IMPACT OF E-LEARNING ON TEACHING AND LEARNING PRACTICES IN HIGHER EDUCATION INSTITUTIONS – STUDENTS VIEW

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ABSTRACT

Higher Education systems are in rising demandall over the globeto use ICT tools in teaching and learning to improve students' knowledge. Due tocovid pandemic, Educational institutions are moved to E- learning platforms. To create knowledge based society, it is very needed to incorporate ICT tools at all stages of the higher education system. E-learning became a vibrant instrument for teaching and learning practices. It is the best recent method of teaching which has stimulated the interest of students and faculty from all educational systems. but, the biggest care is the quality of learning, which is more related to the design & execution of the content. This paper examines the impact of E-learning and E-teaching in higher education institutions, from the student perspective. Further, it makes an attempt to quantitative research, and data were collected from both UG & PG students of St. Joseph's College of Arts and Science (Autonomous) Cuddalore; A convenient sampling method was adopted and the data was gathered using a structured questionnaire. Further, the study indicates how E-learning affects teaching and learning practises in higher education institutions.

Keywords: *Educational system, E-Learning, Technology, ICT tools, E- Teaching.*

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1. Introduction

The Higher education system has developed remarkably from an ordinary education system to new methods that support the delivery and acquiring the knowledge through the use of computer technology. Technology advancement has created a good platform to improve teaching skills and broaden students' learning capacity. E-learning is the best example of the development of technology used in the higher education system. E-learning is an instructional method that has great potential

and is ready for research into how it influences both instructional practices and student knowledge acquisition.

E-Learning is used by many organizations to give input to their employees, while universities and colleges are using ICT tools to improve their quality of education. The E-learning trend has pushed academic institutions offering the course via the Internet.However, during the virtual mode teaching and learning process, several problems arise for both teachers and students. With all of the issues and inadequate experience in growing technology, evaluating E-learning is urgently needed for better understand its impact and usefulness on educational activities.

Taking into the above consideration, this paper makes an attempt to quantitative research on the influence of E–learning methods on teaching and learning practices in higher education. In this aspect, the present study aims to view how students are to adopt E-learning in their teaching and learning practices. Further, the study has been conducted among students at the college level indicating the ways and means of adaptability of technology in their future learning processes.

2. Review of Literatures

Munyaradzi Zhou et (2022)suggested in their research that, If technology is not accepted, effectively used, and adopted, learning will not improve. Technologies remove everyday challenges; Students will learn effectively and apply skills learned in the broader context if virtual learning is implemented successfully.

Rakesh C Ramola (2021), According to his research, quality e-learning will become a way of life in the coming years, and both administrators and faculty members will face significant challenges. It was believed that in the future, technically strong professionals would be required to improve the quality of online learning. Institutions should also take steps to improve educational quality by utilising modern technology.

Nassoura (2020) stated in his study that all educational institutions are using new software to provide technology-based teaching and learning.

Bali .s (2018) According to his research, students and teachers are adopting a new learning system based on technology.

Warner et (1998) investigated the concept of virtual mode of learning preparation in the field of VET. They describe students' eagerness for virtual learning in three major areas: (a) their preference for the type of face-to-face teaching; (b) their confidence in learning through electronic

communications, including the capability and self-reliance to use the Internet and computer-based communication; and (c) their ability to learn independently.

3. Objectives of the Study

1. To study the influence of ICT tools in students teaching-learning process.
2. To examine the usefulness of E- Learning prctices.
3. To analyse the student's perception on E-Learning practices for teaching-learning.

4. Research Methodology

To address the above objectives, the following research methods were employed.

a) Questionnaire development and instrument

The data was gathered using a structured questionnaire created in accordance with the objectives of this paper. Due weightage was given to the number of questions, type, relevance, wording and scale of measurement.

b) Sample and Data collection

The research is constructed on the primary survey of 100 students fromSt.Joseph's College of Arts and Science (Autonomous), Cuddalore, India. selected conveniently from the various department, mostly from commerce discipline consisting of PG and UG (final year students only). The survey questionnaire was self-administered and distributed. It was clearly explained to students the purpose and objectives of survey.

c) Data analysis

The questionnaires were thoroughly checked and edited. It comprised of a question on Likert scale with five point and other close ended function pertaining to the impact of in e-learning. The data were entered in SPSS package Version 14. Moreover, statistical tests such as ANOVA,Kruskal Wallis test, T – test and percentage analysis were applied for further data analysis.

Hypothesis: To achieve the study's goals, the following hypothesis was developed:

Ho: There is no significant difference between the gender and perception of the students.

5. Limitations

1. The study addresses only a small group of students (100) in the institution.
2. The study was conducted only on the final-year students of UG and PG, not the first year students of the college.
3. The study was confined only to St.Joseph's College of Arts and Science in Cuddalore.

Results and Discussions

The analysis revealed the following results based on objectives.

Table 1: Primary details and Student demographics

Gender	Frequency	Percentage
Male Students	41	41
Female Students	59	59
Age		
Below 20 years	57	57
21 -25 years	43	43
Level Of Study		
UG	70	70
PG	28	28
Year of Study		
Ist Year	13	13
IInd Year	32	32
IIIrd Year	55	55
Discipline		
Commerce and Management	80	80
Science	20	20
Use of E-Learning practices		
Constantly	12	12
Frequently	35	35
Occasionally	45	45
Never	01	01
Not interested	07	07
Practice of Teaching and Learning		
Extremely Good	06	06
Good	60	60
Not Bad	27	27
Worst	04	04
Extremely Worst	03	03
Impact of Technology		
A major impact	36	36
A modest impact	41	41
Little or no impact	07	07
Not able to Predict	16	16
Using Technology by faculty		
(a) Strongly Agree	28	28
(b) Agree	52	52
(c) Neither agree nor disagree	13	13
(d) Disagree	05	05
(e) Strongly Disagree	02	02

Source: Primary Data

Table 1 displays the variables related with the adoption of E-learning in higher education for teaching and learning practices along with demographic aspects. Further, in Table 1, the majority of students gave more positive feedback than negative. This indicates that students are pleased with the way technology is being used in their teaching and learning practices.

Ho: There is no significant difference between the gender and perception of the students.

Table 2: ANOVA Test for significant differences among Gender with respect to the Perception and Opinions of students about E- Learning

S.No	Opinions	Male	Female	F Value	Significance
		Mean	Mean		
1	I am interested in E-Learning practices	4.0	3.59	4.770	0.031*
2	I was able to follow the teaching and learning practices through E-Learning	3.63	3.32	3.023	0.085
3	I believe that using e-learning will help me to improve my skills	3.95	3.44	5.495	0.021*
4	I believe that the teacher's use of e-learning is effective.	3.53	3.44	0.221	0.639
5	E-learning is more engaging than traditional methods.	3.31	2.84	4.133	0.045*
6	The opportunity to interact with the teacher is increased by using e-learning.	2.95	2.76	0.608	0.437
7	The opportunity to interact with my classmates is increased by using e-learning.	2.65	2.54	0.232	0.631
8	Using e-learning motivates me to keep learning on the Internet on my own.	3.70	3.42	1.502	0.223

Source: Primary Data

***Significance at 5 percent**

The Probability value is more than 0.05, the null hypothesis is accepted at 5 percent level of significance, with regards to the variables of I was able to follow the teaching and learning practices through E-Learning, I believe that the teacher's use of e-learning is effective, The opportunity to interact with the teacher is increased by using e-learning, The opportunity to interact with my classmates is increased by using e-learning, Using e-learning motivates me to keep learning on the Internet on my own. Hence there is nil significant difference between male students and female students with regards to the students Perception of E-learning on the above mentioned variables. The probability value is less than 0.05, the null hypothesis is rejected at 5 percent level of significance

with regards the variables of I am interested in E-Learning practices, I believe that using e-learning will help me to improve my skills, E-learning is more engaging than traditional methods. Hence, there is a significance difference between male students and female students with regards to interested in e-learning, using of e-learning improves my skills and E-learning is more engaging than traditional methods. The majority of the students said that using of e-learning help them to improve their skills and they also agreed that e-teaching by the teachers also effective.

Table 3: Kruskal – Wallis Test

S.No	Opinions	Male	Female	P Value
		Mean	Mean	
1	I am interested in E-Learning practices	57.66	45.53	0.027*
2	I was able to follow the teaching and learning practices through E-Learning	58.46	44.97	0.013*
3	I believe that using e-learning will help me to improve my skills	58.44	44.98	0.018*
4	I believe that the teacher's use of e-learning is effective.	50.73	50.34	0.943
5	E-learning is more engaging than traditional methods.	57.18	45.86	0.047*
6	The opportunity to interact with the teacher is increased by using e-learning.	53.35	48.52	0.395
7	The opportunity to interact with my classmates is increased by using e-learning.	52.04	49.43	0.649
8	Using e-learning motivates me to keep learning on the Internet on my own.	54.72	47.57	0.207

Source: Primary Data

***Significance at 5 percent**

The Probability value is more than 0.05, the null hypothesis is accepted at 5 percent level of significance, with regards to the variables of I believe that using e-learning will help me to improve my skills,the opportunity to interact with the teacher is increased by using e-learning, The opportunity to interact with my classmates is increased by using e-learning, Using e-learning motivates me to keep learning on the Internet on my own. Hence there is nil significant difference between male students and female students with regards to the students Perception of E-learning on the above mentioned variables.

The probability value is less than 0.05, the null hypothesis is rejected at 5 percent level of significance with regards the variables of I am interested in E-Learning practices, I was able to

follow the teaching and learning practices through E-Learning, I believe that using e-learning will help me to improve my skills and E-learning is more engaging than traditional methods. Hence, there is a significance difference between male students and female students with respect to the above mentioned variables. The majority of the students are agreed that the e-learning methods are more engaging then traditional teaching methods.

Table 4: T-test for significant differences among Gender with respect to the Perception and Opinions of students about E- Learning

S.No	Opinions	Male	Female	t value	P value
		Mean	Mean		
1	Practice of Teaching and Learning through online mode.	3.658	3.593	0.406	0.686
2	Adoption of practical class through the online mode	3.341	3.355	0.085	0.932
3	Impact of technological innovation on teaching methodologies over the next five years	3.146	2.847	1.422	0.158
4	Important of new technologies to choose an educational institution by students	3.561	3.491	0.441	0.660
5	Using Technology by faculty	3.975	4.000	0.134	0.894

The Probability value is more than 0.05, the null hypothesis is accepted at 5 percent level of significance, with regards to the variables of Practice of Teaching and Learning through online mode, Adoption of practical class through the online mode, Impact of technological innovation on teaching methodologies over the next five years, Important of new technologies to choose an educational institution by students and Using Technology by faculty. Hence, there is a significance difference between male learners and female leaners with respect to the above mentioned variables. The majority of learners agree that using E-learning motivates them to learn subjects online on their own.

Table 5: Percentage analysis of the opinion of the students about E-learning

S.No	Opinions	SA	A	N	D	SD
1	I am interested in E-Learning practices	19	51	19	9	2
2	I was able to follow the teaching and learning practices through E-Learning	8	45	34	10	3
3	I believe that using e-learning will help me to improve my skills	25	35	23	14	3
4	I believe that the teacher's use of e-learning is effective.	11	47	26	11	5
5	E-learning is more engaging than traditional methods.	11	27	25	29	8

6	The opportunity to interact with the teacher is increased by using e-learning.	20	30	15	17	18
7	The opportunity to interact with my classmates is increased by using e-learning.	5	21	23	30	21
8	Using e-learning motivates me to keep learning on the Internet on my own.	21	35	29	7	8

Note: SA – Strongly Agree A – Agree N – Neutral D – Disagree SD – Strongly Disagree

Source: Primary Data

From the above table, it is found that the majority of the students, 51 percent of the students are interested in E-learning practices, 45 percent of the students can follow the teaching practices, 35 percent of the students believe that using E-learning improves their skills, 47 percent of the students believe that teachers using E-learning is effective, it is also observed from the above table 30 percentage of the students have opportunity to interact with the teachers and 35 percent of the students feel that, the E-learning motivates to keep learning by their own.

It is clearly stated that 29 percent of the students disagree with E-learning being more engaging, which shows that, the students are facing difficulties in engaging in E-learning and 30 percent of the students disagree with an opportunity to interact with their classmates by using E-learning.

It is concluded from the above table, students are interested in E-learning practices and there can follow the teaching during E-learning mode, it also helps the students to improve their skills, teachers also use E-learning platform effectively, E-learning motivates the students to keep learning.

Major Findings

- Most of the students (60%) said that the e-learning practices on teaching and learning is good.
- 46 % of the students feel only good about the adoption of practical classes through the online mode.
- 41% of the students agreed that technological innovation has a modest impact on teaching methodologies over the next five years.
- 67% of the students agreed that the availability of new technologies is highly important to choose an educational institution.
- 52%% of the students agree with teachers in the college would use and integrate more technologies in their teaching.
- Most of the students are interested in e-learning practices for teaching and learning

Conclusion

From the above findings, it can be decided that the overall influence of E-learning on teaching and learning practices in higher education has positively influenced students' attitudes toward E-learning. The results clearly indicate that the students are very much interested in E-learning methods for teaching and learning Moreover, the teachers should also have the necessary skills, knowledge, and attitude to incorporate them into the course content,no innovation should be expected unless the level of teachers is known. If suitable steps are taken, the highereducation system will become more creative and advanced. The appropriate ICT tools utilisation can act as a catalyst, bringing about a paradigm change in both content and pedagogy. The E-learning system faced some challenges it will be overcome by adopting some new Teaching strategies in technology-enabled learning. As a result, E-Learning is considered to be one of the most effective teaching and learning strategies.

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INTERPRETATION BASED ON EFFECTIVENESS OF BLENDED MODE LEARNING AMONG STUDENTS USING MACHINE LEARNING TECHNIQUE

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ABSTRACT

Education is a key for everyone's success. Education builds one's career, life skills and personality. The beauty of education is its face to face communication. This environment makes teachers and students to interact with each other which would be highly effective since a study proved that face to face communication will be much effective than communicating through any other forms. Considering the past two years, there was an unexpected change in mode of education. Due to Covid-19 pandemic, everybody needs to shift for online mode of education from offline mode. This method of learning is new to all and everyone has different intention about this mode of education. This paper aims to describe about the concept of crowd learning process, an effective process to make online education useful. This paper also includes the survey of statistical measures of College students about some of performance metrics between both online and offline education and blended mode education. Here the survey from students was also studied with a questionnaire and predicted the mindset of students about online education through a Machine Learning Algorithm.

Keywords: *Online learning, Offline learning, K Nearest Neighbour [KNN], Blended Mode, Impact among students.*

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I Introduction

The process of education is growing parallel with raise in technology. The education system was different in different corners of the world. Concentrating on our country India there were three main different stages of education namely Ancient, Medieval and modern. During Ancient times the

education was of Brahmanas, Upnishads and Dharmasutras. Those educations were on forests, under the nature and outside environment where students mind will be fresh and active. This education given to students was about personality, characteristics, culture and noble ideas.

As everyone knows Muslims invaded India in medieval period, the education was only about Islamic Religion and their beliefs. Coming to Modern education, this becomes a way to what proper education system is. The aim of modern education was to be educating students in terms of new ideas, new technologies, equality etc., by which they can lead their own life independently.

Not only studies, sports, extracurricular activities played major role in Modern education. Students came up as professionals after their modern education. These were happened in long years of gap between them. Then the modern education tends to grow bigger along with the modern era.

At this period of time everyone is having their education in their hand. Technology makes distance to disappear between people and education. By the Start of 2000s, online education step into student's life. Many foreign countries initiated this online education from early 2000s itself. Our country wasn't sure about that and rarely at some of the ends of the country nearly 100 people out of 1000 people learned through the online education those times.

Covid-19 Pandemic situation made a drastic change in everyone's life. Due to the strong communicating virus, people were shuttered in their home itself. Education stepped into online mode in all parts of the world. Technology emergence became a boon for all educational institutions at that time with which education is given to the hands of students.

Students can learn from their place itself through any of smart device, meanwhile Teachers can teach from their place itself. Online education has more pros and cons from different views of different people. It helped a lot during this crisis.

The process called Crowd Learning is introduced on digital learning. This process simply defines collaborative learning. It is also called Crowd wisdom. The process is making an individual to improve more with respect to every aspect in his/her education by working together as a team. In

other words Crowd Learning process is sharing work among participants or teachers and make individual to gain education in efficient manner.

