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EFFICACY AND ADAPTATION OF E-LEARNING IN INDIAN HIGHER EDUCATION INSTITUTIONS DURING COVID-19

Abstract. The unpredictable lockdown period due to COVID-19 has kept everything on hold, and along with other sectors, the educational sector is the most affected. This study attempted to map out the fragility of higher educational institutions in adopting new learning methods and the effectiveness achieved**.** This is descriptive research based on an empirical investigation of the current issues related to sudden changes in the knowledge delivery process in regular classes of colleges and universities in developing countries like India. Five constructs, namely quality delivery, effectiveness, organisational support, self-efficacy, and readiness were evaluated to measure learners' perceived satisfaction. Appropriate statistical tools were applied to analyse the data, along with hypothesis testing. A few institutions have effectively adjusted the learning process, but its prolificacy is doubtful in the majority of cases. Many (about 62 percent) reported that through assignments and study materials, it is difficult to clear the concepts, especially in the case of practical subjects. There is an opinion that e-learning appears not to be as fruitful as regular conventional classes. It has become a little difficult to transform the centuries-old classroom teaching model due to a paucity of infrastructural readiness, prior experience in e-learning, drawbacks in learning methods, etc., which needs to be addressed by administration. The main barriers, as per our study, are the paucity of interactivity between the parties and drawbacks in the method adopted for teaching. This research did not include premier institutions like IITs, AIIMS, and other highly rated institutes in India, as our goal was to articulate the real situation below the creamy layer. The COVID-19 pandemic has opened new avenues to eliminate drawbacks and reconsider the pedagogical methods, teacher training, examination system, etc. for the insertion of e-learning in the education system.

Keywords: E-learning; COVID-19; effectiveness; higher education; ICT.

1. INTRODUCTION

The COVID-19 epidemic has presented the international community with a number of complex challenges over the past few years. Aside from other things, the difficulties necessitated a swift digital revolution in a variety of industries and human endeavours [1]. The last few years have seen a shift in the education industry at every level, from elementary school to university [2]. In this particular situation, work from home is a common method chosen by various organisations to continue with the operation, and hence the importance of e-learning lies here. The unpredictable period had kept the future of students at stake, as the academic calendar of educational institutes was disturbed all over the world. To resume academic classes and to keep track of the students' progress, all the educational institutions started to change the conventional teaching curriculum into an e-learning based programme. Several colleges were compelled to shift their activities entirely to a distance mode due to the necessity of physical distancing during the pandemic. As a great enabler and facilitator, ICT has kept the learning process intact and minimised the barrier of social distancing. Various digital platforms are now

accessible to teachers and learners around the clock. Even the UGC (Universities Grants Commission) has made arrangements for e-content in the form of audio, video, and text for teachers, students, academicians, and researchers. Students can be in constant touch with their teachers over online classes conducted via Zoom, Google Hangouts, Google/Moodle Classroom, Skype, YouTube, WebEx, etc. The exact timeline for the resumption of educational institution operations remains uncertain under the pandemic scenario.

Statement of the problem. The quality of e-learning lies in the planning and preparation of the course content and the ability of the learner to understand it in the same sense. According to the National Council of Applied Economic Research (NCAER) Skills Reports 2018-19 [3], e-learning is complementary to the traditional method, which enables the learners to collect more knowledge apart from the knowledge gained in the classroom. According to [4, p. 313], "a blended course that combines online components with traditional face-to-face learning has emerged as an alternative mode and supplements the teaching and learning process". E-learning and distance learning are not very new topics; academic literature has much evidence on the effectiveness and use of e-learning. Educational institutions have proper planning and design before starting any programme, either online or conventionally, and they are treated separately. But in a pandemic scenario, e-learning becomes a substitute for the traditional learning system. Educational institutions were forced to convert their physical, lecture-based, or conventional classes into e-learning classes within a short span of time. No matter what methods have been applied to teach, the final outcome should satisfy learners [5]. In light of the current emergency situation and the transition from traditional in-person teaching to e-learning, the researcher aims to investigate such a sudden change in the education system.

