suggest a significant skill gap among Indian graduates,

underscoring the growing demand for e-learning to deliver necessary training and education (Arizton Advisory & Intelligence).

Review of literature

(Piyush Joshi and Shweta Dewangan, 2021) [6] contend that different sectors of economy have changed including education sector. Unlike any other sector, education sector has seen many evolution and changes. Education system changed from Guru-Shishya Parampara to class room teaching, then teaching with the help of projectors or LED and now its online teaching classes or teaching through E-Learning portals or Web Based E-Learning (WBEL). It has been seen from the past several years that online education system or E-Learning system has emerged as a powerful contender for new education system. From the recent past it has been found that several online courses have been conducted to educate millions of people around the globe on various topics. In spite of difference in culture and language and diverse population E-Learning system has gained a lot of popularity increase in affordability and purchasing power of Indians. The only reason for growth in E-Learning system is drastic change in information technology and technological improvements. This article aimed at examining the impact of E-Learning or Web Based E-Learning (WBEL) in modern India Education System (Piyush Joshi and Shweta Dewangan, 2021) [6].

(RenuGangwar, D.K. Singh and Anil Kumar Singh, 2023) Scope of e-learning extends widely encompassing several areas like academic, corporate, service etc. Today e-learning industry comprises millions of rupees. Whatever be the area, creating an effective e-learning environment plays a very important role. It involves institutional (administrative and academic), pedagogical (goals, content, design approach, organization, methods and strategies), technological (infrastructure planning, hardware and software), interface design (page and site design, content design), evaluation (assessment of learners instruction, evaluation and usability testing), management (maintenance of learning environment and distribution of information) and ethical (social and cultural issues, geographical diversity, learner diversity, information accessibility and legal) (RenuGangwar, D.K. Singh and Anil Kumar Singh, 2023).

(Devendra Bhongade and Yogesh M. Sarode, 2018) [2] By recognizing that e-learning truly is a methodology, one can experience the greatest benefits that e-learning has to offer now and in the future. In the end, the fact remains that, with respect to e-learning, poor quality procurement practices are a barrier to growth and adoption. So it is necessary to make a thorough evaluation when it comes to choose e-learning software for education in order to improve the knowledge of learners, the learning outcomes, the performance outcomes, and the business and policy impact and in order to value the money spent. In underdeveloped and developing countries, e-learning raises the level of education, literacy and economic development. If the agricultural industry targeted

through Elearning, the growth rate will defiantly increase. E- Learning and E-commerce can be developed through proper investigate and plan of action (Devendra Bhongade and Yogesh M. Sarode, 2018) [2].

Types of e-learning models

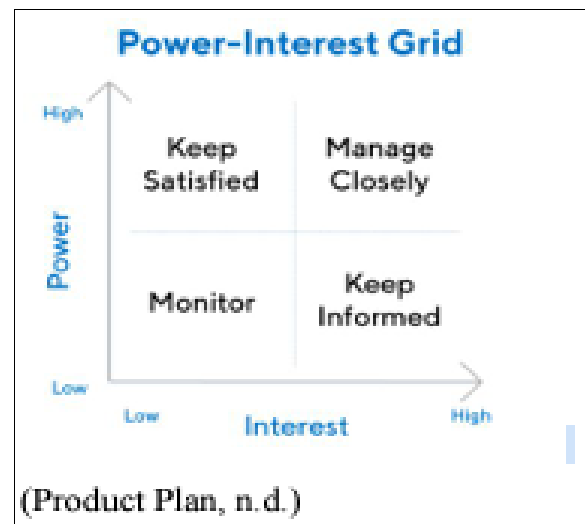
There are basically 3 types of E-Learning i.e. Synchronous, Asynchronous and Blended Learning.