Table 1: Comparison among Online Education and Offline Education

S.no	Performance Metrics	Online Education	Offline Education
1.	Location	Can learn from anywhere	It is location specific
2.	Communication	Happens Digitally	Happens Face to Face
3.	Mode of Learning	Digitalized tools	Traditional tools
4.	Time	Saves lot of time	Huge loss of time
5.	Clearing Doubts	Inconvenient for doubt resolution	Convenient for doubt resolution
6.	Cost	Cost Effective	More expensive than Online Education
7.	Pace of Learning	Students determines this learning	Teachers determines this learning
8.	Level of Commitment	Students are less serious and committed	Students are more serious and committed
9.	Interaction between students and teachers	Less interaction	More interaction
10.	Faculty Student Ratio	1:1, less attention	1:40, more attention
11.	Soft Skills	Very less soft skills was developed	All soft skills was developed
12.	Internet Connection	Internet Connection & technology is needed	No Internet Connection & technology is needed
13.	Social Interaction	Very less	Will be more and enhance social interaction
14.	Missing sessions	Not a big issue	Missing face to face lecture will be difficult
15.	Charges	Reasonable Cost	Might be High fees.

II Literature Survey

A. Khattar, P. R. Jain and S. M. K. Quadri in "Effects of the Disastrous Pandemic COVID 19 on Learning Styles, Activities and Mental Health of Young Indian Students - A Machine Learning Approach," let to know the thoughts of Indian students about online education, their adopting nature and in their lives in lockdown. [1]

F. Hegyesi, J. Velencei constructed a paperwork named “On the Impact of Online Courses on Engineering Education”, focuses on positive side of the online learning among students and initiated more number of online courses for the efficient learning from their place itself. [2]

Hai Zhang, Luyao Yu, Mengxue Ji, Yulu Cui, Dongping Liu, Yan Li, Haiqiao Liu &Yining Wang in their paper,” Investigating high school students perceptions and presences under VR

learning environment", studied about mindset of high students on online education and had drawback of surveying only among students and can be enhanced to teachers and students all over the world. [3]

Jiangfeng Li contributed a paper called Analysis of the "Impact of Online Courses on the college student learning habit" surveyed among students with a questionnaire said that online education should be optimized in order to make students benefit on digital learning. [4]

Joe Llerena-Izquierdo, Orlando Barcia-Ayala and Raquel Ayala-Carabajo on their paper "Faculty Training through Crowdlearning for Emerging Online Education" implemented a concept of Crowdlearning which means collaborative learning in online mode of education that ensures every people in the meet or class will be participated in the scenario of learning. [5]

L. Makkar, AbeerAlsadoonl, P.W.C. Prasad, A. Elchouemi in their paperwork called "Impact of e-Learning on Students: a proposal and evaluation of enhanced elearning model to increase the academic performance of university students", proposed two frameworks for enhanced learning and career growth through E learning. [6]

M. Arora, L. M. Goyal, N. Chintalapudi and M. Mittal, in their paper called "Factors affecting digital education during COVID-19: A statistical modeling approach," describes about a survey about outcome and affordability of online education and observed that outcome has quite negative impact while on the other hand affordability has positive impact. [7]

PetarKolar , Filip Turcinovi , Dario Bojanjac proposed a paper work named "Experiences with Online Education During the COVID-19 Pandemic–Stricken Semester", researched about the effect of online education in a semester of a students, their performance in that semester exams and the tracking performance were seen to be positive. [8]

R. M. Tawafak, G. Alfarsi, M. N. AlNuaimi, A. Eldow, S. I. Malik and M. Shakir together in "Model of Faculty Experience in E-Learning Student Satisfaction", introduced a e-learning tool called PLS tool which could highly useful on online education of the students as if they were in face-to-face mode of education. [9]

Ram Gopal, Varsha Singh, Arun Aggarwal wrote a paper called "Impact of online classes on the satisfaction and performance of students during the pandemic period of COVID 19" where they described about the satisfaction of students, performance and factors affecting education via online mode. They surveyed among only students and that could be prolonged to teachers and other research scholars too. [10]

Shadi A. Aljawarneh in his paper called “Reviewing and exploring innovative ubiquitous learning tools in higher education”, described about the different types of tools used on E learning like Web 2.0, Web 3.0, Blackboard and MOODLE and its effectiveness. [11]

Shan Zheng, Liu Fudong and Zhang Ping in their paper called “Thinking and Practice of Online Teaching under COVID-19 Epidemic” dealt with the concepts to make online teaching efficient with problem-based learning [PBL] with “Data Structure” as example and worked out this design to be effective. [12]

Sumitra Pokhrel and Roshan Chhetri conducted a review with the paper called “A Literature Review on Impact of COVID-19 Pandemic on Teaching and Learning” which shows us about the impact of Covid 19 on digital education and insisted that digital learning may also continued even after resuming face to face education. [13]

III Proposed Work

Here is the simple architecture diagram for analyzing student’s mentality using K Nearest Neighbor technique.

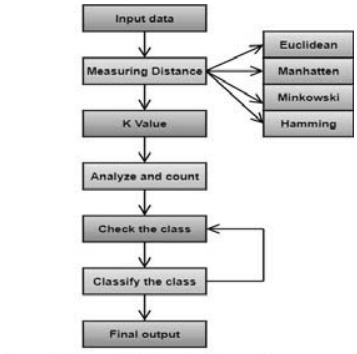


Figure 1: K Nearest Neighbour Architecture Diagram

The beginning every process should be with input document. This paper contains survey report of some students on performance metrics of mode of education as an input document. The aim is to predict the mindset of the student with respect to their answers given in the questionnaire survey. The mindset prediction is possible if the answers of students were combined as some of basic class and with those combinations, the high combinations could be their mindset. This could be done using a Machine Learning Algorithm called K Nearest Neighbour Algorithm. After the collection of input data, the measuring distance should be calculated. There are many different methods to measure distances among data like Euclidean, Manhatten, Minkowski and Hamming. Formulas for finding distances are in following table: [Table 1]

Table 1: Formulas for different distance metrics

S.No	Measuring Distance	Formulas
1.	Euclidean	d(x, xi) = sqrt(sum((xj – xij)^2))Where d is distance, xi, xj are points.
2.	Manhatten	d(X1,X2)=sum for i to N sum || $X1_i$ – $X2_i$ || where d is distance, xi are points.
3.	Minkowski	d(X,Y)=(∑i=1n|Xi−Yi|p)1/p where d is distance, xi and yi are points.
4.	Hamming	d(x,y) = Σd1x$\mathbf{d}_{\neq}$yd where d is distance, x and y are different points.

The Euclidean distance metric is chosen for measuring distance since it is effective than other three distance metrics. After measuring distance, k parameter is fixed. Then the inputs are analyzed and counted according to class specifications. The next module is class checking and classifying the data into what class it should belong to. This process is done repeatedly for all the input data and final output is obtained. The output would be the class which has more number of classified data. With that the mindset of student could be predicted.

IV Experimental Evaluation and Results

A questionnaire forms, filled by nearly 200 students were taken as input. Its metrics and evaluations were given below.

Table 1: Performance Metrics on Comparing Online and Offline Education

S.No	Performance Metrics	Online/Agreed	Offline/ Disagreed	Both/ Moderate
1.	More Understanding	69	82	53
2.	More Creativity	67	99	38
3.	Logical Thinking	62	100	42
4.	Team Behaviour	57	115	32
5.	Performance Stability in Assessments	64	90	50
6.	Increase Self Learning	87	66	51
7.	Dynamic Mode Adoption is Hard?	54	77	73
8.	Highly Reachable	56	111	37
9.	Issues in Internet Connection	70	118	16
10.	Blend Mode Education	86	68	50

Table 1 discusses the mindset of students for different performance metrics of mode of education. The performance metrics used were creativity, understanding, logical thinking, blended mode, team work, network, issues in network etc.

Table 2: Mobile networks used by students

S.no	Mobile Network	No. Of Students
1.	Jio	67
2.	Airtel	57
3.	Vodafone	70
4.	Others	13

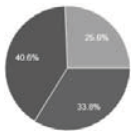
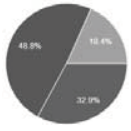
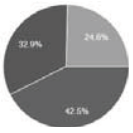
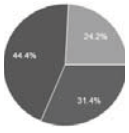
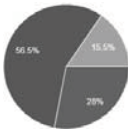
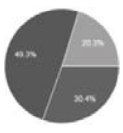
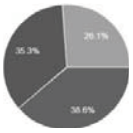
Table 2 describes us that which mobile network is used by students. It is clear that Vodafone network is used by many students followed by Jio, Airtel. Rarely 13 students use other type of mobile networks.

Table 3: Whether their mobile data has Fast network in their Areas

S.no	Mobile Network	Total Count	Fastest	Slow	Moderate
1.	Jio	67	38	13	16
2.	Airtel	57	24	11	22
3.	Vodafone	70	17	36	16
4.	Others	13	2	2	9

If we consider the speed of mobile network on their respective areas as discussed in Table 3, Jio stands first along with Airtel and Vodafone. Though Vodafone network was used by large number of students, Jio becomes fastest network.

Table 4: Performance Metrics with its pie chart

Performance Metrics	More Understanding	More Creativity	Self-Learning	Performance Stability	Team Behavior
Pie Chart					
Performance Metrics	Hard to accept online?	Highly Reachable	Increase Logical Thinking	Blended Mode	High speed of Mobile Network
Pie Chart					

Online Education/Strongly Agree/Yes: Blue

Offline Education/Strongly Disagree/No: Red

Both/Moderate/May be considered: Yellow

Table 4 describes pie charts of some of performance metrics on comparison between online education and offline education. Nearly 41 percent students feel that offline education is highly understandable and 34 percent students feel offline is highly understandable and nearly 26 percent students feel both educations are highly understandable. It is seen that more than 45 percent students think offline education provides more creativity than online and both mode of education. Only 18 percent students feel that both mode of education provides more creativity. While analyzing self learning technique online education take precedence over offline education. Students feel online education provides more time for self education than offline education and both mode of education. Coming to performance Stability on tests, assignments offline education is highly preferable by students than offline and both education modes. Students think that team behavior between them will be increase in Offline education. Nearly 57 percent feel this and 28 percent students feel online education will increase team behavior while 15 percent students feel both education increase team behavior. Nearly 39 percent students think that adopting online education is not so bad. Quarter of students feel it is hard. Half of the students said that Offline education is highly reachable other than two, online and both mode of education. In the criteria of Increasing Logical thinking, 50 percent of students thought Offline education increases logical thinking, other than 20 percent of both education and 30 percent of online education. With respect to Blended mode of education which is combination of both online and offline mode of education, most of the students find out it will be good and only few students think it might not be possible. On comparing High speed of Mobile network 39 percent of students said it is in high speed and nearly 36 students feel it is less speed while moderate speed is voted by 28 percent students.

Figure 2 describes the network issues for the students in their areas. It is good that more than half of the students feel there is no issues on their network in their residence but some 34 percent students feel that they have issues. Some of the issues they said were no signal, tower problems and network issues. Many students feel that cost for data is too high. They say that the cost of net pack is too high, even though they get weak network in their residence.

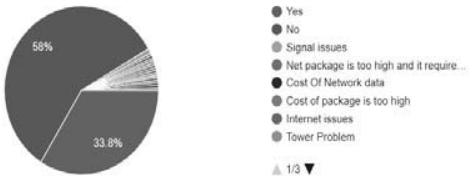


Figure 2: Network issues reasons

V Conclusion

The experimental evaluation and results in this paper let to know about the students opinions about mode of educations by analyzing its performance metrics. This paper also analyzed the issues faced by the students in their residence with their network. It is also analyzed with the help of K Nearest Neighbour algorithm which is one of the Machine Learning Technique to predict the mindset of the students with respective to their answers in the questionnaire. It is concluded that, in the students perspective Offline education tends to be more effective than online education. But online education also has positive impacts on students education and learning. The most important reason why students could not cope up with the online education is signal issues and cost of mobile data. As far as blended mode education (both online and offline learning) is concerned, many students are ready to adopt as analyzed in performance metrics statistics. So in future, blended mode of education can also acquire the place of current mode of education.

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MEASURING THE PROS AND CONS OF E-LEARNING VIA SWOT ANALYSIS

UGC CARE APPROVED

ABSTRACT

The world is moving towards open education. This method of learning brings instructors and students throughout the world closer through the virtual medium of the internet. People are getting a common platform to share their ideas and work together. Institutes, instructors and students are able to collaborate with each other globally. SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats. Online teaching and learning have certain difficulties in maintaining communication between teacher and student because direct and physical contact between people is lost. The technical problems of connectivity, technological equipment, and internet access for users can hinder e-learning processes (Favale et al., 2020). Despite the advantages offered by virtual education due to the flexibility of time and geographical location, there are also some fragile aspects that need concern too. This paper intends to explore and evaluate the pros and cons of online learning via SWOT analysis. The data were collected from 138 teachers and models were developed through SEM and SWOT Grid. It is concluded that, from the SWOT analysis, it is focused that strengths and opportunities have more relationships and weaknesses and Threats have lesser relationships.

***Keywords**: E-learning, Issues, Opportunities, Strengths, Weakness, Threats.*

I. Introduction

Online learning is defined as "learning experiences insynchronous or asynchronous environments using different devices (e.g., mobilephones, laptops, etc.) with internet access. In these environments, students canbe anywhere (independent) to learn and interact with instructors and otherstudents" (Singh & Thurman, 2019).The shift from face-to-face lectures to online classes is the only possible solution for online learning.Indeed, academic institutions would not be able to transform all of their college curricula into and online resource overnight. Distance, scale, and personalized teaching and learning are the three biggest

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challenges for onlineteaching. Innovative solutions by institutions can only help us deal with the pandemic (Liguori& Winkler, 2020).The strengths, weaknesses, opportunities and threats (SWOT) analysis is one of the strategic planning approaches used to evaluate the status of a plan or strategy. The strengths describe which aspects of a topic or part of an organization are superior and what distinguishes it apart from the competitors. The weaknesses stop the effectiveness of a strategy at its desired level. Moreover, the opportunities indicate the desirable external factors which can provide the target strategy with a competitive advantage, while threats point out to the factors that are likely to harm the organization or its strategies.

II.Reviews

In a study, students were found to be not sufficiently prepared for balancing their work, family, and social lives with their study lives in an online learning environment. Students were also found to be poorly prepared for several e-learning competencies and academic-type competencies. Also, there is a low-level preparedness among the students concerning the usage of Learning Management Systems (Parkes et al., 2014).Many students and teachers also face psychological problems during crisis—there is stress, fear, anxiety, depression, and insomnia that lead to a lack of focus and concentration. Disasters create havoc in the lives of people (Di Pietro, 2017). To conduct smooth teaching–learning programs, a list of online etiquette was shared with students and proper instructions for attending classes were given to them (Saxena, 2020).One should not merely focus on the pros attached to the adoption of online learning during the crises but should also take account of developing and enhancing the quality of virtual courses delivered in such emergencies (Affouneh et al., 2020).

III.Research Methodology

This study is based on the primary survey which has been conducted exclusively for the purpose of the preparation of the current paper through Google form. A totalof 138teachers responded to the queries on SWOT analysis and were considered as sample respondents. The data obtained were entered and edited in Excel sheets and then transferred to SPSS for further analysis and the output of Path analysis and Structural Equation Modelling were taken from AMOS.

IV.Strengths

The strengths of the online learning modes can rescue us from these hard times. It is student-centered and offers a great deal of flexibility in terms of time and location. The e-learning methods

enable one to customize procedures and processes based on the needs of the learners. There are plenty of online tools available which is important for an effective and efficient learning environment. Educators can use a combo of audio, videos, and text to reach out to their students in this time of crisis to maintain a human touch to their lectures. The following tables give the analytical assessment of Strength in Online Teaching

Table 1 KMO and Bartlett's Test for the Strength in Online Teaching

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.907
Bartlett's Test of Sphericity	Approx. Chi-Square	1871.669
	df	190
	Sig.	.000

Source: Derived

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is a statistic that indicates the proportion of variance in the variables that might be caused by underlying factors. Generally, the KMO values between 0.8 and 1 indicate the sampling is adequate. From the above analysis, it is found that the value of The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.907 which is close to one expressing strong validity. The value of Chi-square is 1871.67 and is statistically significant as the p value is less than the standard limit of 0.05.

Table 2 Factor analysis for the Strengths in Online Assessment

Variables	**Components**		
	Affability	**Automation**	**Adaptability**
Virtual Classroom	.837		
Dynamic Interaction	.769		
Student-Centered	.751		
Access to Resources	.742		
Flexibility	.710		
Impartiality	.652		
Module results were obtained	.467		
Reduces refreshment cost		.869	
Reduces cost of commuting transportation		.836	
Environmentally sound		.730	
Automated assessment		.616	
Promotes collaboration		.592	
Basic IT skills		.569	
Adjustable timings			.751

Instant result and feedback			.728
Serving many students in a short time			.711
Connected both in and out of class			.669
Better student engagement			.652
Creative Thinking			.584
% of variance	23.77	21.35	21.16
% to total	36	32	32
Correlation Analysis			
	Affability	Automation	Adaptability
Affability	1		
Automation	.577**	1	
Adaptability	**.702****	.700**	1

Source: Primary Survey

Affability is the first factor filtered under the strengths of Online Teaching which consists of the statements such as Virtual Classroom(.837), Dynamic Interaction(.769), Student-Centered (.751), Access to Resources (.742), Flexibility (.710), Impartiality (.652), and Module results were successfully obtained (.467). This factor has a variance of 23.77 percent with 36 percent out of the total. **Automation**is the second factor filtered under the strengths of Online Teaching which consists of the statements such as Reduces refreshment cost (.869), Reduces cost of commuting transportation (.836), environmentally sound (.730), automated assessment (.616), Promotes collaboration (.592), and Basic IT skills (.569). This factor has a variance of 21.35 percent with 32 percent out of the total. **Adaptability**is the third factor filtered under the strengths of Online Teaching which consists of the statements such as Adjustable timings (.751), Instant result and feedback (.728), Serving many students in a short time (.711), Connected both in and out of class (.669), Better student engagement (.652), and Creative Thinking (.584). This factor has a variance of 21.16 percent with 32 percent out of the total.It is understood from the correlation analysis that there exists a positive and significant association between the components Accessibility and Affability (.702**), between Adaptability and Automation (.700**), and between Automation and Affability (.577**). The same is further depicted through Path analysis as below.