Analysis of recent studies and publications. E-learning has proven to be effective for learners across all backgrounds, regardless of their demographic characteristics. However, it is crucial to consider the significance of students' technological proficiency and self-efficacy in order to fully use the benefits of e-learning [6]. [7] determined the students' exposure to e-learning at the secondary school level and found that this learning mode provides options for the students to choose courses or instructors and enables them to learn as per their convenience. E-learning is beyond the limited learning time and resources of traditional teaching. [8] found that e-learning in the education system gives the learners a platform with specific learning styles, and by maintaining proper interaction and proving timely and meaningful feedback to them, it can be a superior mode to transform the education system. [9] conducted a study at two universities in Saudi Arabia to assess how effective learning can be via electronic mode. Through the examination of individual viewpoints, the findings indicated that the application of e-learning increases the productivity of the teaching and learning process and enables students to customise their learning pace according to their convenience. Teachers' perception of the online mode of learning is also important for successful e-learning. People who are already quite comfortable with using computers and email were found to be optimistic about the potential of online education. Issues like internet accessibility, previous e-learning experience, and organisational structure are the perceived barriers encountered by teachers. Motivators are "self-efficacy to use technology, intellectual capabilities, and sufficient provision for technology infrastructure." [10, p. 327]. The evaluation of the effectiveness of online learning should take into account both negative and positive attitudes. This is because attitudes can evolve and change over time as individuals gain experience, which in turn influences future planning and strategies [10]. Although e-learning has made it possible for more people to gain access to education and satisfy their need for knowledge, the success of these programmes depends on the users themselves, not on the technological advancements that have made them possible [11]. In order to optimise effectiveness, it is imperative that tools and procedures are employed in a manner that adheres to established best practices. Utilising technology for educational purposes presents challenges due to the presence of numerous

distractions that impede students' productivity. Consequently, effectively managing the allocation of time between educational and non-educational activities involving technology has become increasingly arduous. [12].

TAM (Technology Acceptance Model) was applied as a prominent method to find a relationship between the use of the internet and the adoption of web-based training in corporate training [13]. TAM was also applied to ascertain the aspects having an impact on the adoption of e-learning and the attitude of university students [14]. Some used the TAM model with other widely accepted models like the ECM (Expectation Confirmation Model) and the TPB (Theory of Planned Behaviour) to envisage learners' intentions to continue learning via e-learning [15]. A few studies evaluated the e-learning process using Krikpatrick's classical model, which comprises four components: 'Reaction, Learning, Behavior and Result' [16, p. 3]. In the corporate world, e-learning is chosen for being less expensive and flexible enough to strike a balance between quality and quantity. [17, p. 112] extended the TAM model by adding "technical support and perceived self-efficacy" to determine the factors behind students' comfort or inconvenience with Moodle, a web-based learning platform. The prevalence of e-learning has been observed in the corporate sector, wherein learners exhibit enough preparation and mental readiness to achieve the objectives of the learning system. [18]. [19] conducted a case study approach to evaluate an ICT training programme by a government authority and found that feelings of irrelevance cause dropouts from a course, and resistance is due to a lack of will and skills rather than time. Thus, it is imperative to thoroughly examine the requirements of learners prior to the development of a course. Higher education needs more sophistication and caution in the implementation of effective e-learning [20]. However, [21] evaluated e-learning in relation to a mental health training programme for CMEs (continuing medical education) and OPs (occupational physicians). The findings indicated that there were no significant disparities between the traditional and e-learning approaches. E-learning is a widely recognised form of learning that may be employed in various organisations and courses. Its effectiveness has been demonstrated in the context of pharmaceutical education [22], agricultural learning programmes [23], and software engineering courses [24].

According to [25], distance learning had no significant impact on students' overall academic performance. Online delivery of practical work and projects was perceived by students as being less engaging due to the lack of opportunities for peer engagement, the limited interaction with the instructor, and the lack of practical experimentation. A recent study undertaken in Bangladesh, India, Nigeria, and Saudi Arabia has found that the COVID-19 pandemic has had detrimental impacts on education, leading to disruptions in learning and reduced availability of educational and research resources [26]. Additionally, the authors also indicate that online education faced obstacles due to inadequate infrastructure, such as network and power concerns, as well as challenges related to inaccessibility, unavailability, and insufficient digital abilities. Emerging economies may lack the necessary IT infrastructure to effectively address the challenges presented by online education. The issue of an 'unstable internet connection' emerged as a significant obstacle in the context of online learning, as indicated by recent research done with students from Hong Kong University during periods of pandemics [27]. The study conducted by [28] also documented comparable difficulties encountered in the transition to online instruction amidst pandemics in the Philippines. The researcher found four key themes that have a significant impact on the online learning experience. These themes include limited or non-existent internet connectivity, financial limitations, inadequate access to technological gadgets, and the absence of affective or emotional support. A noteworthy discovery was documented in a research study carried out in India, wherein students identified flexibility as the most preferred aspect of the online instructional experience during pandemics [29]. The research done by [30] looked at the perceptions and encounters of Dutch teachers during the pandemic. The authors emphasise that

the professional development of teachers and their intentions to incorporate information and communication technology (ICT) are key factors for effectively implementing online teaching. Moreover, a comparable study conducted in the realm of higher education in Germany has indicated that the present circumstances are likely to yield favourable outcomes in terms of digital advancements in university pedagogy [39]. In a recent study conducted in Canada [31], the authors examine the viewpoints of students regarding the efficacy of emergency remote education (ERE) in response to the COVID-19 pandemic. The researchers identify five key variables that contribute to the successful implementation of ERE. The elements can be categorised as follows: provision of comprehensive resources, demonstration of empathy and care by teachers, student involvement in the final test design process, implementation of a relaxed teaching schedule, and streamlined logistics. The study conducted by [32] in Australia focuses on tertiary students and their experiences with emotional regulation during the COVID-19 pandemic. The researchers not only examined various factors influencing emotional regulation but also emphasised the importance of fostering collaboration among students in online learning environments. Additionally, they highlight the necessity of adapting pedagogical approaches to suit the demands of online education.