- Synchronous means at the same time, so in Synchronous type of E-Learning, there is a interaction between participant and instructor via Web Bases Portal.
- Asynchronous means not at the same time, so in Asynchronous system of E-Learning the portal allow the participant to complete the syllabus or training without interaction with the trainer or instructor.
- Blended learning is a combination of E-Learning tool with traditional class room teaching. In Blended learning students can enjoy classroom experience with interaction with teachers and students via actual classroom. Blended E-Learning has benefits of face to face interaction with social benefits of classroom training and different teaching technique (Piyush Joshi and Shweta Dewangan, 2021) [6].

Problems faced and concerns due to e-learning by its key stakeholders

Stakeholder Analysis

Before listing out the problems, it is important to analyse who the primary and secondary stakeholders are through the usage of a brief stakeholder analysis, based on the following power interest grid.



The above-given grid gives a basis for defining the part that a certain community or a group of likewise people play in a project, policy or subject defined on the power they hold and the interest they have over the subject.

Table 1: Stakeholder analysis table

Sl. No.	Stakeholder Name	Power	Interest	Primary/ Secondary Stakeholder	Analysis
1	Students	High	High	Keep Satisfied: Primary	<ul style="list-style-type: none"> Students use e-learning for after school supplementary coaching, coaching to get enrolled in higher education institutions and many more For half, it forms a sub-portion of their education, be it courses to enhance their skills or a diploma for others it can be the sole way of gaining an education.
2	Teachers	High	High	Keep Satisfied: Primary	<ul style="list-style-type: none"> Teachers play a major role in educating the children, be it teaching their students the curriculum subjects or guide them for the experience of life. Be it any mode of education, on-line or offline, both the scenarios affect their professional and personal lives in a major way. The most important argument that arises is that teachers/mentors should be up to date with the technical sophistication of the fast-growing I.T. world to provide a smooth e-learning experience to its students.
3	Parents	High	Low	Manage Closely: Secondary	<ul style="list-style-type: none"> Several students, in India, till date, rely on their parents for the payment of the fee, whether it be a high schooler, an undergrad student or a post-grad student, hence, parents become a major stakeholder. Further, it is the responsibility of the parents to monitor the child's internet activity. Also, parents and the environment at home also plays a vital role in the academic performance of children, whether it be online or offline
4	Educational Institutes and the Administration	High	High	Keep Satisfied: Primary	<ul style="list-style-type: none"> The educational institutes are directly related with many factors, lack of familiarity with technology of students and faculty impedes the smooth functioning and purpose of online education They are the ones responsible for distance learning. They see to that, the investment in technology yields a proper return to further invest in the development of the institutes and those concerned.
5	Content Producers	Low	High	Keep Informed: Secondary	<ul style="list-style-type: none"> With the change in the mode of learning, certain changes are also required for the curriculum. The kind of content to be given to the candidates and the way it is formulated and presented (videos, animations as substitutes to the text) to them to ensure maximum learning.
6	Technology Producers	Low	High	Keep Informed: Secondary	<ul style="list-style-type: none"> The emergence of e-learning provides several opportunities for technology providers. It is their job to come with solutions and technology that is accessible, affordable and is easy to use by all, be it a child or a professor. Further, it also opens up a lot of prospects for new markets and investments that might have a high rate of interest (ROI).
7	Apex Educational Bodies	High	Low	Monitor: Primary	<ul style="list-style-type: none"> It is the job of government bodies to provide reforms and policies that can provide a level playing field of educational opportunities across the nation, especially in a country like India. They hold the ultimate power to encourage or discourage e-learning. They influence the formation of curriculums, which are the sole way of bringing in evolution in the education sector.

(Hanaaya Varyani and Navaneeth M S).

Issues & challenges in e-learning

1. Technological Challenges

The e-learning raises significant challenges in the technological research area. For development of e-learning resources that meet the users requirement need to be addressed. The technological challenges of e-learning can be considered as two key technological research areas.