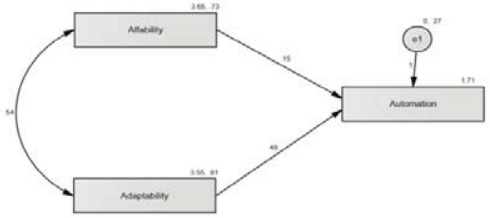

Figure 1: Path Analysis for Strength in Online Classes

Table 3 Regression Weights: Opportunities in Online Assessment

Constructs			Estimate	S.E.	C.R.	P
Automation	<---	Affability	.147	.073	2.01	.045
Automation	<---	Adaptability	.480	.070	6.89	***
Covariance						
Affability	<-->	Adaptability	.540	.080	6.72	***
Correlation						
Affability	<-->	Adaptability	.700			

Source: Derived

As per the regression weights, it is noted that the relationship between Automation with Affability and Adaptabilityis significantas the p values are less than 0.05 and the Critical Ratio values (C.R) are more than the standard limit of 1.96. Further, the Covariance between Affability and Adaptabilityis also statistically significant as per p-value and Critical Ratio and the correlation between the two is positive 0.700 representing a good relationship.

V.Weakness

E-learning has certain weaknesses in the form that it can hamper the communication between the learner and the educator, that is, direct communication and human touch are lost. Users can face many technical difficulties that hinder and slow down the teaching–learning process (Favale et al., 2020). Time and location flexibility, though is the strength of online learning these aspects are fragile and create problems. Students' non serious behavior in terms of time and flexibility can cause a lot of problems.

Table 4 KMO and Bartlett's Test for the Weakness in Online Teaching

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.934
Bartlett's Test of Sphericity	Approx. Chi-Square	2335.78
	df	171
	Sig.	.000

Source: Derived

As a Common phenomenon, the KMO values between 0.8 and 1 indicate the sampling are adequate. From the above analysis it is found that the value of The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.934 which is close to one expressing strong validity. The value of the Chi-square is 2335.78 and is statistically significant as the p-value is less than the standard limit of 0.05.

Table 5 Factor analysis for the Weakness in Online Assessment

Variables	Components		
	Technology issues	Physical Issues	Distraction issues
Lack of computer literacy	.841		
Persons with limited ICT skills	.729		
Expensive resources	.729		
Constantly changing technology	.715		
Lack of Personal Computers	.698		
Extensive faculty training	.665		
Login and enrollment complications	.662		
Lack of awareness	.658		
Lack of coordination among learners	.565		
Can cause depression		.832	
Can lead to insomnia		.802	
Too much sitting		.774	
Worsen eye strain		.683	
Face technical problem		.638	
Difficulty in the usage of software		.636	
Student feedback is limited in online learning			.750
Distractions of Social Media			.727
Lack of attention			.707
Network issues			.562
Increase the habit of cheating			.547
% of variance	29.41	24.26	17.19
Cumulative %	29.41	53.67	70.86
% to total	42	34	24

Correlation Analysis			
	Technical	**Physical**	**Distraction**
Technical Issues	1		
Physical Issues	.754**	1	
Distraction Issues	**.759****	.758**	1

Source: Primary Survey

Technology issues are the first factor filtered under the weakness of Online Teaching which consists of the statements such as Lack of computer literacy (.841), Persons with limited ICT skills (.729), Expensive resources (.729), Constantly changing technology (.715), Lack of Personal Computers (.698), Extensive faculty training (.665), Login and enrollment complications (.662), Lack of awareness on blended learning (.658), and Lack of coordination among learners (.565). This

factor has a variance of 29.41 percent with 42 percent out of the total. **Physical Issue** is the second factor filtered under the weakness of Online Teaching which consists of the statements such as cause depression (.832), lead to insomnia (.802), Continuous sitting (.774), Worsen eye strain (.683), Face technical problem (.638), and Difficulty in the usage of the software (.636). This factor has a variance of 24.26 percent with 34 percent out of the total. **Distraction issue** is the third factor filtered under the weakness of Online Teaching which consists of statements such as Student feedback is limited in online learning (.750), Distractions of Social Media (.727), Lack of attention (.707), Network issues (.562), and Increase the habit of cheating (.547). This factor has a variance of 17.19 percent with 24 percent out of the total.It is understood from the correlation analysis that there exists a positive and significant association between the components Distraction Issues and Technical Issues (.759**), between Distraction Issues and Physical Issues (.758**), and between Physical Issues and Technical Issues (.754**). The same is further depicted through Path analysis as below.

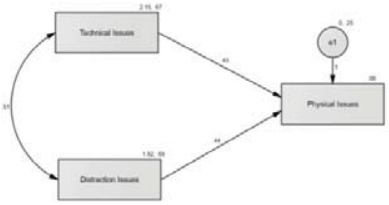

Figure 2: Path Analysis for Weakness in Online Classes

Table 6 Regression Weights: Weakness in Online Assessment

Constructs			**Estimate**	**S.E.**	**C.R.**	**P**
Physical	<---	Technical	.431	.079	5.432	***
Physical	<---	Distraction	.444	.079	5.647	***
Covariance						
Technical	<-->	Distraction	.513	.073	7.076	***
Correlation						
Technical	<-->	Distraction	.759			

Source: Derived

As per the regression weights, it is noted that the relationship between Physical issues and Technical issues and Distraction issues is significant as the p values are less than 0.05 and the Critical Ratio values (C.R) are more than the standard limit of 1.96. Further, the **Covariance between** Technical issues and Distraction issues is also statistically significantas per p-value and Critical Ratio and the correlation between the two is positive to the tune of 0.759 representing a good relationship.

VI.Opportunities

Online learning generally has a lot of opportunities available but this time of crisis will allow online learning to boom as most academic institutions have switched to this model. Online Learning, Remote Working, and e-collaboration sexploded during the outbreak of Corona Virus crisis (Favale et al., 2020).Teachers can practice technology and can design various flexible programs for students' better understanding. The usage of online learning will test both the educator and learners. It will enhance problem-solving skills, critical thinking abilities, and adaptability among the students.

Table 7 KMO and Bartlett's Test for the Opportunities in Online Teaching

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.920
Bartlett's Test of Sphericity	Approx. Chi-Square	2044.19
	df	171
	Sig.	.000

Source: Derived

From the above analysis, it is found that the value of The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.920 which is close to one expressing strong validity. The value of the Chi-square is 2335.78 and is statistically significant as the p-value is less than the standard limit of 0.05.

Table 8 Factor Analysis for the Opportunities in Online Assessment

Variables	**Components**		
	Academic Attainability	**Academic Affordability**	**Academic Accessibility**
Flexibility in the scheduling of classes	.782		
Academic/corporate partnerships	.749		
Synchronous Learning hours	.736		
Upskilling in new technologies and resources	.723		
Academic collaboration	.721		
Development of new online resources	.695		
Provide technical instructions	.655		
Frequent meetings are possible online	.611		
Working remotely	.578		

Stimulate activity		.795	
Stimulation of motivation		.792	
Train Teachers in distance learning		.684	
Teach more students at a lower cost		.677	
Meet new people - social interaction.		.591	
User friendly		.498	
Can store data			.826
Accessibility of Documents			.822
Instant record of results			.777
Learning is accessible regardless of location			.464
% of variance	29.07	21.34	18.64
Cumulative %	29.07	50.41	69.05
% to total	42	31	27
Correlation Analysis			
	Attainability	**Affordability**	**Accessibility**
Attainability	1		
Affordability	**.744****	1	
Accessibility	**.734****	.663**	1

Source: Primary Survey

Academic Attainability is the first factor filtered under the opportunities of Online Teaching which consists of the statements such as Flexibility in the scheduling of classes (.782), Academic/corporate partnerships (.749), Synchronous learning hours (.736), Upskilling in new technologies and resources (.723), Academic collaboration (.721), Development of new online resources (.695), Provide technical instructions (.655), Frequent meetings are possible online (.611), and Working remotely (.578). This factor has a variance of 29.07 percent with 42 percent out of the total. **Academic Affordability**is the second factor filtered under the opportunities of Online Teaching which consists of the statements such as Stimulate activity (.795), Stimulation of motivation (.792), Train Teachers in distance learning (.684), Teach more students at a lower cost

(.677), social interaction (.591), and User friendly (.498). This factor has a variance of 21.34 percent with 31 percent out of the total. **Academic Accessibility** is the third factor filtered under the opportunities of Online Teaching which consists of the statements such as can store data (.826), Accessibility of Documents (.822), Instant record of results (.777), and Learning accessible regardless of location (.464). This factor has a variance of 18.64 percent with 27 percent out of the total. It is understood from the correlation analysis that there existsa positive and significant association between the components Academic Affordability and Academic Attainability (.744**), between Academic Accessibility and Academic Attainability (.734**), and between Academic Accessibility and Academic Affordability (.633**). The same is further depicted through Path analysis as below.

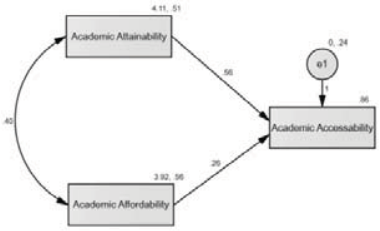

Figure 3: Path Analysis for Opportunities in Online Classes

Table 9 Regression Weights: Opportunities in Online Assessment

Constructs			**Estimate**	**S.E.**	**C.R.**	**P**
Academic accessibility	<---	Attainability	.560	.087	6.423	***
Academic accessibility	<---	Affordability	.260	.083	3.123	.002
Covariance						
Attainability	<-->	Affordability	.395	.057	6.988	***
Correlation						
Attainability	<-->	Affordability	.744			

Source: Derived

As per the regression weights, it is noted that the relationship between Academic Accessibility and Attainability and Affordability is significant as the p values are less than 0.05 and the Critical Ratio values (C.R) are more than the standard limit of 1.96. Further, the Covariance betweenAttainability and Affordability is also statistically significant as per p-value and Critical Ratio and the correlation between the two is positive to the tune of 0.744 representing good relationship.

VII.Threats

Online learning faces many challenges ranging from learners' issues, educators'issues, and content issues. It is a challenge for institutions to engage studentsand make them participate in the teaching–learning process. It is a challenge forteachers to move from offline mode to online mode, change their teachingmethodologies, and manage their time. It is challenging to develop content that not only covers the curriculum but also engages the students (Kebritchiet al., 2017).

Table 10 KMO and Bartlett's Test for the Threats in Online Teaching

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.911
Bartlett's Test of Sphericity	Approx. Chi-Square	2269.86
	df	190
	Sig.	.000

Source: Derived

In general, KMO values between 0.8 and 1 indicate the sampling is adequate. From the above analysis, it is found that the value of The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.911 which is close to one expressing strong validity. The value of the Chi-square is 2269.86 and is statistically significant as the p-value is less than the standard limit of 0.05.

Table 11 Factor Analysis for the Threats in Online Assessment

Variables	**Components**		
	Connectivity issues	**Assessment issues**	**Health issues**
Unstable power supply	.860		
Unsecure Wi-Fi	.836		
Insufficient training	.783		
It is expensive to use LMS	.765		
Lack of computers	.721		
Mandatory websites	.574		
Insecure website	.547		
Plagiarism	.544		
Issues with assessment		.784	
Resistance to adopting change		.759	
Time constraints		.747	
Lack of commitment		.616	
Issue with automation		.533	
Privacy issues		.484	
Unsecured Job		.451	
Distractions and time management.			.836
Technical issues.			.793
Health threats			.709
Effects on eyes			.613
Threat to on-campus institutions			.484
% of variance	26.38	20.93	20.04

Cumulative %	26.38	47.31	67.35
% to total	39	31	30

Correlation Analysis

	Connectivity	**Assessment**	**Health**
Connectivity issues	1		
Assessment issues	.797**	1	
Health issues	.718**	.752**	1

Source: Primary Survey

Connectivity issue is the first factor filtered under the threats of Online Teaching which consists of the statements such as unstable power supply (.860), Unsecure Wi-Fi (.836), Insufficient training (.783), it is expensive to use LMS (.765), Lack of computers (.721), Mandatory websites (.574), insecure website (.547), and Plagiarism (.544). This factor has a variance of 26.38 percent with 39 percent out of the total. **Assessment issues** is the second factor filtered under the threats of Online Teaching which consists of the statements such as Issues with assessment (.784), Resistance to adopting change (.759), Time constraints (.747), Lack of commitment (.616), Issue with assessment (.533), Privacy issues (.484), and Unsecured Job (.451). This factor has a variance of 20.93 percent with 31 percent out of the total. The health **issue** is the third factor filtered under the threats of Online Teaching which consists of the statements such as Distractions and time management (.836), Technical issues (.793), Health threats (.709), Eye Strain (.613), and Threat to on-campus institutions (.484). This factor has a variance of 20.04 percent with 30 percent out of the total. It is understood from the correlation analysis that there existsa positive and significant association between the components Assessment issues and Connectivity issues (.797**), between Health issues and Assessment issues (.752**), and between Health issues and Connectivity issues (.718**). The same is further depicted through Path analysis as below.

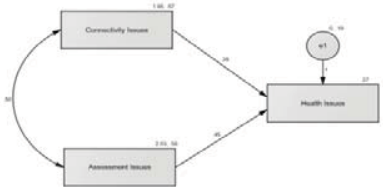

Figure 4: Path Analysis for Opportunities in Online Classes

Table 12 Regression Weights: Opportunities in Threats Assessment

Constructs			**Estimate**	**S.E.**	**C.R.**	**P**
Health	<---	Connectivity	.278	.076	3.649	***
Health	<---	Assessment	.450	.082	5.524	***
Covariance						
Connectivity	<-->	Assessment	.497	.068	7.296	***
Correlation						
Connectivity	<-->	Assessment	.797			

Source: Derived

As per the regression weights, it is noted that the relationship between Health issues and Connectivityissues and Assessmentissuesis significantas the p values are less than 0.05 and the Critical Ratio values (C.R) are more than the standard limit of 1.96. Further, the Covariance betweenConnectivity and Assessmentisalso statistically significant as per p-value and Critical Ratio and the correlation between the two is positive to the tune of 0.797 representing a good relationship.

Table 13 Correlation Among Swot

		Strength	**Weakness**	**Opportunities**	**Threats**
Strength	r	1			
	Sig				
Weakness	r	-.142	1		
	Sig	.097			
Opportunities	r	**.706****	-.255**	1	
	Sig	.000	.003		
Threats	r	.084	**.429****	.022	1
	Sig	.328	.000	.796	
**. Correlation is significant at the 0.01 level (2-tailed).					

Source: Derived

The degree of relationship is positive between Strengths and Opportunities (.706**) and is comparatively low between Threats and Weaknesses (.429**) while other interrelationships are meager and negative. However, the following figure explains the path analysis among the variables of SWOT analysis.