The purpose of the article: The present inquiry pertains to the degree to which this particular educational revolution is advantageous for the future of society. The overall goal of this article is to assess the efficacy of the education system in transforming the teaching and learning method and to identify the perceived barriers to using an e-learning platform during pandemic uncertainty. The objectives of this research are as follows:

– to study the factors influencing the adaptability of e-learning by educational institutions of higher learning
– to study various challenges faced during the process of implementation.

2. THE THEORETICAL BACKGROUNDS

'Electronic learning', also known as e-learning, has become a commonly used method to teach students of higher education. In simple terms, e-learning can be provided via the distribution of material via email, mobile application, or other electronic form, and most effectively by using graphics, videos, interactive sessions, online classes etc. [7]. Through e-learning, people can learn as per their convenience and at any place without any restrictions. The circumstances have changed over the years, and now students can use electronic devices like computers, mobile phones, tablets etc. easily for learning purposes. In today's world, teaching and learning are possible without a traditional classroom and the physical presence of an instructor or learner [33]. E-learning is one of the blessings of advanced technology and has become part and parcel of the lives of students in the 21st century. The experts have recommended e-learning as a weapon to reshape and rejuvenate the century-old educational system. William Aurthur said that Learning is more than memorising information; it is the acquisition of insight. Teaching goes beyond knowledge transfer; it inspires transformation. In spite of being comfortable using the internet and web, students were found not to be fully satisfied with the present e-learning system. The most demanding factors, according to [34, p. 34], for the success of e-learning are "learning objectives, context, preferences, individual learning habits, learning skills and abilities on e-learning, and prior knowledge of the course were not clearly known to the course developers to personalise the learning experiences of the learners". According to [35], drivers for effective e-learning include the learner's computer phobia, the instructor's attitude towards e-learning, flexibility, the course's quality, perceived usefulness, perceived simplicity of use, and variation in evaluations that influence the learner's reported satisfaction. [36] compared the e-learning systems of developed and developing countries. The main barriers reported by the authors are organisational support and awareness

and technological barriers. After a thorough investigation of previous literature and the interrelationships of various factors as discussed above, a conceptual framework has been proposed. This framework is used to study the direct effect of the five constructs (quality delivery, effectiveness, organisational support, self-efficacy, and readiness) on learners' perceived satisfaction and, ultimately, effectiveness in knowledge delivery by higher educational institutions.
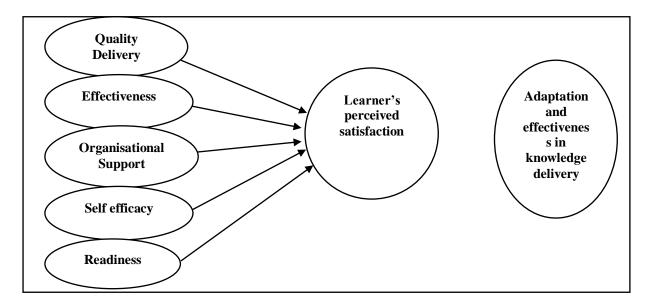

Figure 1. Conceptual framework

3. RESEARCH METHODS

A descriptive research approach was framed for this study. A structured questionnaire seeking information on e-learning experiences was prepared, and apart from a few qualitative data points, the remaining were quantitative using a 7-point scale. One hundred sixty correctly filled-out questionnaires were analysed in the study. The respondents were students of higher education in Assam, which is a state in northeastern India. As per the requirements of the study, both survey data and secondary sources were used. The target group for primary data was the students pursuing graduation and post-graduation courses. A structured questionnaire was distributed through electronic means for ease of collection. For secondary sources, knowledge in existing literature is extensively used, along with reports, articles, etc. The snowball sampling method was used to collect data from appropriate sources. The reliability test was performed using the Cornbach alpha of the internal consistency of the variable chosen for the study. Various tests, like the t-test, ANOVA, and Pearson's correlation coefficient, were performed using SPSS software.