2. Development of New Forms of Learning community and Interactive Learning

In e-learning environments interaction, cooperation and community play an important role to support learning. The developments in the area of e-learning environments provide new forms of interaction for learning experience. It generates new relationships between learner and computer

and also form a new learning community. Key issues include:

- New forms of multimodal interface to support learning.
- New techniques to understand and support learning communities.
- The development of systems to support mobile communities of learners.
- Personalization techniques that meet user personal needs and current activity. Techniques to promote and support interaction.
- Discovery of new learning communities.
- Support for time to time assessment services.

3. Developing New Knowledge Facilities for e-learning

E-learning environment needs to support the rapid increase in the size and variety of data by appropriate semantic services. The semantic services generate a surrounding semantic context for learning support. Research that needs to work on:

- Development of learning and reasoning theories for uncertain and incomplete knowledge.
- Support for the development of large-scale learning facilities.
- Support for a dynamic learning process. Support for information sharing across different learning facilities.
- Developments of lightweight knowledge capture technique for promotion of lifelong learning.

4. Research Issues for e-learning

Current e-learning research brings together pedagogical, technical and organizational concerns within a wider set of socio-cultural factors. These factors influence the research agenda in e-learning system. Understanding these broader social and cultural issues is of significant importance to the research communities involved in e-learning and will have a significant role in informing future practices.

Analysis and interpretation of primary data

The primary data is collected from 50 sample faculty respondents based in the city of Bengaluru drawn from various arena.

Table 2: Profile of the Respondents

Variables	Frequency	Percentage
Age in Years		
20-25	14	28
25-30	11	22
30-35	9	18
Total	50	100
Gender		
Male	36	72
Female	14	28
Total	50	100
Occupation/ Field of Study		
Full time	22	44
Part time	18	36
Seasonal	10	20
Total	50	100
Education		
Undergraduate	35	70
Postgraduate	10	20
Others	5	10
Total	50	100
Duration of the Course		
Short-term	35	70
Medium-term	7	14
Long-term	8	16
Total	50	100
Level of the Course		
Beginner	31	62
Intermediate	8	16
Advanced	11	22
Total	50	100

The respondents are predominantly young adults, with nearly 50% falling into the 20-30 age range (28% in 20-25

years, 22% in 25-30 years). Online learning seems to appeal most strongly to individuals who are in the early stages of their career, possibly because of its flexibility, accessibility, and alignment with the learning habits of younger generations. As the respondents get older, the percentage decreases, which might suggest that online learning is less popular or less practical for individuals who are older and perhaps have more fixed commitments (e.g., full-time employment, family responsibilities). The data reveals a significant gender imbalance, with males representing 72% of respondents and females 28%. This suggests that more males are engaging with online learning in this sample. To ensure greater gender equity in online learning, further research might be needed to explore the reasons behind this disparity and to identify ways to make online education more inclusive and accessible to all genders.

The majority of respondents are employed (80% in full-time or part-time work), which suggests that online learning is well-suited for individuals who want to balance education with their professional commitments. Flexibility appears to be a key factor driving the appeal of online courses. Seasonal workers make up a smaller portion (20%) of the sample, but their engagement suggests that they too value online learning as a way to stay productive during off-seasons. Understanding these different occupational categories can help tailor online learning offerings to meet the diverse needs of working adults.

The majority of respondents (70%) are undergraduate students, indicating that online learning is widely used to supplement formal education, perhaps through electives, certifications, or skill development. A smaller group (20%) is pursuing postgraduate education, which suggests that online learning is also a useful tool for advanced students looking for flexible study options. A small proportion (10%) falls into the "others" category, which could include non-traditional learners.

Short-term courses are the most popular (70%), reflecting a demand for flexible, focused learning opportunities. This suggests that most learners are looking for courses that can be completed quickly, perhaps for skill-building or professional development. Medium-term (14%) and long-term courses (16%) have a smaller following, but there is still interest in more substantial educational commitments. Beginner courses dominate (62%), which aligns with the larger number of undergraduate students engaging in online learning. These learners are likely seeking foundational knowledge. Intermediate and advanced courses are also popular (16% and 22%, respectively), indicating a demand for deeper or specialized learning once basic knowledge is established.