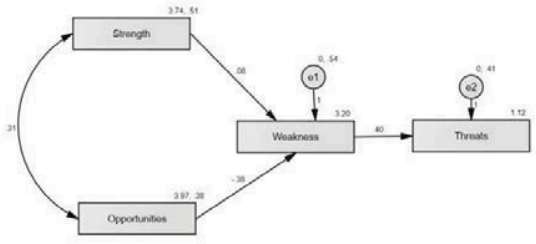

Figure 4: Path Analysis for SWOT Analysis

Table 14 Model fit Indices for the Structural Equation Modeling on Swot

Name of category	Name of index	Adequate fit	Index Value	Remarks
Absolute Fit measure	CMIN/DF	< 3.00	2.015	Accepted
	AGFI	> 0.90	0.962	Accepted
	RMSEA	< 0.80	0.860	Not Accepted
Incremental fit measure	NFI	> 0.90	0.970	Accepted
	CFI	> 0.90	0.984	Accepted
	TLI	> 0.90	0.953	Accepted
	IFI	> 0.90	0.985	Accepted
Parsimonious fit measure	PCFI	> 0.50	0.328	Not Accepted
	PNFI	> 0.50	0.323	Not Accepted
	p-value	> 0.05	0.133	Accepted

Source: Derived

The above table shows the model's fitness. In the case of absolute fitness, CHIN/Df value is 2.015 is less than 3, AGFI is 0.962 is greater than 0.9, and RMSEA is 0.860 which is more than 0.80. Thus, the model for the SWOT analysis on Online Teaching is an adequately fit. The incremental fit measure includes the value of the Normal Fit Index (NFI) is 0.970 > 0.9, Comparative Fit Index (CFI) is 0.984 > 0.9, the Tucker Lewis index (TLI) is 0.953 > 0.9, and Incremental Fit Index (IFI) is 0.985 > 0.9 and proves the incremental fitness of the model. The parsimony comparative fit index (PCFI) value is 0.328 is lesser than the desired value of 0.5 and the Parsimony normed fit Index (PNFI) value is 0.323 is lesser than the required value of 0.5. Though the value of the Parsimony Goodness of fit Index (PGFI) is less than the desired values still the value is close to the required level. Thus, the value of all the indices except the Parsimonious fit measure satisfies the criteria required for having the fitness model. The p-value is 0.133 which is more than the required value of 0.05 denoting the significance.

Table 16 Regression Weights: Opportunities in Online Assessment

Constructs			Estimate	S.E.	C.R.	P
Weakness	<---	Strength	.080	.123	.652	.514
Weakness	<---	Opportunities	-.380	.143	-2.650	.008
Threats	<---	Weakness	.400	.072	5.565	***
Covariance						
Strength	<-->	Opportunities	.312	.046	6.751	***

Constructs			Estimate	S.E.	C.R.	P
Correlation						
Strength	<-->	Opportunities	.706			

Source: Derived

As per the regression weights, it is noted that the relationship between Weakness and Opportunities(.008) and between Threats and Weakness (.000) is statistically significant and between Weakness and Strength (.514) is not statistically significant as the threshold value of p is 0.05. Further, the Covariance betweenStrength and opportunities is also statistically significant as per p-value and Critical Ratio and the correlation between the two is positive to the tune of 0.706 representing a good relationship.

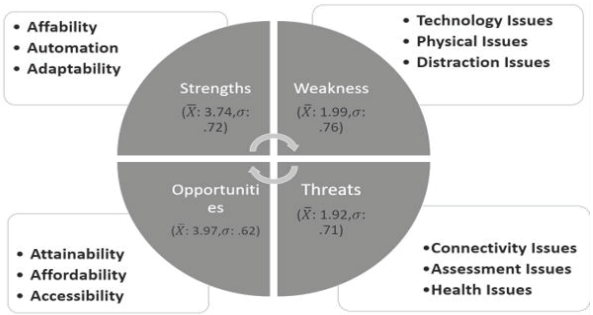

Figure 5: SWOT Analysis

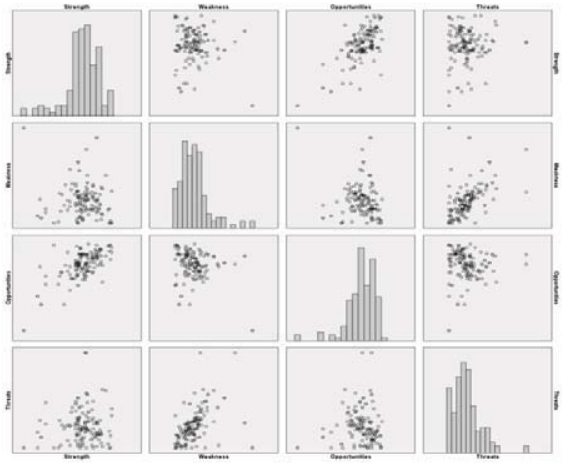

Figure 6 SWOT Grid Analysis

VIII.Conclusion

Ensuring digital equity is crucial in this tough time. Not all teachers andstudents have access to all digital devices, the internet, and Wi-Fi. Unavailability ofproper digital tools, no internet connections, or Wi-Fi connections can causea lot of trouble due to which many students might lose out on learning opportunities. The present study focus on the Pros and Cons of E-learning Via SWOT analysis. The opinion obtained from 138 teachers from various places resulted that the strengths of online learning filtered with the components of Affability, Automation, and Adaptability, the weakness of online learning filtered with the components such as Technology issues, Physical Issues, and Distraction issues, the opportunities of online learning filtered with the components such as Academic Attainability, Academic Affordability and Academic Accessibility and the threats/challenges of online learning filtered with the components such as Connectivity issues, Assessment issues and Health issues. It is concluded that the issues under the components of SWOT analysis are more intense among Connectivity Issues, Distraction Issues, Physical Issues, Health Issues and Assessment Issues. From among the SWOT analysis, it is focused that strengths and opportunities have more relationships and weaknesses and Threats have lesser relationships. Efforts should be taken by institutions to ensure that every student andfaculty is having access to the required resources and can increase the implementation of digitalization to wider higher education in all aspects.

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OUTCOME OF USING THE SUPER MARIO EFFECT IN E-LEARNING

UGC CARE APPROVED

ABSTRACT

In Today's Uncertain World, Online Modes of Teaching and E-Learning have become the new normal after situations such as the Global Pandemic and such. Most Students Prefer to learn new concepts with the help of the internet since it provides a better insight into the concept they are trying to learn compared to the traditional classroom. Although self-discipline is very much essential for a proper session of distraction-free learning, this method of learning has proven itself very useful to a lot of students as well as teachers. However, the major drawback of this method is that when learning concepts on the internet it is very much essential to keep a track of your understanding. Although E-learning sites provide questions in between modules to check your ability they are often not taken into much consideration. So to overcome this problem we can utilize a method called the "Super Mario Effect". Super Mario is a game where a player progressively learns about the game's various traps and power-ups, and each time the player has lost their(in the game) life and restarted the level he plays through the level with a new level of understanding. This cycle of failure and learning makes it easier for a new player to understand the game much more quickly. The same method can be implemented in our online mode of learning as well, Where the student cannot pass through a module unless and until they have cleared the corresponding test, And, if at any point the student fails to get a passing mark in a test module then the whole lesson would restart to make sure the student gets hold of the proper answers to the questions. This way of learning can improve not only the understanding capacity of the students but also it can help full in training their capacity to retain the information learned to a much better extent.

Keywords: *Super Mario Effect, E-Learning, Tests, Online Assessment.*

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I. Introduction

The Legacy of the traditional education system has been held up strong for a long time. But in recent times after the global pandemic, the approach toward education has changed. Students using applications like "Zoom" and "Google Meet" to attend classes and sites like "Youtube", "Byjus", "Vedantu" and "Khan Academy" have made it easy for students to learn even during prolonged quarantine. The World has realized how students can be educated properly even when they stay at home. With this new era of learning, there are certainly a lot of shortcomings and drawbacks such as "lack of interest", "Procrastination" and "Excessive Screen-time" but the Advantages are also plenty when compared to the traditional method of learning. A Student can have a more"Convenient", "Flexible", "Affordable" and"Customised" learning experience.

Due to the advent of online classes, the process of teaching has also drastically changed itself to adapt to new ways of teaching. Teachers have started to make recorded videos to teach their students with the help of tools like pen tablets and whiteboards. Most of the online lessons taken by students were recorded sessions during the start of the pandemic and even after the pandemic, the number of students learning with the help of recorded videos and practice questions has only increased drastically.

So to make the method of learning through recorded videos this paper compares how the application of the "Super Mario Effect" while learning through recorded videos. "Super Mario Effect" is a psychological trick to help achieve success by exploiting the power of repetition. The concept is that if you fail X number of times then you have crossed X steps in the process to success.

II. Super Mario Effect

Super Mario is a platformer game developed and published by Nintendo in 1983. The Objective of the game was for the player to traverse the main character "Mario" through a series of platforms and obstacles to reach the end of each level. The special part of this game was that it was hard for players to traverse the main character through the maze of platforms and enemies to the end of the level to reach the flag that triggered the end of the level. The game was made even tough to beat since each time the player made a mistake and lost a life the game would reset itself to the start of the level. Despite the fact that this made the game annoying,players somehow wanted to reach the end of the level after the amount of effort they have put so far into reaching the goal. Since the player learned a new fact about the level each time they were killed by an enemy or fell to their

death into a trapdoor, They, had one more arrow in their quiver to complete the level. The sense of accomplishment a player earns at the end of the level keeps them wanting more. The fact that we can learn from this game is that when triggered properly we can use our frustration and sense of failure to trick our brain to do more complex and complicated tasks with ease. The repetitive cycle of failure,learning, and applying the knowledge gained from previous failures to tackle problems helps the brain get a good grasp of any concept.

Drawing parallels to the game, the student represents Mario. Just like how Mario is inexperienced in the game, the student also might have less knowledge of the concept they are going to learn. The concept resembles the game where we have many hurdles and levels to cross to reach the goal.

Every level in the game is represented by a segment of the concept where the student watches the video and answers the questions. Here we divided the topic into smaller segments so that every student gets deeper knowledge of the segments. It also makes sure that the student is not pressured into learning heavy concepts vaguely. Clearing the smaller segments will keep the student motivated to complete the other levels as well as give them confidence that they can master the concept. The questions could represent both the trap doors as well as the power-ups present in the game. If the student answers the questions correctly, they easily pass to the next level. But, if they fail to get the correct answer, the assessment goes back to the first page, and hence, the student ends upgoing back to the first segment. This happens so that the student can see where they have made the mistake and if necessary, learn the concept again and answer the questions. In the game, as Mario keeps clearing the levels, he becomes stronger and the player becomes aware of the locations of coins and power-ups. Similarly, as the student completes every segment in the concept, he becomes stronger in the topic. Though there may be failures, it is an opportunity for the student to rectify their mistakes and re-learn the concept in a better way. The final goal in the game is to rescue princess peach from king Koopa aka browser (the villain). In our scenario, princess peach is our strength in the concept which is determined by our scores on the overall test. Here, the test for the entire concept resembles Browser. After learning the concept using the super Mario effect, the scores on the test are highly likely to improve and the student will be relatively stronger in the concept just like how Mario reaches his goal, the student also can strengthen themselves in the concept that they have been lagging in

III. Using Super Mario Effect For Learning

A. Preparation of the material

First, the lesson to be learned has to be split into smaller sections that seem comfortable to learn at a time. Then each section is to be allocated a set of practice questions. This is the preparation that is required to implement and use the "Super Mario Effect" for learning a new concept.

B. Learning using the "Super Mario Effect"

- To start the student has to learn the first segment and answer its corresponding questions.
- Then the student has to check for errors in the questions answered by them.
- In case the student gets an answer wrong then the student must start all over from the first segments.
- If the student gets the right answers to all the given questions, then the student can continue to the next section.
- In any circumstance, if the student fails to answer a given question, then the student has to start all over again from the first segment.
- The following are the basic steps to use the "Super Mario Effect"for learning.
- Even if the student feels frustrated due to the large amount of repetitive work, the progress made so far by him/her will help them stay motivated long enough to finish the lesson.

IV. Method

The method used to implement the "Super Mario Effect" for use in online learning involves the use of "Google Forms"and Videos from "YouTube".

Step 1:

Topics to be taught or learned are decided and video material is collected for the same. We decided to use the topics "Basics of Scheduling" and "Processes and Threads" from "Operating Systems" to be used as the material. We Searched the internet to compare pre-recorded videos to use for the Experiment. After much comparison, we ended up choosing videos from a youtube channel called "Neso Academy". The reason for choosing this channel was that they had easily understandable videos that used simple English to convey the information properly. The reason for choosing these two topics was that they both had a similar level of complexity. This helped us maintain a fair ground for comparison of the conventional method and the one that involves the use of the "Super Mario Effect".

Step 2:

We went through the entire set of recorded material and filtered the essential videos from the practice problems. Then each of the chosen segments was analyzed and five questions were prepared from each segment. Each segment had five different types of questions from different levels of difficulty. The questions were also prepared in a way such that each one required a different level of understanding to answer properly. The Questions were of a multiple-choice type to be easily integrated into "Google Forms".

Step 3:

The chosen questions and video segments were uploaded in the correct sequence to the google form. The "Section" function was used to separate the videos and questions. The sections were arranged in the order of "Video Segment" and "Corresponding Questions". To implement the looping part of the method we used the google form "Proceed to Section" feature to loop the flow of the form to the starting page if and when any question is answered wrong.

This makes it in a way such that only when a student gets all the questions correct, they will be able to complete the lesson. The most important step was to modify the function of the previous button in the google form as students can bypass the looping feature by using the previous button. The settings were changed to disable the function of the previous button.

Step 4:

The final changes were made to the setting of the google form to accept only one response from a student. This helped us a lot at the end when the data was analyzed as it did not require the filtering of data at the time of analysis. The settings to generate an excel spreadsheet using the response to the questions were also turned on to collect the data and import it into "Juypter Note Book" later for analysis. Additionally, the mail id of each student was collected to make a correlation of the data much easier while it is being analyzed.

Step 5:

This last step involved the use of the "Shorten URL" function to shorten the link of the google form for easier circulation. The form was also finalized and a time limit was set. The choices of the form's questions were also set to shuffle to prevent the student from copying from friends.

With this last step the form was finalized and the URL to access the form was shared with the students who participated in this experiment.

Step 6:

Once the Link to the two forms (Form 1 without the use of the "Super Mario Effect" and Form 2 with the use of the "Super Mario Effect") where shared, we started monitoring the analytics tab to watch over the responses of the students and to have a check over any unusual change in responses. After the time limit of the links expired, the data was converted to two separate excel sheets and was uploaded to “Juypter Note Book” for further analysis.

Analysis of Data Collected

The data that was collected in the Spread Sheet was cleaned and uploaded into JuypterNoteBook for further analysis.

A combination of Pandas and Matplotlib packages where used to analyze the data.

- First the Data from both the normal test on the Basics of scheduling and the test conducted after using the "Super Mario Effect"to teach the concepts of Processes and threads.
- From now on let us refer to the first data set as Before Effect and the second data set as after effect.
- Here is the Summary of Both the data sets of marks scored before and after using the super Mario effect

  Before Effect:

	Email	Total_Score
0	aishwariyaa@student.tce.edu	4
1	anugayathri@student.tce.edu	10
2	balasivam@student.tce.edu	10
3	balasundaram@student.tce.edu	6
4	dhaneshwar@student.tce.edu	6
5	duraisamy@student.tce.edu	6
6	fathimafirose@student.tce.edu	8
7	hariharinni@student.tce.edu	10
8	harshiniv@student.tce.edu	10
9	hirthick@student.tce.edu	8
10	hiruthik@student.tce.edu	6
11	jayalakshmir@student.tce.edu	2
12	jayshnee@student.tce.edu	6
13	kaveens@student.tce.edu	10
14	msaravanakumar1@student.tce.edu	8
15	narmadhar@student.tce.edu	10
16	pnandhini@student.tce.edu	6
17	sathyasai@student.tce.edu	6
18	sharanb@student.tce.edu	10
19	shyamsundarm@student.tce.edu	8
20	sivaguru@student.tce.edu	6
21	sujan@student.tce.edu	8
22	sweathasm@student.tce.edu	8
23	varshal@student.tce.edu	10
24	vinikshaa@student.tce.edu	10
25	vinothar@student.tce.edu	10

After Effect:

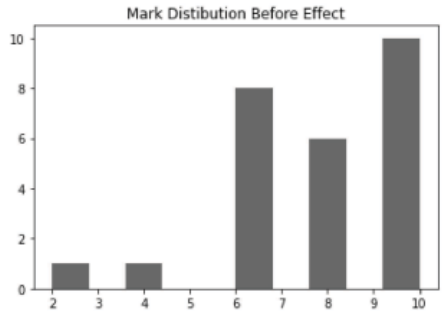
	Email	Total_Score
0	aishwariyaa@student.tce.edu	6
1	anugayathri@student.tce.edu	9
2	balasivam@student.tce.edu	8
3	balasundaram@student.tce.edu	9
4	dhaneshwar@student.tce.edu	9
5	duraisamy@student.tce.edu	7
6	fathimafirose@student.tce.edu	8
7	hariharinni@student.tce.edu	9
8	harshiniv@student.tce.edu	9
9	hirthick@student.tce.edu	8
10	hiruthik@student.tce.edu	7
11	jayalakshmir@student.tce.edu	8
12	jayshnee@student.tce.edu	8
13	kaveens@student.tce.edu	7
14	msaravanakumar1@student.tce.edu	8
15	narmadhar@student.tce.edu	9
16	pnandhini@student.tce.edu	6
17	sathyasai@student.tce.edu	9
18	sharanb@student.tce.edu	7
19	shyamsundarm@student.tce.edu	6
20	sivaguru@student.tce.edu	9
21	sujan@student.tce.edu	9
22	sweathasm@student.tce.edu	8
23	varshal@student.tce.edu	6
24	vinikshaa@student.tce.edu	6
25	vinothar@student.tce.edu	10