Table 1

Summary of variables

Dimensions	Measurement scale	Mean	Cronbach's Alpha
Self efficacy	E-learning enables me to learn in less time	3.57	0.901
	I believe that through e-learning I can learn anytime anywhere	4.05	0.899
	I need to put more efforts in online learning as compared to regular classroom teaching	4.77	0.919

	I need help from classmates/friends to understand the concepts of materials provided	4.30	0.927
Quality Delivery	The course is structured and designed and complete to meet the objectives of the e-learning	3.41	0.897
	The material provided is organized into logical understandable component	3.66	0.894
	I found the contents of e-learning to be useful and relevant	3.52	0.897
Readiness	I can manage time for academic and non-academic activities while staying at home along with other distractions	4.39	0.903
	I have access to infrastructure required for e-learning		
Effectiveness	E-learning enables better interaction between teacher and students	3.13	0.894
	There is no difference in learning via online platform and offline regular classroom teaching	2.30	0.903
	Subjects having practical concepts are also taught with due care	2.77	0.900
	To what extent the objectives of giving distance learning are fulfilled during this lock down period of COVID 19 pandemic	3.23	0.895
	Our teachers have really worked hard to make the e-learning environment interesting, enjoyable and easy to understand	3.82	0.897
Organisational support	Our institution collects regular feedback to improve the quality of e-learning	2.93	0.897
Learner's perceived satisfaction	Overall satisfaction with the change in knowledge delivery by your institution	3.39	0.891

The various parameters and variables that are used for measuring e-learning effectiveness are mentioned in Table 1. The mean score and reliability for the internal consistency of factors were determined by calculating the coefficient of alpha. According to the rule of thumb, an alpha value greater than 0.7 is reliable and acceptable. In our case, the total Cronbach alpha was 0.901, and the individual variable reliability test was also within the acceptable range. The constructs are divided into five categories: 'Self efficacy', 'Readiness', 'Quality delivery', 'Effectiveness', 'Organisational support' and 'Learner's perceived satisfaction'. This indicates that the variables are all relevant to measuring the expected phenomenon.

4. THE RESULTS AND DISCUSSION

4.1. Formatting of objectives

A detailed analysis of the results obtained from the study is presented in this section.

4.1.1. Measuring the digital connection status of students

More than half of the respondents have a proper internet connection and smart phones and computers to perform the tasks assigned by the teacher. However, even if we think that there is no issue, 22 percent do not have computers, and 5 percent do not have any facility to connect with the teachers or the activities going on in the virtual classroom. The issue of an 'unstable internet connection' emerged as a significant obstacle in the context of online learning [27].
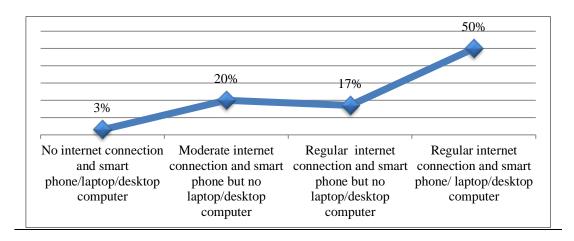
Figure 2. Digital connectivity

This variation will increase if we consider more higher education institutions in rural areas. As per NSS's (National Sample Survey) 75th round report on 'Social Consumption of Education 2017-18', only 20 percent of households have computers, 39.8 percent have internet access in urban areas, and 4 percent have computers and 15 percent have internet access in rural areas [37]. So, one can clearly see the difference in infrastructural readiness between rural and urban areas. It is possible to implement online learning in urban areas. The same report also counted the digital skills among youth, where only 17.6 percent could use computers and 18.4 percent could access the internet.

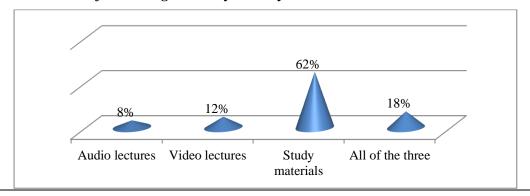### *4.1.2. Mode of knowledge delivery used by teachers*

Figure 3. Mode of knowledge delivery

A majority of the teachers (62 percent) preferred to provide materials, which sometimes make it a little difficult for the students to understand the concepts of practical subjects. Only a few tried to make audios and videos to teach a topic to provide the environment of real learning to the students, and in the case of live classes, it becomes easier to clarify doubts instantly as if they are facing each other with certain limitations. However, 18 percent used a combination of all of the mentioned methods according to the requirements of the topic. Online classes can be conducted via Zoom, Google Hangouts, Google/Moodle Classroom, Skype, YouTube, Webex, etc. In our study, Google Classroom is extensively used, but the rate of online class teaching is very low. Obstinacy is one of the barriers to an effective e-learning process, as some think that traditional teaching methods are more convenient and successful [19].