The majority of respondents (88%) had a positive experience with computer-mediated learning to either a great or full extent, which indicates that online learning platforms are well-received and effective for most learners. A large majority (80%) of respondents felt they could effectively cope with missed lectures, which highlights the flexibility of online learning in terms of catching up with course material. A large majority (80%) of respondents felt they could effectively cope with missed lectures, which highlights the flexibility of online learning in terms of catching up with course material.

Table 3

Learning Experience					
Particulars	To Great Extent	To Full Extent	To Moderate Extent	To a Small Extent	Not at all
Experience with the computer mediated learning	19	25	2	3	1
Coping up with missed lectures	11	29	8	1	1
Integration with various types of media	13	21	11	4	1
Tracking the student progress online	18	21	9	2	0
Course Content					
Particulars	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Relevance and manner of presenting course content to the learning goals	20	18	10	1	1
Suiting the students' learning styles, interests or backgrounds at the beginning of the course	22	22	3	2	1
Engagement and Interaction					
Particulars	Very Effective	Effective	Moderately Effective	Effective to Small Extent	Not Effective
Course activities	15	20	11	2	2
Interaction with the instructors and peers	22	22	2	2	2
Technology and Accessibility					
	To Great Extent	To Full Extent	To Moderate Extent	To a Small Extent	Not at all
Technical issues affecting the learning experience	25	19	2	2	2
Usability of the on-line platform	22	15	11	1	1

Tracking student progress online seems to be a strong feature, with 78% of respondents feeling that it is effectively implemented. This suggests that online platforms are providing useful tools for both learners and instructors to monitor academic performance. The vast majority of respondents (76%) found the course content to be relevant and well-presented, with only a small percentage expressing dissatisfaction. This is a positive indicator of course quality and its alignment with learning goals.

The course content seems to be well-tailored to students' learning preferences and backgrounds, with 88% of respondents agreeing to some extent. This suggests that the

online courses are catering to diverse learning needs. Most respondents (70%) felt the course activities were effective to some degree, though there is a smaller group (8%) who found them less effective. This indicates that course activities are generally engaging but might require further refinement for certain learners. The interactions in online learning (with instructors and peers) are generally positive, with 88% of respondents feeling that the interactions were effective to some degree. This highlights the importance of communication and engagement in online courses, which contribute to the learning experience.

Table 4: Influence of the Online learning and Learning Experience

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
Experience	Between Groups	13.213	3	4.404	2.430	.037
	Within Groups	83.367	46	1.812		
	Total	96.580	49			
Progress of learning	Between Groups	11.869	3	3.956	2.042	.000
	Within Groups	89.111	46	1.937		
	Total	100.980	49			

(Source-Primary Data)

1. Experience with Online Learning

- **Sum of Squares Between Groups (13.213)**
This value represents the variation between the groups (e.g., different categories of responses regarding experience with online learning). A higher sum of squares indicates greater differences between groups.
- **df (Degrees of Freedom) Between Groups (3)**
There are 4 groups (experience categories: to a great extent, to full extent, to moderate extent, and to a small extent), so the degrees of freedom between groups is 3.
- **Mean Square Between Groups (4.404)**
This is the average variation between groups, calculated by dividing the sum of squares between groups by the degrees of freedom. This value is used to calculate the F-statistic.
- **F-value (2.430)**
The **F-statistic** is the ratio of the variance between the

groups to the variance within the groups. A higher F-value suggests a greater likelihood that the group means are significantly different from each other. In this case, the F-value is 2.430.

- **Significance (Sig.) = 0.037**
This p-value tells us whether the difference in the group means is statistically significant. Since 0.037 is less than the common threshold of 0.05, we can conclude that there is a statistically significant difference in the experience with online learning between the different groups. In other words, the experience of online learning differs significantly depending on the group.

Interpretation for Experience

There is a statistically significant difference in the experience with online learning across the different response

categories (e.g., "To a Great Extent", "To Full Extent", etc.). This suggests that participants' experiences with online learning vary significantly, and different factors may be influencing how they perceive and engage with the learning process.