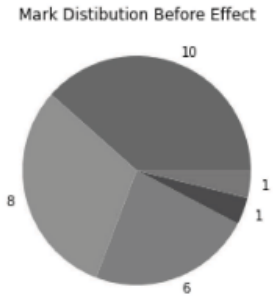
- The average of the total marks scored by the set of students who have participated in the collection of data is 77.69% Before using the effect and 78.84%. The Formula used for the calculation of the average is :

$$A = \frac{1}{n}\sum_{i=1}^{n} a_i$$

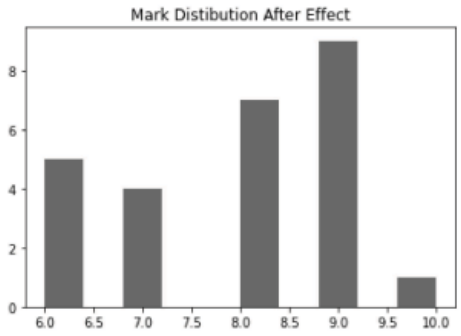
- Here is the graphical representation of both data sets

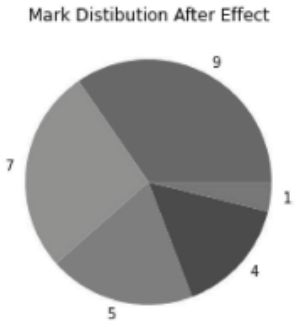
Before Effect:





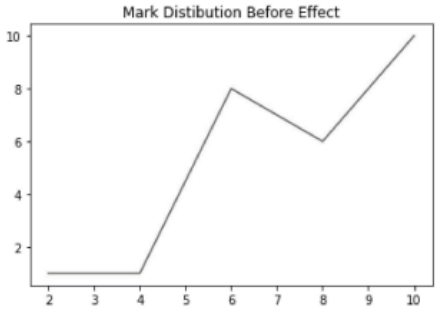
After Effect:



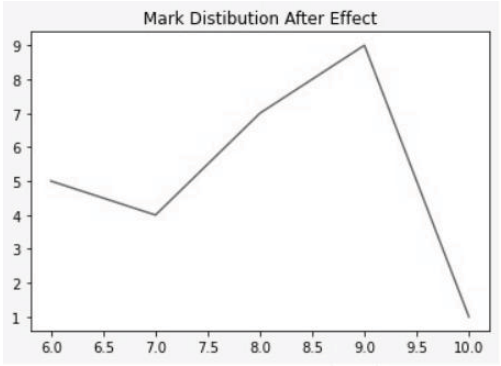


- Here is the general distribution of marks of the two data sets

Before Effect:



After Effect:



- The Difference in the Highest marks in both scenarios is non-existent. But the difference in the lowest marks of both scenarios is 40%. From this, we can have a conclusion that the use of the "Super Mario Effect" has greatly benefited the students who had a below-average score, to begin with, while they conventionally learned the topics by the use of only recorded videos.

VI. Results from Collected Data

- The usage of the "Super Mario Effect" to teach students the concepts showed an increase of 1.15% in the average marks of the students.
- **Outliers:** The Number of students below the score of 50% reduced drastically after implementing the “Super Mario Effect” to teach them.
- **Outliers:** The highest total also dropped from 100% to 90%.This indicates that this method is not suited for people who can have a good understanding of the topics even without the need for such methods.By following such methods they tend to drop their normal score by a significant amount.
- The overall number of students who got a decent score (above 60%) saw an increase in the count after using the effect.
- The number of students that participated in the experiment where 30 but only about 26 people made it to the end of the lesson in the given time.This indicates that this method takes longer for slow learners to use.
- Despite the number of students with better scores have increased as a result of the effect, the graphs clearly indicate that this learning methodology has not affected the students who already had a good score on the normal test.So this method is best suitable for use by students with average and below-average marks.
- The effect only had a slight negative impact on the students with good scores.So students with good scores are better off using their own method of learning to score better.
- The Effect has also proven itself in improving the students who needed just a little bit to perform and give above-average results.
- Though the increase in the average of the entire set of students is only 1.15% the number of students who have got better marks has increased.This can be seen clearly in the above-mentioned graphs and charts.
- The Number of Students who got the answer correct for the harder questions in the forms saw an increase after the use of the “Super Mario Effect”.

VII. Insights from Collected Data

- This method of learning has a proven effect on students who have a score that is average or below average.

- The use of the "Super Mario Effect" has made it easy for most slow learners to gain a better understanding of the given topic faster.
- The “Super Mario Effect” does not have any significant effect on the students who already have a good score.
- Despite being a little bit more time-consuming than other conventional methods of learning using recorded material, the use of the “Super Mario Effect” is definitely more helpful for a better and easier understanding of a given concept.
- The “Super Mario Effect” is in no way a substitute to live online classes or Physical Classes, it’s just a better method that can be used by students who use recorded sessions to learn concepts to get a better understanding of the concepts.
- The “Super Mario Effect” is best suited for students
  who have good self-discipline because, procrastination while using this method for learning will lead to a waste of time due to the flow of the learning method.

VIII. Conclusion

As we can clearly see from the results derived this method is definitely useful to bring a better understanding to students while using recorded videos to teach. Despite the method not being helpful for students with good grasping power, this method has proven to be very useful when teaching students with an average and below-average scores.

The major problems with the use of this method at this point are:

- All the material has to be prepared manually by the teacher and has to be manually uploaded to google forms. This process can be time-consuming and hectic if it has to be followed on a regular basis.
- The Video content for lessons might not always be available on youtube and might need to be created by the teacher in order to use it with this method of teaching, as a result, the process can become even more time-consuming to finish.
- The repetitive nature of the lesson when answered wrong can lead to students getting frustrated and quitting mid-lesson due to the lack of concentration. Thus, this can affect the learning of students with a low attention span or students with problems like ADHD.
- In places, with low internet bandwidth, it might not always be possible to view the videos repetitively due to the large amount of buffering

- Some topics might not be compatible with the flow of this method of learning. Example: Topics with lots of numerical problems that require working out
- (or) Topics that require descriptive answers to evaluate properly

The Solutions to some of the problems that can be created in the future to improve this method further:

- The creation of an automated system to scrape the web for questions and videos to get appropriate content can be useful when preparing the material. This solution can be created with the help of NLP(Natural Language Processing) and Web Data Extraction APIs.
- The construction of a custom framework to implement the teaching method can also benefit the teachers who create the content. The framework can be made in such a way that the videos required can be downloaded and played repeatedly without the requirement for an internet connection. The creation of such a framework also bypasses the need to rely on google forms for collecting, storing, viewing, and evaluating the necessary contents.
- Such a framework can be created by using a combination of front-end and back-end APIs. This system has to support the looping function between sections and also has to maintain a database of video segments and questions to work successfully.

Other future improvements to the method can be to add a loop counter and make the lesson stop after certain cycles to prevent the students from getting demotivated

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   Pp 1-2
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PERCEPTION OF TEACHERS TOWARDS THE USE OF LEARNING MANAGEMENT SYSTEM IN TEACHING AND LEARNING

UGC CARE APPROVED

ABSTRACT

This study examines the perception of teachers towards the use of learning management system in teaching and learning. Sample of the study includes 75 teachers from the higher education institution and were selected using purposive cluster sampling technique. Data was collected using Questionnaire constructed by the investigator consisting of 25 items. The data was collected through google form. The reliability coefficient was found to be 0.89. The findings revealed that majority of the teachers showed positive perception towards the use of learning management system in teaching and learning. Findings also showed that 94% of teachers felt it difficult to use the learning management system continuously in their teaching due to the fact that the students learning could not be ensured completely and the interaction with the students could not be assessed. The factors including stream, subject , exposure to learning management system and frequency of using the learning management system affected the perception of the teachers and was significantly related . The knowledge about the various learning management system among the teachers showed explanatory significance in the perception of the teachers towards the use of learning management system. The study suggests training the teachers in using the learning management system effectively and also to help the teachers use the learning management system continuously in their teaching.

Keywords*: Perception, learning management system, higher education.*

1. Introduction:

At this age of technological explosion, online education tools are being widely used in higher education system to facilitate teaching and learning in the present scenario. Informationis largely available online. Teachers and students are using these resources widely and at their own pace. The roles and responsibilities of the teachers are increasing in par with the growth of technology and its use in the education sector. They are in need to ensure the correct usage of technology by the student

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community. Learning Management System (LMS) is the new technological support the teachers are adopting to manage their students accessibility to the course material and their learning activities. All higher education institutions globally are encouraging their teachers and students to use Learning Management System (LMS) in order to provide 24/7 accessibility to the resources. This Learning Management System (LMS) serves as the communication tool and the medium to share knowledge. Thus, Learning Management System (LMS) has created the opportunity to teachers and students to use the digital technology in educational context. Many higher education institutions have adopted the Learning Management System (LMS) to increase the quality of teaching and learning and to encourage the teachers and students to be more interactive. Learning Management System (LMS) is introduced worldwide in education to deliver the course materials to students, allow the teachers to communicate with the students 24/7 and to equip them with all technological skill. This Learning Management System (LMS) also creates a virtual place to allow interaction between the teachers and students [1]. With this in mind, the researcher sought toexamine thePerception of teachers towards the use of Learning Management System in Teaching and Learning and present in this paper.

2. Literature Review:

W.W. Goh, J. L. Hong and W.Gunawan (2014) [1], in their study revealed that the perceived simplicity of using Moodle for teaching does not inspire good responses from academics. Lecturers only partially make use of Moodle's interactive capabilities, treating it as a content repository. It was discovered that usability problems, interaction problems, and communication problems negatively impacted the lecturers' perception.

Hsu & Chang [2] explore the willingness of students to adopt Moodle for learning. The findings showed that the most important factor directly influencing students' attitudes about adopting Moodle is perceived ease of use.

Ahmad and Fitrianto Eko Subekti (2021) [3] , in their study showed that more than 40% of instructors say that the LMS facilities are excellent, and more than 60% of teachers concur that using Moodle has a favourable impact on math learning. More than 30% of respondents to this study disagreed that teachers were prepared to use Moodle, indicating that teachers do not view resources as being ready.

3. Objectives of the Study:

To find out the perception of teachers towards the use of learning management system in teaching and learning

To offer suggestions to the teachers to develop positive perception towards the use of learning management system in teaching learning

4. Methodology:

The present study was conducted under survey method.Sample of the study were selected using purposive cluster sampling technique which includes 75 Higher Education Teachers from MotherTeresaWomen's University. Data from the selected sample was collected using Questionnaire constructed by the investigator consisting of 25 items. This tool was a two point scale with scoring 2,1 respectively. The tool was validated based on the pilot study. The reliability coefficient of the tool used was found to be 0.89.

5. Analysis and Interpretations:

QualitativeandQuantitativeanalysisofdatarevealedthatmajorityoftheselectedsamplehad positive perception towards the use of learning management system in teaching learning

Table 1 Knowledge about Learning Management System (LMS)

Familiarity	No. of Respondents	Percentage
Yes	75	100
No	0	0
Total	75	100

From the above table, it can be noted that 100 percent of the respondents had the knowledge about the various Learning Management System (LMS) and its uses in the higher education system.

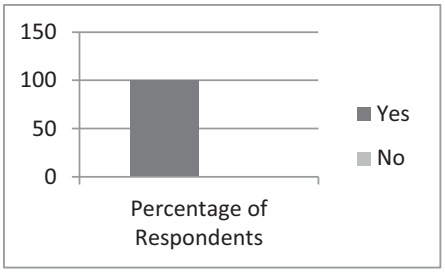

Table 2 Familiarity in using Learning Management System

Familiarity	No. of Respondents	Percentage
Yes	66	88
No	9	12
Total	75	100

The above table stated that, though the teachers had the knowledge about the various Learning Management Systems, 88 percent of them were familiar on how to use the Learning Management System and 12 percent of them were not familiar about using the Learning Management System.

Table 3 Difficulty in using Learning Management System

Difficulty	No. of Respondents	Percentage
Yes	19	25
No	56	75
Total	75	100

The above table shows that, 25% of the teachers had difficulty in using the Learning Management System and 75 percent of the teachers did not have any difficulty. The teachers opined that they faced lot of difficulty in organizing the LMS since it has lot of steps for each activity.

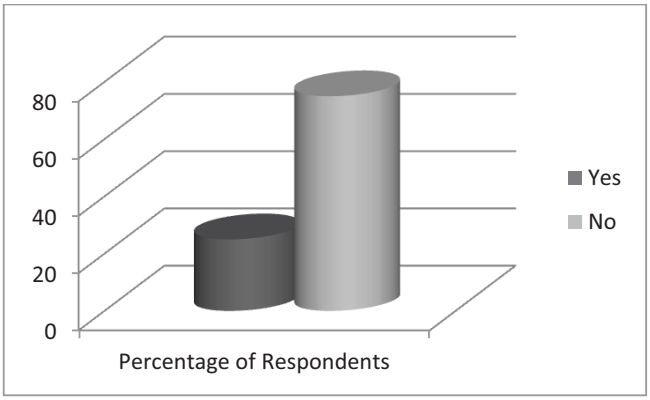

Table 4 Benefit sofusing Learning Management System

Benefits	No. of Respondents	Percentage
Yes	65	87
No	10	13
Total	75	100

The above findings reveal that 87 percent of the higher education teachers benefited from using Learning Management System. They added that this helped them highly during the lockdowns and online classes. 13 percent of the teachers opined that they did not benefit of using Learning Management System.

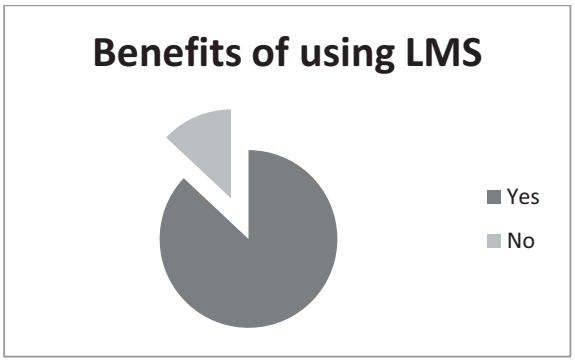

Table 5 Effect of LMS in students achievement

Achievement	No. of Respondents	Percentage
Yes	63	84
No	12	16
Total	75	100

When comparing to the use of LMS on the learning of students, it is seen that 84 percent of the teachers state that Learning Management System had positive effect on the learning of the students and 12 percent of the teachers stated that there was no remarkable effect on the learning of the students. They also added that this may be due to the fact that the students are not in control and also the interaction between the teacher and the student also lacks.

6. Qualitative Analysis:

Learning Management System creates a more open atmosphere for the students to stay connected and keep them engaged in class discussions. Literatures suggest that the primary role of LMS is to communicate the intended learning activities to students and to act as content repository for the creation and management of resources. Based on the previous research, students and lecturers are satisfiedwith the performance and stability of Moodle [4][5][6]. The researcher conducted the study to find the perception of the higher education teachers towards the use of Learning Management System. The teachers in overall had a positive perception towards the use of Learning

Management System. They opined that the use of LMS like google classroom is easy to adapt but the LMS like Moodle is difficulty for them to use because it has lot of steps to organise every activity. The activities of the students can be assessed to some extent. The teachers feel that there is less interactivity as compared to other social networking tools like whatsapp messenger. The teachers also said that the new users require technical support to use the LMS to the fullest benefit[7].

7. Findings and Conclusion:

- The teachers in the higher education system had positive perception towards the use of LMS
- All the teachers had the knowledge about the various LMS available
- Majority of the teachers were familiar with the usage of LMS in their teaching
- The teachers opined that they faced lot of difficulty in organizing the LMS since it has lot of steps for each activity.
- They also added that the using of LMS has less effect on the students learning due to the fact that the students are not in control and also the interaction between the teacher and the student also lacks.
- .The teachers feel that there is less interactivity as compared to other social networking tools like whatsapp messenger

8. Conclusion:

Thus the results of this study demonstrate that teachers can engage more fully in LMS if they understand its value and give it some serious thought. Learning Management System is simple to use for instruction. In order to provide good user support and motivate teachers to use the system, universities should offer a lot of workshops and training opportunities. This will increase teachers enthusiasm in utilising LMS and lessen their worry about it.

Acknowledgement

I would like to express my sincere thanks to all the staff who completed the questionnaire and answered it towards the successful conduct of the research.