4.1.3. Previous experience of teachers and learners with e-learning mode of education
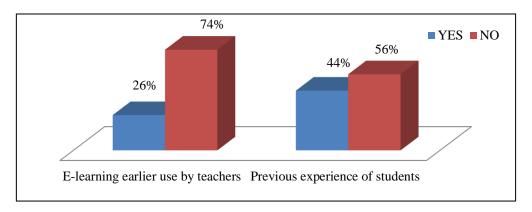

Figure 4. Previous experience in e-learning

The above table tells us about the previous e-learning experiences of the instructor and learners. Almost half (56 percent) of the respondents have no previous experience, which means it is the first time for them to explore the virtual learning platform. In the case of teachers, only 26 percent of cases were found where they used the various techniques and tools of online learning in conventional regular classes. The ratio between teacher's and learner's experience indicates that students have changed with the changing environment around the world, which is obviously not always the case with their teachers. In spite of huge investments in technologies and equipment, the rate of usage is seen to be lower due to a lack of skills, confidence, or pedagogical or structural issues in the present educational system [38]. Sometimes teachers' workload also influences the adoption level of technology for teaching purposes, as time management becomes a little difficult with a heavy amount of work.

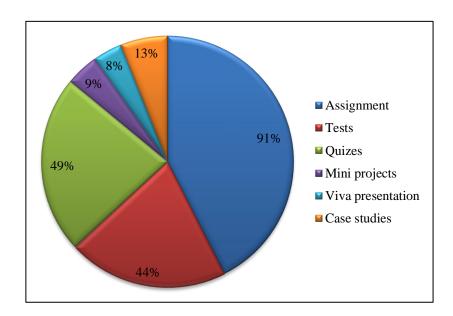### 4.1.4. Online assessment modes used by teachers to assess the knowledge imparted

Figure 5. Mode of online assessment

The result showed that in most cases, assignment-based evaluation is used by the teachers, followed by quizzes, tests, case studies, mini-projects, and viva presentations in a few cases.

4.1.5. Issues/problems encountered by learners in e-learning process

Issues/problems encountered in e-learning process

Lack of interaction with teacher	61%
Issues with learning Process	45%
High cost of data	36%
Network problem	30%
Electricity issues	15%

This table shows the problems and issues encountered by the respondents. Basically, the main issue is the communication gap between teachers and students, which causes a breakage of links within studies [39]. Another problem is the learning process adopted by the teachers, where more emphasis is placed on the completion of the syllabus than concept clearance, as reported by the respondents. Certain personal issues that are not related to the learning process are encountered by students, like poor network connections, electricity issues, and the high cost of data.

4.1.5. Analysis of descriptive statistics of the variable to measure quality delivery, effectiveness and overall satisfaction

Analysis of descriptive statistics

Measurements	Scale							Mean
	1	2	3	4	5	6	7	
Structure and design of the course	16%	17%	19%	24%	11%	10%	3%	3.41
Content organization and quality	15%	18%	20%	13%	8%	21%	5%	3.66
Contents usefulness	16%	16%	16%	24%	14%	8%	6%	3.52
E-learning enables to learn in less time	22%	15%	8%	15%	20%	15%	5%	3.57
Interaction between instructor and learner	23%	15%	8%	15%	20%	14%	5%	3.13
Offline regular classroom vs online platform teaching	43%	20%	21%	7%	4%	2%	3%	2.3
Importance on subjects having practical concepts	35%	20%	13%	10%	16%	3%	3%	2.77
Achievement of objectives for giving distance learning	25%	16%	12%	20%	17%	7%	3%	3.23
Institutional support and collection of feedback to improve the quality of e-learning	34%	16%	12%	14%	11%	10%	3%	3.82
Role of instructor in e-learning	18%	12%	17%	12%	16%	13%	12%	2.93
Learner's perceived satisfaction with the change in knowledge delivery	21%	16%	13%	16%	23%	8%	3%	3.39

The above table featured the analysis of descriptive statistics of various aspects of effectiveness in the application of e-learning by colleges and universities.

- The respondents found the structure and design of the course appropriate, with a mean of 3.41; however, the maximum, i.e, 24 percent showed moderate (4) satisfaction.
- Content organisation and usefulness have a mean score of 3.66 and 3.52, respectively. The majority of the respondents, i.e, 21 percent (6) and 24 percent (4), showed moderate satisfaction.
- Communication between learner and instructor has a mean score of 3.13, which shows less than moderate satisfaction, and 23 percent reported almost no interaction with the teacher.
- When a question is asked about the difference in learning between a regular classroom and a virtual platform, the majority 43 percent (1) find it difficult to cope with the new environment; however, the mean is 2.31, which also indicates very low satisfaction.
- There is also dissatisfaction regarding the teaching process for subjects requiring practical knowledge, with a mean score of 2.77 and 35 percent (1) having not even understood the concept.
- The teachers also needed to work hard to cope with the new challenge, and the respondents showed less than moderate satisfaction (mean of 2.93), however, 18 percent (1) showed lowest and 16 percent (5) showed more than moderate satisfaction.
- Moreover, overall satisfaction is a little less than moderate, with mean of 3.39, but if we check the frequency, 23 percent (5) are satisfied and 21 percent (1) are least satisfied. [Numbers in () are the mode score on a scale of 1–7].