2. Progress of Learning

- **Sum of Squares Between Groups (11.869)**
This value represents the variation between the different groups in terms of their **progress of learning**. Again, a higher sum of squares indicates larger differences between groups.
- **df (Degrees of Freedom) Between Groups (3)**
Similar to the first analysis, there are 4 groups, so the degrees of freedom between groups is 3.

- **Mean Square Between Groups (3.956)**
The average variation between groups is 3.956, which is calculated by dividing the sum of squares by the degrees of freedom.
- **F-value (2.042)**
The F-statistic for progress of learning is 2.042. This value is used to test whether the differences in progress are due to random variation or represent a real difference between the groups.
- **Significance (Sig.) = 0.000**
The p-value of 0.000 is well below the standard significance level of 0.05, meaning that the differences in the progress of learning are highly significant.

Table 5: Association between the effectiveness of online learning with Course Content, engagement and interaction and Technology and Accessibility

Anova						
		Sum of Squares	df	Mean Square	F	Sig.
Relevance and manner of presenting course content to the learning goals	Between Groups	11.315	3	3.772	2.139	.008
	Within Groups	81.105	46	1.763		
	Total	92.420	49			
Suiting the students' learning styles, interests or backgrounds at the beginning of the course	Between Groups	17.065	3	5.688	2.590	.014
	Within Groups	101.015	46	2.196		
	Total	118.080	49			
Course activities	Between Groups	18.275	3	6.092	3.511	.022
	Within Groups	79.805	46	1.735		
	Total	98.080	49			
Interaction with the instructors and peers	Between Groups	16.790	3	5.597	3.152	.034
	Within Groups	81.690	46	1.776		
	Total	98.480	49			
Technical issues affecting the learning experience	Between Groups	14.963	3	4.988	2.206	.100
	Within Groups	101.731	45	2.261		
	Total	116.694	48			
Usability of the on-line platform	Between Groups	17.988	3	5.996	3.280	.029
	Within Groups	82.257	45	1.828		
	Total	100.245	48			

(Source-Primary Data)

The provided ANOVA (Analysis of Variance) results investigate the relationship between the effectiveness of online learning and several key variables: course content, engagement and interaction, and technology/accessibility. Specifically, it examines how aspects like the relevance and presentation of course content, suitability to learning styles, course activities, interaction with instructors/peers, technical issues, and usability of the platform impact the overall effectiveness of online learning.

Key ANOVA Results Breakdown

1. Relevance and Manner of Presenting Course Content to Learning Goals

- **Sum of Squares Between Groups (11.315)**
Represents the variation in responses regarding the relevance and presentation of the course content across the different groups.
- **df (Degrees of Freedom) Between Groups (3)**
There are 4 groups (likely representing different levels of agreement or experience with the course content), so the degrees of freedom between groups is 3.
- **Mean Square Between Groups (3.772)**
The average variation between the groups is 3.772.
- **F-value (2.139)**
The ratio of variance between groups to variance within

groups. A higher F-value suggests a stronger likelihood of significant differences between group means.

- **Sig. = 0.008**
The p-value is 0.008, which is less than 0.05, indicating that there is a statistically significant difference in the effectiveness of online learning based on the relevance and presentation of course content. This means that how well the course content aligns with learning goals significantly affects the overall effectiveness of the learning experience.

Interpretation: The way course content is presented and its relevance to learning goals plays a significant role in shaping students' perceptions of the effectiveness of online learning.

2. Suiting the Students' Learning Styles, Interests, or Backgrounds

- **Sum of Squares Between Groups (17.065)**
Indicates variation in how well course content suits different students' learning styles or backgrounds.
- **df (Degrees of Freedom) Between Groups (3)**
The groups likely reflect different levels of agreement or satisfaction with how well the course matches learning preferences.
- **Mean Square Between Groups (5.688)**

The average variance between groups for this factor.