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PROFESSIONAL COMPETENCIES OF EDUCATORS IN THE PANDEMIC ERA

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ABSTRACT

Numerous studies have been conducted worldwide to assess the problems associated with the COVID-19 lockdown in general and especially with online learning. Teachers are the most important actors in improving students' learning outcomes and thus in addressing a learning crisis during the pandemic era. Throughout the closure of educational institutions, teachers continued to teach under extremely fluid and trying conditions: increased workloads, having to use new and unfamiliar technologies without adequate training, experiencing a lack of materials for online instruction, high levels of physical and mental stress, and insufficient support. This study focus on the professional competency of the teachers in the midst of new normal teaching experiences. An online survey was conducted to collect data. The configuration questionnaire link was sent to educators using the "Google Form" via WhatsApp and email and received complete responses from 50 respondents. The researcher used statistical tools such as percentage analysis, reliability testing and factor analysis using SPSS and SEM using AMOS. Educators' academic activities are divided into three components and named as professional, academic and research and the components were evaluated and fitted as a model through SEM. It is inferred from the study that through struggles and hurdles, the educators proved themselves as professional educators.

***Keywords**: CFA, College Educators, COVID-19, Online Classes, Online Courses, Pandemic Lockdown, SEM and Online Teaching.*

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I. Introduction

In China (Wuhan), from December 2019 pneumonia caused by the novel coronavirus (SARS-CoV-2) was spread. It is the largest infectious disease. The WHO says COVID-19 (coronavirus) is an infectious problem. Cases of coronavirus have been increasing day by day since the first case in India was detected on January 30, 2020. Colleges and educators were only doing academic interaction in online and were eagerly awaiting the end of the situation. Colleges, professors and students face various challenges and obstacles. In this gaze, many colleges and universities across India have canceled or modified educational activities such as conferences, seminars, FDPs, workshops and other educational and sports activities because universities and colleges need to protect and maintain their students and faculties health. College professors use their time effectively to attend virtual courses and classes, teach classes online and does their research work. In this brief study, the researcher would like to project a model for the professional competencies of educators during pandemic era.

II. Purpose of the Study

The motive of the present study is to fit a suitable model using SEM among College Educators' Academic Activities during COVID-19 Lockdown. From this perspective, the research was aimed to analyze the college educators' academic activities and divided into component and SEM approach.

III. Methodology

Descriptive research was undertaken to assess the college educators' academic activities during pandemic lockdown. An online survey was conducted to collect data. The configuration questionnaire link was sent to educators using the "Google Form" via WhatsApp and email. The total number of respondents was 50 educators and the educators provided complete information related to the study survey. The researcher has used statistical tools such as percentage analysis, reliability testing and factor analysis using SPSS and SEM using AMOS.

Review of Literature

- Priyadarshani H D C and Jesuiya D (2021), their studies show that students are satisfied with online classes and receive adequate teacher assistance, but they do not assume that regular classroom teaching will be replaced by online classes. Teachers face difficulties in conducting

online classes due to lack of proper preparation and development to do online classes. Online classes for practical subjects are difficult to conduct. Teachers are not supportive of implement online classes without proper training and proper infrastructure facilities such as networks and computers. They suggested that take steps to address barriers to embracing online learning is important.

- Lokanath Mishra, Tushar Gupta and AbhaShree (2020), The purpose of their study is to address the essential needs of online teaching-learning in education in the midst of the COVID-19 epidemic and how the resources of educational institutions can effectively transform formal education into effective online education with the help of virtual classes and other important online tools. Their paper shows a complete picture of the online teaching-learning activities taking place during the lockout period in education management and the online teaching-learning process in the midst of the COVID-19 eruption. As a result of their paper is to overcome persistent educational barriers and ensure that educational activities and discourses resume as a normal practice in the education system.
- Veena Shenoy, Sheetal Mahendra and Navita Vijay (2020), They are conducting research to know the technical adoption, teaching and learning process, student involvement and teaching experience towards virtual classrooms during lockout due to COVID-19 in India. The teachers' feelings and perceptions of using technology and experience are different for different users. Although COVID-19 has created a cognitive paradox in the minds of students and teachers of the various situations they face in daily life in conjunction with community, family and teaching and learning. They found that, due to the pandemic situation, most of the higher education technology in Bangalore is widely accepted and the involvement of students is higher than the regular class involvement.

Research Gap: Previous researchers have dealt with Teacher's Perception on Online Teaching Methods, Technology Adaption in teaching and learning process and online teaching-learning in higher education during COVID-19 pandemic lockdown. But the present study manifests the Structural Equation Modelling for college educators' academic activities during COVID-19 lockdown.

V. Educators' Academic Activities During Lockdown

A. Demographic profile

Through the survey, out of 50 respondents, 56% are Female, 44% are Male, 36% within the age group of 21-30, 42% within the age group of 31-40, 16% are within the age group of 41-50 and

remaining 6% are within the age group of Above 50, 14% are Associate Professor, 38% are Assistant Professor, 32% are Guest Lecturer and 16% are PTA Staff, 30% are teaching Arts major, 24% are teaching Science major and the balance 46% are teaching Commerce major, 42% are working in Government institutions, 12% are working in Private institutions, 28% are works in Management institutions and the remaining 18% are working in Self-financing blocks. Individually, 26% of the sample respondents having the capacity of earning up to Rs.15,000, 28% are earning between Rs.15,001-Rs.30,000, 14% are earn between Rs.30,000-Rs.45,000, 20% are earns between Rs.45,001-Rs.60,000 and the rest 12% are earns above Rs.60,000. Hence it is implicit that the sample group consist of a majority of females, middle-aged, assistant professors, teaching commerce major, and are working in government institutions.

Table I Pandemic Lockdown Experiences

Variables	Category	Frequency	%	Cumulative %
Participation of Virtual Programs during the lockdown	Yes	46	92	92
	No	4	8	100
Self-evaluation after the completion of online courses	Yes	27	54	54
	No	23	46	100

Source: Primary Survey

From among the 50 sample of respondents, 92% are participating virtual programs during the lockdown and rest 8% are not participating, 54% are self-evaluation after the completion of online courses and remaining 46 are neglected it. Hence it is inferred from the above, most of the respondents were participate in virtual programs during the lockdown and self-evaluates after the completion of online courses.

B. Educators' Academic Activities during Lockdown

Table II Test of Reliability

Variables	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Reliability Cronbach's Alpha
Attending Online courses	23.70	44.337	.505	.797	**.822**
Offering online classes	23.10	44.418	.440	.818	
Making a new articles	22.44	47.476	.580	.834	
Finishing a project	22.92	44.442	.482	.800	
Preparing competitive examinations	23.16	43.076	.539	.793	
Attending e-quizzes	23.28	43.798	.488	.799	

Preparing next semester	22.96	40.325	.698	.775	
Improving knowledge through webinar, workshops, etc.	23.16	39.729	.657	.778	
Doing Academic Work	23.50	42.622	.672	.782	
Doing Research Work	23.08	43.789	.501	.797	

Source: Derived

As the reliability Cronbach's Alpha value is .822, the individual values of cronbach's alpha are more than 0.70 which is acceptable and good measure of the reliability, Corrected Item-Total Correlation values are more than 0.40 and all the ten statements can be considered for further analysis.

Table III Reliability Statistics (ANOVA)

Items		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**
Between People		257.250	49	5.250	**5.926**	**.000**
Within People	Between Items	51.930	9	5.770		
	Residual	429.370	441	.974		
	Total	481.300	450	1.070		
Total		**738.550**	**499**	**1.480**		
Grand Mean = 2.57						

Source: Derived

As per the ANOVA test, the grand mean is 2.57, sum of squares between people is 257.250 and between items is 51.930 and mean square between people is 5.250 and between items is 5.770. The value of F (49, 9) is 5.926 with the significant value of 0.000 which is less than 0.05 and all the statements are statistically significant and can be used for further analysis the data.

Table IV KMO and Bartlett's test of Sample Adequacy

Items		**Values**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.702**
Bartlett's Test of Sphericity	Approx. Chi-Square	220.815
	df	45
	Sig.	**.000**

Source: Derived

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.702 which is more than the good level of 0.70 with the chi-square value of 220.815 for degrees of freedom of 45 and test of significance of 0.000 which is less than 0.05. Hence the KMO and Bartlett's Test of sphericity is permit to further analysis.

Table V Confirmative Factor Analysis

Components	Variables	Components Values	Communalitis	% of Variance	Cumulative % of Variance	% of Total	AVE	CR
Professional								
P1	Attending e-quizzes	**.875**	.881	28.097	28.097	**40.18**	.474	1.985
P2	Attending Online courses	**.751**	.576					
P3	Improving knowledge through webinar, workshops, etc	**.733**	.678					
P4	Preparing competitive examinations	**.729**	.670					
Academic								
A1	Offering online classes	**.845**	.717	22.608	50.705	**32.33**	.483	1.668
A2	Preparing next semester	**.815**	.832					
A3	Doing Academic Work	**.696**	.716					
Research								
R1	Making new articles	**.806**	.666	19.226	69.931	**27.49**	.278	1.177
R2	Finishing a project	**.730**	.725					
R3	Doing Research Work	**.616**	.532					

Source: Derived

From the table above shows that the all the statements are having communalities values are more than 0.40 which is good and divided into the three factors, that is named as Professional, Academic and Research.

Professional: This fact consisting of four statements such as Attending e-quizzes (0.875), Attending Online courses (0.751), Improving knowledge through webinar, workshops, etc (0.733), and Preparing competitive examinations (0.729). The value of CR is 1.985, AVE is 0.474 and % of total is 40.18.

Academic: This factor consisting of three statements such as Offering online classes (0.845), Preparing next semester (0.815) and Doing Academic Work (0.696). The value of CR is 1.668, AVE is 0.483 and % of total is 32.33.

Research: This factor consisting of three statements such as Making new articles (0.806), finishing a project (0.730) and Doing Research Work (0.616). The value of Critical Ratio is 1.177, AVE is 0.278 and % of total is 27.49.

The Confirmative Factor Analysis for Educators' Academic Activities during lockdown showed that the educators thought that among all the activities, academia plays an important role during the pandemic lockdown period.

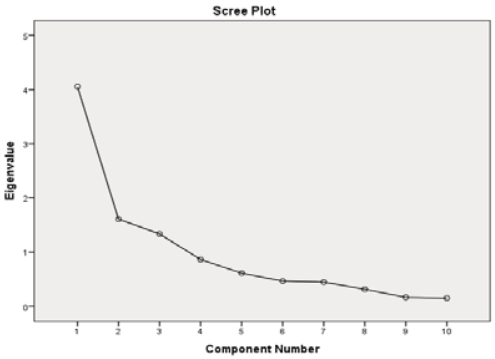

Fig.1 Scree Plot

A scree plot always displays Eigen values in a downward curve, sequencing eigen values from largest to smallest. The scree plot shows that there are two statements which are above the eigen value of one that are sloping upwards and the remaining statements are ranked below the eigen value of one and are sloping downwards.

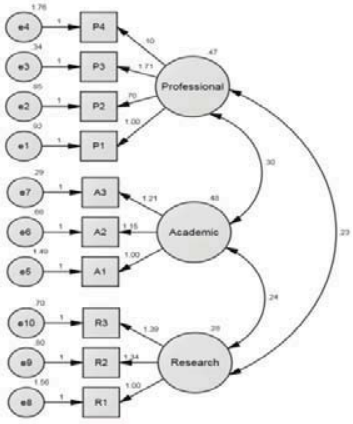

Fig.2 Structural Equation Modelling

Based on the Structural Equation modeling, the hypothesized first-order factorial model consists of three components, P, A and R, which are graphically shown in Figure 3. Three factors

are considered to be related to each other because they measure different but related aspects of a structure. The model of theoretical projected academic performance is in table 6 and it represents models constructs (figure 3), indicator variables and inter-relationships. SEM is the covariance-based statistical methodology. There are no more points to proceeding the structural equation modeling in anticipation of the legitimacy of the measurement model is satisfactory. SEM does not have a single statistical test that best describes the predictive strength of the model. In contrast, different types of activities developed by researchers, evaluate the results in combination.

Table VI Model Fit

Goodness of Fit Measures	Estimates	Cutoff Values	Limit
Chi Square	36.171		
df	32		
CMIN/DF	1.130	< 3	Accepted Limit
p-value	.280	> 0.05	Accepted Limit
CFI	.954	> 0.95	Accepted Limit
GFI	.888	> 0.95	Non-Accepted Limit
AGFI	.808	> 0.80	Accepted Limit
SRMR	.000	< 0.09	Accepted Limit
RMSEA	.052	< 0.08	Accepted Limit
PCLOSE	.456	> 0.05	Accepted Limit

Source: Derived

The model fit shows that the chi-square (df: 32, n: 50) is 36.171, p-value is 0.280 which in more than the limit of greater than 0.05, so it fit the data and F ratio (CMIN/DF) value is 1.130. Comparative Fit Index (CFI) is 0.954 which is more than the limit of greater than 0.95, Goodness of Fit Index (GFI) is 0.888 which is less than the limit of greater than 0.95, Adjusted Goodness of Fit Index (AGFI) is 0.808 which is more than the limit of greater than 0.80, Standard Root Mean Square Residual (SRMR) is 0.000 which is less than the limit of lesser than 0.09, Root Mean Square Error of Approximation (RMSEA) is 0.052 which is less than the limit of lesser than 0.08 and P CLOSE is 0.456 which is more than the limit of greater than 0.95. From the table above and figure 4 and figure 5, CMIN/DF, p-value, CFI, GFI, SRMR, RMSEA and P CLOSE are within the commonly accepted range of values, AGFI only is out of the accepted range of value and hence it can be concluded that the model is fittest model.

Table VII Regression Weights of the Model

Components	Variables	Standardized Regression Weights	Standard Error	Critical Ratio	P Sig. Value	Sig. Level
Professional	P1	1.000				< 0.05
	P2	.698	.260	2.682	.007	
	P3	1.710	.501	3.410	***	
	P4	.683	.231	2.325	.007	
Academic	A1	1.000				
	A2	1.152	.381	3.024	.002	
	A3	1.214	.389	3.118	.002	
Research	R1	1.000				
	R2	1.342	.648	2.070	.038	
	R3	1.389	.664	2.094	.036	

Source: Derived

As per Standardized Regression Weights, all the ten statements are statistically significant as the p values are less than 0.05 and the critical ratios are exceeds 1.96. Hence it is representing that the Structural Equation Modelling for Educators' Academic Activities during lockdown is pertinently fit as per the goodness of fit test.

VI. Summary of Findings

Depending on which indices are to be reported, it is not necessary or unreliable to include every index included in the program's output, as this would be a burden on the reader, the reviewer and the new researcher. Considering the abundance of model fit indices, it becomes a test to select the appropriate indices that represent the best fit of the model (see Table 8 for a summary of some of the key indices are shows here). CFI, GFI, AGFI and RMSEA were found to be the most generally reported matching fit indices. The Chi-Square statistic, degrees of freedom and p value, F ratio (CMIN/DF), Comparative Fit Index (CFI), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Standard Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA) and PCLOSE were found to this research paper to report the model fit. These indices were chosen because they were found to be more insensitive to sample size, sample misalignment and parameter ratings. Although there are no golden rules for assessing model fit, it is necessary to report different indices because different indices reflect different aspects of model fit.

VII. Conclusion

The current article demonstrates the basic concepts and practices for conducting CFA via AMOS, a popular structural equation modelling statistical package. In particular, steps to introduce the factor model of the questionnaire using IBM AMOS Graphics 20.0 have been introduced and explained. With these analyzes, the factor validity of the three-factor model established in the sample of college educators in Tirunelveli city. Educators' academic activities are grouped into three components and that is exploratory factor analysis and move on to confirmatory factor analysis to validate the factor structure and the decision is made using the cut-offs for different indices. The Chi Square, df, CMIN/DF, p-value, CFI, GFI, SRMR, RMSEA and PCLOSE are within the commonly accepted range of values, AGFI only is out of the accepted range of value and hence it can be concluded that the model is fittest model. Current findings are a tool for validating the academic activities of educators, a subjective effect assessment criterion used in previous studies. Establishing the sound structure validity of a measuring instrument has always been a significant issue in the development and application of the questionnaire. However, such analyzes are rarely done in positive among young development research. It is our humble wish that this paper will facilitate future applications of CFA. With the guide provided in this paper, prospective researchers can now easily find out how to conduct statistical analyzes and explore and establish the measurement properties of their proposed tools.

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STRATEGIES TO ENHANCE WEB-BASED LEARNING

UGC CARE APPROVED

ABSTRACT

All around the world, the entire educational system has failed during the COVID-19 shutdown period, from primary to tertiary levels. The internet's technology for education has become crucial for future economic growth, since a nation's progress can be facilitated by a high level of education. The traditional learning approach has been replaced by a variety of online learning strategies, including remote learning, online learning, web-based learning, and e-learning. Web-based learning is now an important area of focus in educational studies which strengthens critical thinking, increases productivity and provides personalized learning. Unlike classroom learning, using web-based technologies or tools in a learning process offers unparalleled flexibility and allows students to study at their own pace. This paper illustrates the three types of web-based learning: Synchronous, Asynchronous and Blended Mode. Using a qualitative method to collect the data via a questionnaire survey randomly from online learners from different age groups, we compared these three modes based on four factors – flexibility, learning potential, cost and effectiveness. The survey involved 500 students and faculties from schools and colleges in Madurai. The study aims to identify the characteristics of a web based learning mode that supports students' learning needs. We have used statistical methods to check the difference between expected value and observed value. The results show that the students overwhelmingly agreed that the Blended web-based learning mode, which includes an interactive and self-paced learning, is highly preferred because of its high flexibility and the availability of online materials, while a teacher can speed up the learning process or provide more challenging resources as needed. This paper addresses the enhancements which can be done to the various forms of web-based learning that may be made to fully take advantage of the fresh ideas that has been received from the learners and educators. This paper concludes how each method could be integrated with edutainment to achieve a more productive outcome and how they can be implemented to effectively get benefitted of the new strategies.