4.2 Hypothesis Testing

4.2.1. Measurement of relationships between the dimensions of e-learning

Null hypothesis (H$_{0a}$): There is no significant relationship between the constructs of e-learning (self-efficacy, quality delivery, effectiveness, organisational support, readiness) and perceived learner's satisfaction.

Alternative hypothesis (H$_{1a}$): There is a significant relationship between the constructs of e-learning (self-efficacy, quality delivery, effectiveness, organizational support, readiness) and perceived learner's satisfaction.

Table 4

Correlation of dimensions and student's perception

Dimensions	Self-efficacy	Quality delivery	Effectiveness	Organisational Support	Readiness	Perceived learner's satisfaction
Self-efficacy	**1**					
Quality delivery	.531**	**1**				
Effectiveness	.581**	.771**	**1**			
Organisational Support	.476**	.680**	.749**	**1**		
Readiness	.604**	.428**	.453**	.329**	**1**	
Perceived learner's satisfaction	.593**	.861**	.860**	.725**	.496**	**1**

**. Correlation is significant at the 0.01 level (2-tailed) with significance value $p < 0.05$

Pearson's correlation coefficient revealed that all the constructs of this study have a positive correlation with overall satisfaction from the learners' perspective.

- Quality of knowledge delivery □--------------------□ overall learners' satisfaction, there is a strong positive relation (r = .861) and has the highest impact on the knowledge delivery process
- Effectiveness in knowledge delivery □--------------------□ overall learners' satisfaction, there is a strong positive relation (r = .860) and has impact on the knowledge delivery process after the construct quality delivery
- Organisational support □--------------------□ overall learners' satisfaction, there is a strong positive relation (r = .725) and has impact on the knowledge delivery process that is less than the constructs, quality delivery and effectiveness
- Competency of the learner □--------------------□ overall learners' satisfaction, there is a strong positive relation (r = .593) and has impact on the knowledge delivery process less than the constructs quality delivery, effectiveness and organisational support
- Readiness of the learner □--------------------□ overall learners' satisfaction, there is a strong positive relation (r = .496) and has impact on the knowledge delivery process less than the constructs quality delivery, effectiveness, organisational support and competency.

Evaluation of the learning process is not a single-dimensional exercise but a multi-dimensional viewpoint that needs critical analysis from various angles. The achievement of virtual learning extensively depends on the learner's acknowledgement of the learning system [40].

4.2.2. Adaptation level

Null hypothesis H$_{0b}$: The effectiveness of knowledge delivery is equal across all the groups of educational institutions

Alternative hypothesis H$_{1b}$: The effectiveness of knowledge delivery is not equal across all the groups of educational institutions

To test this hypothesis, an ANOVA (Analysis of variance) was conducted, as the division of higher educational institutes is done in five groups: central university, state university, private university, government college and private college. The independent between groups ANOVA should have a statistically significant effect ($F = 5.67$, $p = 0.007$, $\eta^2 = 0.221$). Thus, the null hypothesis of no difference between groups is rejected, and 22% of the variance in effectiveness of knowledge delivery was accounted for by institutional groups. This is an indication that the adaptation level of e-learning and execution are not done equally by all the groups of educational institutes. There is a shift in the learning process from teacher-centred to student-centric learning [6], which is being accepted and implemented worldwide. Assam, being the rurally dominant state, has shown versatile results in the study of the adaptation of effective e-learning solutions among educational institutions. State-level educational institutions, especially in rural areas, have found it difficult to effectively implement e-learning in their knowledge delivery processes as compared to central-level institutions. It may be due to the inefficiencies discussed above, like lack of infrastructural readiness, organisational culture, digital skills, interaction between teacher and students, etc. [39], [40]. Sometimes, due to the lack of proper planning and organisation of the process, students manifest poor concentration [41]. So, it is important to reconsider the pedagogical methods, teacher training, examination system, infrastructure building, etc. in higher education to successfully include e-learning as a part of the curriculum.

4.2.3. Relation between instructor's previous experience and learner's perception

Null hypothesis (H$_{0c}$): There is no significant relationship in between instructor's previous experience and learner's perception

Alternative hypothesis (H$_{1c}$): There is a significant relationship in between instructor's previous experience and learner's perception

Table 5

Connection between instructor's previous experience and learner's perception

learner's perception	instructor's previous experience		Mean difference	Sig. (2-tailed)	P value
	Yes	**No**			
	Mean				
Effectiveness	3.30	2.70	0.60	0.154	p>0.05
Perceived satisfaction	4.06	3.16	0.90	0.084	p>0.05

The above table shows the difference between learner's experiences with present e-learning and instructors' previous experiences with learning through electronic modes. The p value on the basis of the t-test conducted is above the required significance value (0.05). So, we cannot reject the null hypothesis in the case of effectiveness (p = 0.154) and perceived satisfaction (p = 0.084) and accept the alternative hypothesis that there is a significant difference in the learner's experience and the e-learning instructor's previous experience. Only 26 percent of the respondents said their teachers were already using some of the e-learning modes in conventional face to face classes, but since this time it is the case for total virtual classes and there is some drawback in the implementation process, it can be concluded that no such fruitful results could be found. However, this percent of respondents have higher 'Effectiveness' (mean diff. 0.60 and p value 0.154) and 'Perceived Satisfaction' (mean diff. 0.90 and p value 0.084) than the remaining.