- **F-value (2.590):**
The ratio of between-group variance to within-group variance, suggesting that the differences between groups are relatively large.
- **Sig. = 0.014:**
The p-value of 0.014 is less than 0.05, indicating a statistically significant difference. This suggests that how well the course caters to individual learning styles, interests, and backgrounds affects the overall learning experience.

Interpretation: Tailoring course content to suit students' learning styles, backgrounds, and interests has a significant impact on how effective students perceive the online learning experience to be.

3. Course Activities

- **Sum of Squares Between Groups (18.275)**
This reflects the variation in how course activities are perceived across different groups.
- **df (Degrees of Freedom) Between Groups (3)**
As with previous factors, there are 4 groups.
- **Mean Square Between Groups (6.092)**
The average variation in course activities' effectiveness between groups.
- **F-value (3.511)**
A higher F-value suggests notable differences in how course activities are perceived.
- **Sig. = 0.022**
The p-value is 0.022, which is less than 0.05, meaning that the effectiveness of course activities is statistically significant in influencing the overall effectiveness of the online learning experience.

Interpretation: The design and implementation of course activities are significantly associated with students' perceptions of the effectiveness of online learning. Engaging and well-structured activities likely enhance the learning experience.

4. Interaction with Instructors and Peers

- **Sum of Squares Between Groups (16.790)**
This represents the variation in responses regarding interactions with instructors and peers.
- **df (Degrees of Freedom) Between Groups (3)**
There are 4 groups here as well, reflecting different levels of perceived effectiveness of interaction.
- **Mean Square Between Groups (5.597)**
Average variation between the groups on this factor.
- **F-value (3.152)**
A higher F-value indicates significant variation between groups.
- **Sig. = 0.034**
The p-value of 0.034 is less than 0.05, indicating a statistically significant difference in how the effectiveness of interactions with instructors and peers influences the overall effectiveness of online learning.

Interpretation: Interaction with instructors and peers plays a significant role in shaping students' perceptions of online learning effectiveness. This highlights the importance of communication and engagement in online courses.

5. Technical Issues Affecting the Learning Experience

- **Sum of Squares Between Groups (14.963)**
This reflects variation in responses about the impact of technical issues on the learning experience.
- **df (Degrees of Freedom) Between Groups (3)**
There are 4 groups in this case as well.
- **Mean Square Between Groups (4.988)**
The average variation in how technical issues affect the learning experience.
- **F-value (2.206)**
The F-statistic here is lower than for other factors, suggesting that the differences between groups are less pronounced.
- **Sig. = 0.100**
The p-value of 0.100 is greater than 0.05, meaning that technical issues do not have a statistically significant impact on the effectiveness of online learning at the 5% level of significance.

Interpretation: While technical issues may still affect some learners, they do not significantly influence the overall effectiveness of online learning in this analysis. This could suggest that most students are either unaffected by technical problems or that the issues they experience are not severe enough to significantly impact their perception of learning effectiveness.

6. Usability of the Online Platform

- **Sum of Squares Between Groups (17.988)**
Represents variation in how different groups perceive the usability of the online platform.
- **df (Degrees of Freedom) Between Groups (3)**
As before, there are 4 groups.
- **Mean Square Between Groups (5.996)**
The average variation in usability perceptions between groups.
- **F-value (3.280)**
A higher F-value indicates that there are significant differences in how platform usability is perceived.
- **Sig. = 0.029:**
The p-value of 0.029 is less than 0.05, indicating that usability of the online platform is statistically significant in determining how effective online learning is perceived.

Interpretation: The usability of the online platform significantly affects the overall learning experience. This suggests that a user-friendly platform is crucial for ensuring that learners can effectively engage with the content, participate in activities, and track their progress.