Keywords: *Web based learning, Web based learning tools, Synchronous, Asynchronous and Blended Mode, Edutainment.*

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I. Introduction

In the past ten years, India's educational system has undergone significant change. How learners participate in the educational content has changed as a result of the introduction of blended learning, online courses, and experiential learning. In layman's terms, web-based training or computer-based training takes place online or over the internet. This type of training, also known as eLearning, has become increasingly well-liked in recent years as a result of the quick development of information and communications technology. Although web-based learning offers benefits, it shouldn't always be considered the preferred option because obstacles (such insufficient equipment) can readily hinder student learning. Because of this, technology must be used properly and not just because it is new and readily available or because students and teachers have specific expectations for this method of course delivery[1]. Both teachers and students seem to focus most of their attention on online courses. For instance, at least 104 presentations at the 2005 meeting of the Association for Medical Education in Europe covered a range of topics related to online education (WBL) [2]. Web-based training provides learners with the flexibility and convenience to access course content regardless of time or location because the training materials are maintained online. Such contemporary training programs also function on any device, browser, and operating system. Static methods of delivering instruction include learning portals, hyperlinked pages, screen cam tutorials, streaming audio and video, and live Web broadcasts. Threaded discussions, chats, and desktop video conferencing are examples of interactive methods. To establish an efficient e-learning program, an organization should adhere to three basic criteria. They are, a range of media should be used, the experience should be mobile-friendly and social features should be implemented.WBT is

thus one of the most practical, economical, and adaptable training methodologies accessible, especially for big, global corporations.

II. Objectives

- To identify the characteristics of web-based learning modes
- To examine which web-based mode is the best
- To analyze the strategies to enhance web-based learning
- To discuss how edutainment can be integrated with web-based learning modes

III. Overview

Web-based training offers unmatched flexibility by enabling employees to learn whenever and wherever they want. WBT can be delivered as self-paced learning, instructor-led virtual training, or a hybrid of the two through a blended learning environment. Based on how each sort of web-based training involves learning, there are three primary categories: Synchronous, Asynchronous, and Blended Web-Based Modes.

A. Synchronous Web-Based Mode

Synchronous type of training is instructor-led and requires in-person interaction between the instructor and students, which most closely resembles conventional face-to-face learning. Synchronous training allows for the simultaneous delivery of instruction to one or more individuals in different places.Students can have a deeper sense of connection to their peers and teacher through synchronous online entire class meetings and well-structured small group meetings, which can also help them stay interested in the course's activities [3]. Webinars, online discussions, conference calls, and online tutoring are a few examples.

Pros:

- Allows structured learning
- Provides direct information
- Offers increased interaction

Cons:

- Students with low studying pace may be held back
- Lack of flexibility

B. Asynchronous Web-Based Mode

The absolute reverse of synchronous training is asynchronous training. The training materials are available online, and students can use them whenever it is convenient for them. Asynchronous learning provides maximum flexibility because all of the course material is accessible online, allowing students to take it at their own pace and comfort. Online training that is conducted asynchronously lacks real-time guidance. A new, widely used learning model for distant learners can be built on asynchronous interaction [4]. Online tutorials, pre-recorded webinars, and video tutorials are a few instances of asynchronous training.

Pros:

- Highly flexible, as learners can study at their own pace
- More practical type of learning
- More affordable

Cons:

- Limited guidance and communication
- Requires self-discipline

C. Blended Web-Based Mode

Asynchronous and synchronous aspects are combined in blended learning. It involves in-person learning or online real-time interactions between a student and the instructor. Additionally, some of the training can be completed at one's own pace and according to one's schedule.

Pros:

- Increased accessibility and flexibility
- Instant communication
- Efficient student assessment

Cons:

- High cost
- Overload for instructors

Each web-based learning method has benefits and drawbacks of its own. When a learner is not entirely focused on themselves to learn, web-based learning would become unproductive. Therefore,

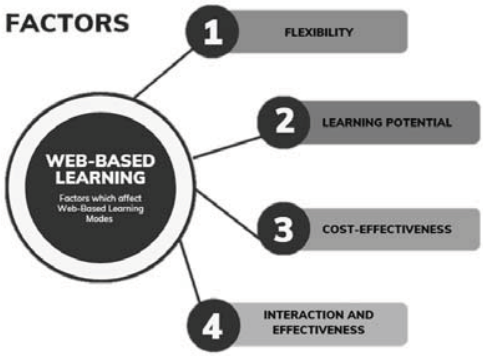
it must be ensured that the student is focused on the teaching and should advance. Therefore, choosing a mode that is best suited for e-learning is essential.

IV. Materials and Methods

We used a qualitative approach to get the data by randomly selecting online students from various age groups to complete a questionnaire survey, and we evaluated these three modes based on four criteria: flexibility, learning potential, cost, and effectiveness. About 500 students and faculty members from schools and institutions in Madurai participated in the survey. The goal of the study is to analyze the aspects of a web-based learning environment that meets students' learning requirements. To examine the discrepancy between the expected value and the observed value, we applied statistical techniques.

V. Analysis

The respondent in the survey had to specify which web-based learning method they preferred for studying. The individual must also decide why they favor that mode. Four criteria are listed as the basis for their decision to use that particular mode. These factors include how flexible the mode is, how much learning potential is obtained, the cost involved and the effectiveness in interaction in that particular mode. So, each respondent would have chosen their preferred mode and the reason behind their choice. This information is gathered from students and faculty members and is presented as tabular data.



The tabular data gathered indicates that the majority of respondents chose blended mode. The table also makes the following deductions. First of all, it has been discovered that those who have chosen synchronous mode have done so mostly because of its potential for learning given that it involves face-to-face interaction. Second, the main reason why individuals chose asynchronous mode was its increased flexibility. Thirdly,

the criteria for blended mode are selected in accordance with the individual. It can be observed that blended mode largely fits all four requirements. Therefore, the web-based learning mode that is best suited for e-learning is the blended one.The results indicated that perception, self-efficacy, and interaction among students have a strong correlation with outcomes. [5].

A. Chi-Square Test

A survey was conducted for 500 students to select the best learning mode. The chi-square test was used to further analyze the survey's data. The chi-square test (symbolized as 2) of independence determines whether there is a correlation between the two variables' categories.The chi-square test has the following crucial characteristics:

- The variance is equal to the degrees of freedom times two.
- The average distribution is equal to the number of degrees of freedom.
- When the degree of freedom rises, the chi-square distribution curve resembles the normal distribution.

Table I. Web-Based Learning

	Flexibiltiy	**Learning Potential**	**Cost-Effectiveness**	**Interaction and Effectiveness**	**Total**
Synchronous Mode	31 21.10%	61 50.00%	11 11.83%	28 20.29%	131
Asynchronous Mode	63 42.85%	10 8.20%	17 18.28%	7 5.07%	97
Blended Mode	53 36.05%	51 41.80%	65 69.89%	103 74.64%	272
Total	147 100%	122 100%	93 100%	138 100%	500

If the p-value for a Chi-square test is less than or equal to the designated significance threshold, there is enough data to conclude that the observed distribution differs from the expected distribution. In this case, we may say that there is a relationship between the provided category variables.Flexibility, Learning Potential, Cost, Interactivity, and Effectiveness were the four parameters examined.

$$X^2 = \sum z \frac{(Observed\ Value - Expected\ Value)^2}{Expected\ Value}$$

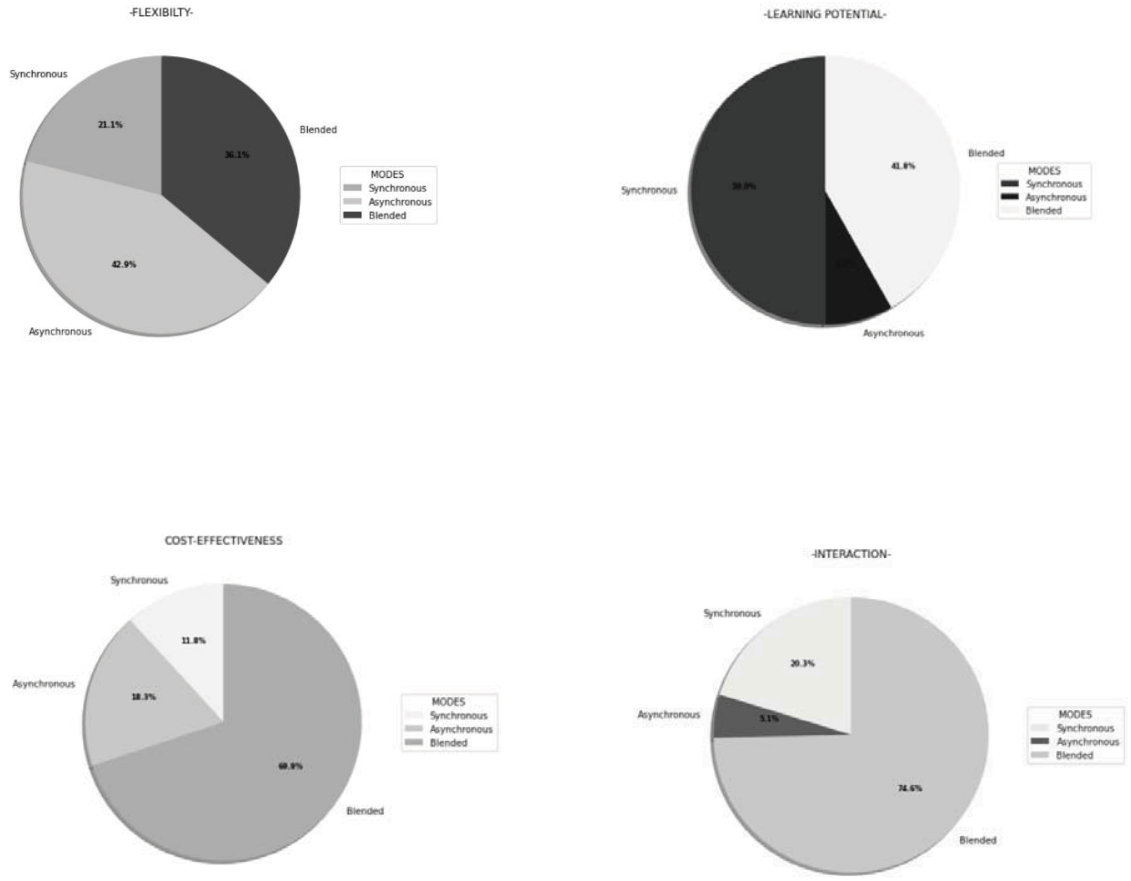


Fig.1.Web-Based Learning Modes and factors affecting them

A. Kruskal Wallis H Test

We were able to get the conclusion that the blended learning mode was superior to the synchronous and asynchronous learning modes by using the chi-square test. To demonstrate that

the blended mode is the most effective, we divided an 80-student class into two separate groups of 40 students at random. Each group spent a total of 20 days using the blended learning technique. All of the students were requested to answer the same questions that had been given earlier at the end of the 20-day period. The Kruskal-Wallis test was performed to compare the results of both survey.

The medians of three or more independent groups are compared using the Kruskal-Wallis test to evaluate whether or not there is a statistically significant difference between them.

This test is the nonparametric equivalent of the one-way ANOVA and is typically used when the normality assumption is violated.The Kruskal-Wallis test does not assume normality in the data and is much less sensitive to outliers than the one-way ANOVA.To conduct a Kruskal-Wallis Test, we can simply enter the values into the Kruskal-Wallis Test calculator.

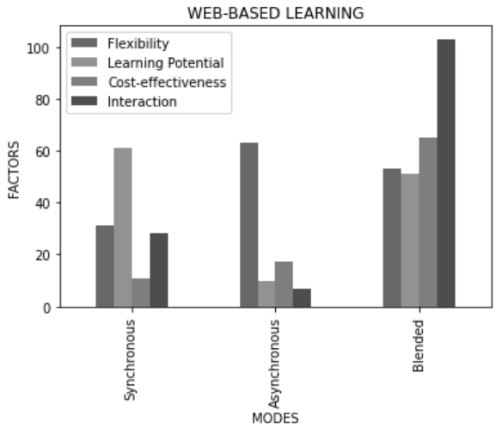
There was a significant difference between the median scores of the two groups. The outcomes were exactly as predicted. Both synchronous and asynchronous learning modes students claimed that the blended method was more efficient.

$$E_R = \frac{n+1}{2}\sigma^2 = \frac{n^2-1}{12} \quad (1)$$

In (1), E_R represents the expected value of the rankings, σ represents rank variance and n represents the total sample size.

$$H = \frac{n-1}{n} \cdot \sum_{i=1}^{k} \frac{n_i.(\bar{R} - E_R)}{\sigma^2} \quad (2)$$

In (2), n represents total sample size, n_i represents the number of cases in group i,$\overline{R}$ represents mean rank sum in group i, E_R represents expected value of the rankings and σ^2 represents rank variance.



VI. Discussions on Result

A. Enhancing Synchronous Web-Based Mode

Due to the increased flexibility offered by online courses, many students prefer to enroll in them, particularly in light of the epidemic, when many may find themselves managing work, childcare, and course completion in ways they previously hadn't. However, the pandemic has also made it possible for synchronous elements to be really important for student learning, to meet the course's objectives, or just to enable students to interact with teachers and classmates more effectively. Many of the advantages of traditional training, such as quick feedback and direct group cooperation, are also offered via synchronous learning, while avoiding any of the disadvantages, such as the expense of on-site instructors. To make the most of synchronous learning opportunities, one must create a successful synchronous learning plan that enables them to make use of the numerous tools, approaches, and technologies that are presently available.

The following strategies can be used to enhance web-based learning in synchronous mode. When planning the synchronous event/lesson/course, keep your main goal in mind. Integrate learning and group collaboration activities. Create a manual that students can use as a reference. Focus on learning actively. Include an accompanying visual presentation to the synchronous learning process. Provide a list of important websites, resources, and information about future assignments. To increase engagement, create tutorials or online situations. To facilitate a discussion, seek out volunteers. Encourage students to share their opinions. After the synchronous event, class, or course, make the presentation internet accessible.

The learner can ask questions of their instructor, participate in debates, and take a more active role in their own academic progress when the format is synchronous. These in-person interactions can improve learning and provide for a more enjoyable experience for the learner.

B. Enhancing Asynchronous Web-Based Mode

In the online learning environment, asynchronous strategies that provide students the opportunity to complete their coursework or participate in a conversation at different times are quite beneficial. The increased visibility of individual learning and thinking is a significant advantage. Instructors and teaching assistants can use the extra time to create insightful and focused feedback. When events don't go as expected, these methods also offer flexibility.Asynchronous learning activities are characterized by the absence of simultaneous student participation. Effective asynchronous activities foster a succession of conversations between teachers and students, unlike some tasks, such as watching recorded mini-lectures and taking online quizzes.This learning enables students to learn at their own pace and completely absorb the material before moving on, in addition to giving them the freedom to access information and schoolwork whenever it is most convenient for them.

The following strategies can be used to enhance web-based learning in asynchronous mode. Include a variety of eLearning activities such as video presentations, audio narratives, interactive scenarios, and text-based modules to not only offer variety to the course content but also to enhance learning. Motivate individuals by using stories and examples from the real world. Lend them a helping virtual hand and provide them with an alternative type of aid that takes care of their worries and responds to their important questions. Make bite-sized modules out of lengthy eLearning sessions. Foster group cooperation to offer peer-based help. Include tests or quizzes to monitor students' knowledge and development. They can assess their own development this way as well, which provides them the chance to modify poor learning habits and strengthen their areas of weakness. Use writing prompts to deepen overall understanding of the readings. Provide an online facilitator to oversee and direct the eLearning process. Feedback should be strategic and interactive. Create exercises that promote critical thinking in students. Be constant in email updates and/or communications. Strike a balance between being entertaining and being educational. The majority of highly effective asynchronous e-learning programmes provide enjoyable activities and amusing content, but learning should always be the main focus.

The main idea behind asynchronous learning is that during asynchronous online sessions, students can access their lessons at any time. In an asynchronous class, students can internalize material in a variety of ways, such as by devoting more time to challenging material and rushing through simpler ones. In asynchronous classes, where teachers are unable to personally evaluate

students' preparation, online interaction is essential. This form of instruction also requires a great deal of initiative and self-motivation, particularly if a student is having trouble with a particular subject.