4.2.4. Relationship between learner's perception and previous experience in e-learning

Null hypothesis H$_{0d}$: There is no significant relationship in between learner's perception and previous experience in e-learning

Alternative hypothesis H$_{1d}$: There is a significant relationship in learner's present perception and previous experience in e-learning

Table 6

Connection between learner's perception and previous experience in e-learning

Dimensions	Learner's previous experience		Mean difference	Sig. (2-tailed)	P value
	Yes	**No**			
	Mean				
Self-efficacy	4.44	3.59	0.85	**0.005**	p<0.05
Quality delivery	4.26	3.08	1.18	**0.004**	p<0.05
Effectiveness	3.55	2.31	1.24	**0.001**	p<0.05
Readiness	5.22	3.74	1.49	**0.004**	p<0.05
Perceived satisfaction	3.96	2.94	1.02	**0.026**	p<0.05

The above table shows the difference in perception between learners having previous experience and learners having no experience in learning through electronic mode. The p value on the basis of the t-test conducted is below the required significance level (0.05). Thus, there is enough evidence to reject the hypothesis that there is a significant difference between the

perceptions of learners on the basis of previous experience in e-learning. Experienced learners have more 'Competency' (mean difference 0.85 and p value 0.005) and 'Readiness' (mean difference 1.49 and p value 0.004). They are more satisfied with 'Quality Delivery' (mean diff. 1.18 and p value 0.004), 'Effectiveness' (mean difference 1.24 and p value 0.001), and 'Perceived Satisfaction' (mean difference 1.02 and p value 0.026). But the maximum variation is seen in the case of readiness.

4. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The survey was conducted to determine how well the higher educational institutions are adapting the learning process and upholding the quality of knowledge delivery. The study concluded that e-learning has been adapted by universities and colleges, but its prolificacy is doubtful. Assam, a state that is predominately rural, has produced a variety of results in the investigation of the adoption of efficient e-learning programmes among educational institutions. Compared to central-level institutions, state-level educational institutions have had difficulty successfully integrating e-learning into their knowledge delivery processes, particularly in rural areas. It might be the result of the inefficiencies covered above, such as lack of infrastructure readiness, organisational culture, digital skills, teacher-student connection, etc. Students can display low attentiveness due to improper planning and process management. To successfully integrate e-learning into the curriculum, higher education must therefore reevaluate its pedagogical approaches, teacher training, examination system, infrastructure development, etc. Sometimes the model used for e-learning fails to create a proper learning environment. Even though many steps have been taken to improve the e-learning process, there is a paucity of teacher-student interaction, which is a major drawback in the process of effective e-learning. It was also found that in a few institutions, no such steps have been taken to collect feedback from the students to improve the quality of learning. It can be concluded that since this was not a planned action but just a reactive action towards the inability of providing education in conventional regular mode to reduce the spread of the COVID-19 pandemic, there are certain loopholes that were encountered in the process of implementation during the study. Infrastructure readiness is found to be an integral factor in a successful e-learning process. The centuries-old classroom teaching model has been transformed by this pandemic, giving an opportunity to find new avenues and eliminate drawbacks in the present education system. The government and educational institutions should work in collaboration to update and upgrade the skills and technology required for the development of the e-learning process. The findings suggest that, despite encountering various difficulties, both students and teachers were able to sustain instructional activities without significant interruption in online education. Hence, a fundamental takeaway from this experience is the imperative to prioritise the cultivation of readiness for remote instruction and learning, specifically by fostering the ongoing advancement of educators' pedagogical and technological proficiency.