Summary of Key Findings

1. **Relevance and Presentation of Course Content:**
There is a significant association between the relevance and manner of presenting course content and the effectiveness of online learning. Well-structured, relevant content aligned with learning goals enhances the learning experience.
2. **Suitability to Learning Styles, Interests, and Backgrounds**
The extent to which course content suits students' learning styles, interests, and backgrounds also significantly affects the learning experience. Tailoring content to individual needs is crucial.
3. **Course Activities**

The effectiveness of course activities is a key factor influencing the overall effectiveness of online learning. Engaging, interactive activities are important for maintaining student interest and enhancing learning outcomes.

4. **Interaction with Instructors and Peers**

The interaction with instructors and peers significantly impacts the learning experience, reinforcing the need for strong communication and collaborative opportunities in online courses.

5. **Technical Issues**

Technical issues do not significantly impact the effectiveness of online learning in this study. While they may be a concern for some students, they do not seem to be a major barrier for most learners.

6. **Usability of the Online Platform**

The usability of the online platform significantly impacts the learning experience. A user-friendly platform facilitates smoother navigation and better engagement with course materials, leading to a more effective learning experience.

Conclusion

The findings of this ANOVA analysis highlight the importance of course content, engagement and interaction, and platform usability in shaping the effectiveness of online learning. Factors such as technical issues, while important, do not have as significant an impact on learning effectiveness as other elements like course design and student-instructor/peer interactions. To optimize online learning experiences, course developers should focus on creating engaging content, offering personalized learning pathways, ensuring smooth and interactive communication, and providing an easy-to-navigate platform.

Future of e-learning in India

India has a major role to play in the international e-learning services industry. It is already one of the leading IT service provider countries, and it is now aiming to achieve the same position in the IT enabled services. The presence of world-class educational infrastructure and training professionals enables it to be one of the leading e-learning services providers in the world. On the domestic front, the government and private sectors have taken many e-learning initiatives. Though these initiatives have been met with a lot of enthusiasm and user acceptance, their commercial viability is still under consideration.

The government has been taking some proactive measures in a regulatory and financial capacity to boost the e-learning environment in India. Funds have been invested in setting up Internet kiosks in rural areas for the purpose of communication, which can be used for e – learning initiative as well and can help in providing informal and vocational training as well as formal education. The main strengths of the Indian e-learning services industry are: English speaking, highly qualified and techno savvy manpower Safe Electronic Environment – Official recognition for Digital Signatures and E-transactions Lower costs of human capital when compared to developed countries Strong and buoyant domestic education industry that facilitates up-gradation of skills and introduction of new products (Devendra Bhongade and Yogesh M. Sarode, 2018) ^[2].

References

1. Arizton Advisory & Intelligence. The global e-learning

market: trends, forecasts, and opportunities [Internet]. [cited 2024 Nov 16]. Available from: <https://www.arizton.com/market-reports/e-learning-market>

2. Bhongade D, Sarode YM. Prospect of e-learning in Indian higher education: trends and issues. *Int J Curr Eng Sci Res.* 2018;5(5):180-6.
3. Government of India. e-Learning. Ministry of Electronics and Information Technology [Internet]. 2024 [cited 2024 Nov 16]. p. 1-3. Available from: <https://meity.gov.in>
4. Varyani H, M S N. The past, present and future of e-learning: in India. *Int J Policy Sci Law.* [cited 2024 Nov 16];1(1):99-118.
5. Bhartiya P. The emergence of online education in India [Internet]; c2021 Aug 6 [cited 2024 Nov 16]. Available from: <https://www.k12digest.com>
6. Joshi P, Dewangan S. Impact and development of online education (e-learning) in India. *J Contemp Issues Bus Gov.* 2021 Mar;24(1):3449-58. Available from: <https://cibg.org.au>
7. Gambhir PB. Effective use of e-learning in India: a step toward enhancing higher education. *International Institute of Informatics and Systematics;* c2008.
8. Gangwar R, Singh DK, Singh AK. E-learning in India: challenges and opportunities. *Just Agric Multidiscip E-newsletter.* 2023, 3(8):[page numbers].
9. Sonare S. Our education system and e-Gurukul; c2021 .p. 1-5.