A person's chances of succeeding in a digital setting increased significantly if they were tech-savvy [32], [42]. The problem of students' insufficient access to the internet, computers, and printers, as well as their inability to effectively navigate the online environment, has been the focus of numerous studies. The research found that students from remote regions and those from low-income families have the most trouble overcoming Internet and technology restrictions. The research also revealed that student satisfaction was diminished as a result of challenges encountered in comprehending course lectures. An issue that has been noticed in the context of online learning is the accelerated pace of lectures due to the absence of the instructor's requirement to physically write on a board, as observed in virtual PowerPoint environments. Furthermore, with regards to the adverse impact of motivation on instructors, it is imperative

that educational institutions acknowledge the need for equipping educators with novel pedagogical techniques tailored to address exceptional and demanding situations. The provision of such training and assistance would contribute to the improvement of teachers' self-sufficiency and efficacy, enabling them to effectively handle their workload and maintain their well-being, all while facilitating the transformation of the educational process. From the perspective of students, it becomes evident that supporting e-learning is crucial for promoting interaction, involvement, and enthusiasm in learning activities. From this standpoint, there is a need for a comprehensive support strategy to enhance students' abilities, well-being, and resilience. This approach may involve endeavours to comprehend the social and emotional transformations experienced by students as a result of the pandemic, encompassing their beliefs, motivations, practices, and cultural aspects. A few suggestions encountered during this research that would ease the process of knowledge delivery are mentioned below:

– Offering comprehensive support to students is crucial for ensuring they have access to the essential materials required for effective completion of their academic coursework. This encompasses typical academic components such as homework, lecture notes, quizzes, prompt feedback, and regular communication with students.

– Demonstrate a genuine sense of concern. Whether the crisis at hand manifests as a pandemic or a more geographically confined calamity, it is frequently seen that students experience fear, insecurity, and a strong desire for reassurance, seeking solace in the knowledge that their professors and the university administration genuinely prioritise their well-being.

– Enable student participation in the development of the final examination structure to foster a sense of agency in their ultimate assessment.

– Flexible timetable. In the context of online education, students frequently encounter the challenge of integrating their academic commitments within the constraints of their day-to-day working schedule. The provision of more time is often acknowledged as being highly valued.

– Basic logistics. It is imperative for professors and university administration to prioritise the facilitation of a user-friendly learning management system, ensuring that students possess a comprehensive understanding of its functionality. Additionally, efforts should be made to guarantee seamless accessibility and processing of assignments, quizzes, and exams.

The study is about the current educational scenario based on self-reported data covering the respondents from one state of India, i.e., Assam. So, generalisations of view might vary with changes in the geographical area. Moreover, a study should be conducted pan-India, covering all the higher educational institutions in India, and a comparison can be made between states to show the level of efficiency and advancement achieved in education in both rural and urban areas. Experimental research can also be performed to find the solution in regards to web-based learning and information technology. This study can be used as the foundation for creating a pedagogical paradigm for e-learning in higher education.

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ЕФЕКТИВНІСТЬ ТА АДАПТАЦІЯ ЕЛЕКТРОННОГО НАВЧАННЯ В ЗАКЛАДАХ ВИЩОЇ ОСВІТИ ІНДІЇ ПІД ЧАС COVID-19

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Анотація. Непередбачуваний період карантину, спричинений COVID-19, значно вплинув на розвиток діяльності в різних сферах, особливо в освітній галузі. У дослідженні зроблено спробу окреслити вразливість закладів вищої освіти щодо впровадження нових методів навчання та визначити їх ефективність. Представлене описове дослідження ґрунтується на емпіричному вивченні поточних проблем, пов'язаних з раптовими змінами в процесі надання знань у звичайних класах коледжів та університетів країн, що розвиваються, на прикладі Індії. Для вимірювання рівня задоволеності студентів були оцінені п'ять компонент, а саме: якість викладання, ефективність, організаційна підтримка, самоефективність і готовність. Під час проведення аналізу даних була проведена перевірка гіпотез та застосовані відповідні статистичні інструменти. Отримані результати дослідження показали, що декілька закладів вищої освіти ефективно скоригували навчальний процес, але його результативність у більшості випадків викликає сумніви. Близько 62% респондентів повідомили, що через велику кількість завдань та навчальних матеріалів важко розібратися з поняттями, особливо при виконанні практичних робіт. Існує думка, що електронне навчання виявляється не таким плідним, як звичайні традиційні заняття. Трансформувати багатовікову модель викладання в класі стало дещо складно через недостатню інфраструктурну готовність учителів, відсутність попереднього досвіду в електронному навчанні, недоліки в методах навчання тощо, що потребує рішення цих проблем з боку адміністрації. Основними бар'єрами, згідно з нашим дослідженням, є недостатня інтерактивність між викладачем і студентом, а також недоліки в методах, які застосовувались під час викладання. Дослідження не охопило такі провідні інститути, як-от IIT, AIIMS та інші високорейтингові інститути Індії, оскільки наша мета полягала в тому, щоб сформулювати реальну ситуацію в звичайних навчальних закладах. Пандемія COVID-19 відкрила нові бачення шляхів, які допоможуть усунути недоліки і переглянути педагогічні методи, підготовку вчителів, систему іспитів тощо для впровадження електронного навчання в систему освіти.

Ключові слова: електронне навчання; COVID-19; ефективність; вища освіта; ІКТ.