C. Enhancing Blended Web-Based Mode

The "classroom-only" method is evolving, and distance and cost are no longer barriers to online instruction. Although most firms are not completely switching to online learning in favor of the traditional forms, blended learning is becoming the favored method. Companies are deciding on blended learning because they understand that traditional, non-interactive online or face-to-face training sessions no longer work to ensure that corporate learners have access to the skills and knowledge necessary to satisfy organizational goals. While each approach has pros and cons, blended learning outperforms other learning strategies by making instruction delivery efficient and goal-oriented from the start.

The following strategies can be used to enhance web-based learning in blended mode. Establish the course's interactivity by figuring out how much content will be completed online and how much in the classroom. The students can examine pre-recorded lectures in their free time by using a flipped classroom, and they can discuss and do assignments in class. Utilize videos in learning and instruction. Group Collaboration and Interaction is essential for a blended learning environment to succeed. It is crucial that students interact with one another as well as with the teacher. Place the learning process in the students' hands. Be deliberate when integrating in face-to-face and online learning. Provide tools and opportunities for collaboration. Make interactive elements like online games and quizzes. Assess participants in new ways. Vary the group work approaches. When it comes to project-based blended learning, responsive education, and other learning objectives, the correct technology can make a significant impact. Look for opportunities to use the mentioned technologies on a daily basis. All of these technologies and not just a single technology will be used to support students' learning.

D. Edutainment

E-Learning is the future of learning because it makes getting knowledge more enjoyable and convenient. Furthermore, it supports individuals in realizing their desire of receiving an education regardless of their age, occupation, or any other factor that would prevent them from finishing their education or from enrolling in further coursework.

Edutainment is a special combination of education and entertainment that spreads knowledge through a variety of interesting methods. It is a type of entertainment that aims to both entertain and educate. Edutainment often aims to educate its audience by incorporating lessons into a well-known type of entertainment, such as television shows, video games, multimedia tools, and so on. The major purpose of it is to create an inspiring learning environment for effective training. By establishing connections and fostering empathy through stories, one can arouse the learner's interest. A story-based eLearning course with characters helps to the learner can identify with will keep him interested the entire time.

Combining entertainment with education in blended mode doesn't reduce the value of eLearning; on the contrary, it encourages a warm, fun, and informal learning environment. When eLearning is entertainment-based, learners are highly engaged, which has the most positive impact on information retention.

E. Web-Based Learning Tools

An internet browser is used by users to connect to web-based software, also known as web-based applications, which is running on a server (a computer connected to the Internet).The main distinction between a simple website and browser-based software is that the latter offers desktop-style back-end capability via the front end of your web browser.The most important phases in creating an efficient educational website are to conduct a needs analysis, define goals and objectives, identify technological resources and requirements, and assess pre-existing software to see if it completely satisfies the demands[6].Through the Internet, web-based learning tools offer integrated environments of multiple technologies to serve various educator and learner demands[7].

One of the main advantages of browser-based applications is that, unlike desktop applications, you are not required to buy a large piece of software that you later install locally on your computer.Updates are also made to web-based applications. The following are some examples of Web-Based Apps.

a) Kahoot: Kahoot is a platform for game-based learning that enables you to make entertaining educational games. You can create quizzes on any subject and in any language, and you can include videos, diagrams, and images to personalize them.

b) Edpuzzle: We can make interactive video lessons with embedded audio notes, tests, and quizzes with Edpuzzle.Its analytics tool enables you to track how students are watching your videos and if they understand the content.

c) Quizzizz: With the help of the web-based assessment tool Quizzizz, you may give students quizzes on the social sciences, computer science, technical subjects, and the arts as a timed test or as homework with a deadline.

d) Animoto: Animoto is a digital tool that enables you to quickly and from any mobile device produce high-quality videos, motivating students and enhancing academic lessons. The user-friendly and practical Animoto interface enables educators to produce audiovisual content that responds to specific educational demands.

e) Visme: Anyone can create presentations, infographics, concept maps, timetables, reports, and more with the online design tool Visme.It has a range of features that both non-designers and designers enjoy using, such as free images and graphics, customizability possibilities, and a simple drag-and-drop editor.

Overall, it seems that both instructor and student attitudes and student learning performance were positively impacted by the WBLTs [8].

VII. Conclusion

The results indicate that students overwhelmingly agreed that the blended web-based learning mode, which includes interactive and self-paced learning, is highly preferred because of its high degree of flexibility and the availability of online resources, while a teacher can help accelerate the learning process or provide more difficult resources as needed. This article discussed improvements that can be made to the various web-based learning models in order to effectively capitalize on the new suggestions that have been made by students and teachers. This paper finishes by discussing how each technique could be combined with educational entertainment to provide a more fruitful result and how they can be efficiently used to profit from the new strategies.

The instructor must be willing to modify their conception of effective instructional tactics in order to adopt these strategies. And there are definite advantages to revisiting the components of successful blended learning. These strategies have the potential to improve student results while also boosting accessibility and inclusivity, improving the student experience, and increasing involvement. Colleges and universities continue to adapt how they teach with digital tools and resources to offer an engaging, integrated blended learning experience for students when the immediate COVID-19 pandemic and the emergency transition to remote learning are over.

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TAMIL NADU ENGLISH TEXTBOOKS AND WRITING SKILLS IN THE PERCEPTION OF PRIMARY SCHOOL TEACHERS

UGC CARE APPROVED

ABSTRACT

Attainment of foundational literacy skills as an urgent national mission in Educational polices. Textbooks are the important tool which assists the students throughout the course of study. This study aims to assess the Tamil Nadu English textbooks in attaining foundational literacy skills of writing based on the perception of primary school teachers. The descriptive survey method is used for this study. The sample of the study is 100 primary school teachers in Tenkasi district, Tamilnadu. The simple random sampling was employed to select the sample. A self-made questionnaire on Perception towards TN English textbooksin the attainment of writing skillsconstructed by the investigators (2019)is used for data collection. Percentage analysis, t-test and ANOVA were the statistical techniques utilized to analyze the data. The findings shows that government school teachers have better perception towards TN English textbooks in promoting of writing skills among students.

***Keywords**: Writing Skills, Perception, Primary School Teachers, TN English Textbook.*

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I. Introduction

Writing skill is one of the major language skills which is essential to be developed among students. Especially, it should be cultivated from the school days itself. It enables the students to express their ideas and serves as an instrument of thought. The imaginative as well as critical thinking abilities are developed in writing. It is more important than speaking and requires more

careful organization. Writing skill comprises four important skills like mechanical skills, grammatical skills, judgment skills and discourse skills [1].

Foundational Literacy Skills (FLS) can be viewed as a set of "Gateway skill" that mark the entry of the child in formal schooling processes and help strengthen cognitive, socio-emotional and relational skills. United Nation International Children Emergency Fund says that the foundational literacy skills in writing should include drawing and scribbling to represent something and express themselves in a form of writing. They also suggest the four stages of writing development

1. Emergent writing and scribbling
2. Introduction to conventional writing
3. Structured writing skills at word and sentence level
4. Writing composition

NEP 2020 states FLS as an urgent and necessary prerequisite to learning. It is defined as the ability of the student to read and write, and perform basic operation with numbers. Writing is the specific skill included as foundational literacy skill [2].Thus, writing skills get more attention.

II. Significance of the Study

Writing skill is an important language skill. The standard in writing reflects the politeness and maturity of a person's thought. The Indian government also stresses the significance of foundational literacy skills in NEP 2020. It is reported by the Indian government that about 5 crores of students have failed to achieve foundational literacy skills. Writing is one of FLS which needs to be developed. Textbooks are the ready to hand instruments which students use to study. It acts as a guide for the students throughout their course of study. A good textbook will bring optimum improvements in children learning outcomes. The good primary school English textbooks introduce basic shapes of the letters, vocabulary, grammar and imaginary writing in a systematic way. A good textbook also recognized by the teachers. The researchers through their study intend to explore the understanding of teachers upon the component related to writing skills which are embedded in English textbooks.

III. Statement of the Problem

Writing is the unique language skill as well as one of the foundational literacy skills. It helps the students to express their ideas, opinion and information in a formal way. It can be developed from school days so that the evolution of writing will be more matured and rich in the later stage. In

recent times students failed to attain required writing skills appropriate for their age. National Achievement Survey (2017) was conducted by NCERT to check the desired level of competencies of students in FLS among 3, 5, 8 class students [3]. The report revealed that in class 3 around 67% students were able to answer English questions and in class 5 only 58% students were able to answer[4]. National Education Policy (2020) deliberately states that about five crores of students were found to be lack in FL skills [5]. The corona pandemic leads to frequent lockdown causes disruption in learning process. It is evident that there is a problem in student language skills especially in writing. It is necessary to analyze the teaching methods, teaching learning materials and curriculum in order to find the problem, as textbooks are the instruments providesassistance to the students in the absence of teacher and facilitate self-learning. It is necessary to look over the perception of the teachers over the textbooks in developing writing skills.

IV. Objectives of the Study

1. To find out the level of perception of primary school teacherstowards TN English textbooks in the promotion of writing skills among students
2. To find out the significant difference in the perception of primary school teachers towards TN English textbook in promotion of writing skillamong students with regard to gender, age, locality of the teacher, marital status, type of the school, locality of the school, professional qualification of the teacher and experience of the teacher

V. Hypotheses of the study

1. There is no significant difference among primary school teachers in their perception towards TN English textbook in the promotion of writing skillwith regard to gender
2. There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skillwith regard to age
3. There is no significant difference among primary school teachers in their perception towards TN English textbook in the promotion of writing skillwith regard to locality of the teacher
4. There is no significant difference among primary school teachers in their perception towards TN English textbook in the promotion of writing skill with regard to marital status
5. There is no significant difference among primary school teachers in their perception towards TN English textbook in the promotion of writing skill with regard to type of the school

6. There is no significant difference among primary school teachers in their perception towards TN English textbook in the promotion of writing skill with regard to locality of the school
7. There is no significant difference among primary school teachers in their perception towards TN English textbook in the promotion of writing skill with regard to professional qualification of the teacher
8. There is no significant difference among primary school teachers in their perception towards TN English textbook in the promotion of writing skill with regard to experience of the teacher

VI. Methodology

The present study was conducted by using descriptive method by employing survey as technique.Primary school teachers who are working in Tenkasi district were considered as population of this study. The investigators used simple random sampling technique to collect data from hundred primary school teachers. To measure perception of teachers towards TN English textbooks, the investigator developed and validated a scale on Perception of Primary School Teachers on TN English textbooks in Promotion of Writing Skill (PPSTTPWS) (2021). The scale consists of 20 items. The investigator applied descriptive analysis, t-test, f-test to analyze the data collected.

VII. Analysis of the data

Objective 1: To find out the Level ofperception of primary school teachers towards promotion of writing skill in TN English textbook with reference to background Variables

In table 1 the perception towards promotion of writing skill in TN English textbook among primary school teachers is moderate with regard to background variables such as gender, age, locality of the teacher, marital status, locality of the school, professional qualification of the teacher of the teacher and experience of the teacher. Whereas primary school teachers who work in government schools have high level of perception towards TN English textbook in the promotion of writing skill.

Table 1 Perception of primary school teachers towards promotion of writing skill in TN English textbook with reference to background variables

Perception of Primary School Teachers towards Writing Skills in TN English Textbook							
Variable		**Low**		**Moderate**		**High**	
		N	%	N	%	N	%
Gender	Male	1	7.7	7	53.8	5	38.5
	Female	14	16.1	60	69.9	13	14.9
Age	20-30	4	9.1	34	77.3	6	13.6
	30-40	5	22.7	12	54.5	5	22.7
	40&above	6	17.6	21	61.8	7	20.6
Locality of the teacher	Rural	7	11.1	47	74.6	9	14.3
	Urban	8	21.6	20	54.1	9	24.3
Marital status	Married	14	19.7	43	60.6	14	19.7
	Unmarried	1	3.4	24	82.8	4	13.8
Type of school	Govt.	2	10.5	8	42.1	9	47.4
	Aided	7	22.6	21	67.7	3	9.7
	Private	6	12.0	38	76.0	6	12.0
Locality of the school	Rural	11	18.0	41	67.2	9	14.8
	Urban	4	10.3	26	66.7	9	23.1
Professional qualification	D. Ted.	6	18.2	19	57.6	8	24.2
	B. Ed.	9	13.4	48	71.6	10	14.9
Experience	1-2	4	11.8	26	76.5	4	11.8
	3-5	3	14.3	16	76.2	2	9.5
	5-10	5	33.3	9	60.0	1	6.7
	10&above	3	10.0	16	53.3	11	36.7

Hypothesis 1

There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skill with regard to gender

Table 2 Perception of Primary School Teachers Towards Promotion of Writing Skill in TN English Textbook and its Dimensions with Regard to Gender

Dimension	**Gender**	**No**	**Mean**	**S.D**	**t- value**	**P value**
Handwriting and Vocabulary	Male	13	20.31	2.56	1.730	0.741^{NS}
	Female	87	18.97	2.91		
Grammar	Male	13	20.38	1.85	1.281	0.254^{NS}
	Female	87	19.63	2.67		
Punctuation	Male	13	19.46	2.73	0.083	0.83^{NS}
	Female	87	19.53	2.71		
Creative Writing	Male	13	20.00	2.35	0.364	0.22^{NS}
	female	87	19.74	3.00		
Overall PPSTTPWS	Male	13	80.15	7.93	0.954	0.89^{NS}
	female	87	77.86	8.95		

NS – Not Significant at 5% level

In the table 2, since the p value (=0.89) is greater than 0.05, the null hypothesis is accepted at 5% level of significance. It shows that there is no significant difference in perception of primary school teachers towards writing skill in TN English textbook with regard to gender.It is also true with the dimension namely Handwriting and Vocabulary (0.741), Grammar (0.254), Punctuation (0.8290) and Creative Writing (0.216).

Hypothesis 2

H_o There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skill with regard to age

Table 3 Perception of primary school teachers towards writing skill in TN English textbook and its dimensions with regard to age of the teacher

Dimension	Category	Source of Variation	Sum of Squares	Df	Mean square	f- value	P value
Handwriting and Vocabulary	20-30	Between	.032	2	0.02	0.04	0.95^{NS}
	30-40	Within	31.76	97	0.33		
	40&above						
Grammar	20-30	Between	0.21	2	0.11	0.33	0.71^{NS}
	30-40	Within	30.70	97	0.32		
	40&above						
Punctuation	20-30	Between	0.27	2	0.14	0.55	0.57^{NS}
	30-40	Within	23.73	97	0.25		
	40&above						
Creative Writing	20-30	Between	0.14	2	.0.07	0.23	0.79^{NS}
	30-40	Within	29.22	97	0.30		
	40&above						
Overall PPSTTPWS	20-30	Between	0.03	2	0.02	0.04	0.95^{NS}
	30-40	Within	32.88	97	0.34		
	40&above						

NS – Not Significant at 5% level

In the table 3, since the p value (=0.956) is greater than 0.05, the null hypothesis is accepted at 5% level of significance. It shows that there is no significant difference in perception of primary school teachers towards writing skill in TN English textbook and its dimensions with regard to age.It is also true with the dimension namely Handwriting and Vocabulary (0.952), Grammar (0.716), Punctuation (0.574) and Creative Writing (0.794).

Hypothesis 3

H_o There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skill with regard to locality of the teacher

Table 4 Perception of primary school teachers towards promotion of writing skill in TN English textbook and its dimensions with regard to locality of the teacher

Dimension	Locality of the teacher	No	Mean	S.D	t-value	p value
Handwriting and Vocabulary	Rural	63	19.27	2.65	.553	0.099 NS
	Urban	37	18.92	3.28		
Grammar	Rural	63	19.73	2.67	0.001	0.914 NS
	Urban	37	19.73	2.47		
Punctuation	Rural	63	19.52	2.93	0.020	0.493 NS
	Urban	37	19.51	2.29		
Creative writing	Rural	63	19.29	3.16	2.407	0.132 NS
	Urban	37	20.59	2.25		
PPSTTPWS	Rural	63	7.81	9.41	0.542	0.859 NS
	Urban	37	78.76	7.80		

NS – Not Significant at 5% level

In the table 4, since the p value (=0.859) is greater than 0.05, the null hypothesis is accepted at 5% level of significance. It shows that there is no significant difference in perception of primary school teachers towards writing skill in TN English textbook and its dimensions with regard to Locality of the teacher.It is also true with the dimension namely Handwriting and Vocabulary (0.099), Grammar (0.914), Punctuation (0.493) and Creative Writing (0.132).

Hypothesis 4

H_o There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skill with regard to marital status.

In the table 5, since the p value (=0.054) is greater than 0.05, the null hypothesis is accepted at 5% level of significance. It shows that there is no significant difference in perception of primary school teachers towards writing skill in TN English textbook with regard to marital status. It is also true with the dimension namely Handwriting and Vocabulary (0.102), Punctuation (0.53) and Creative Writing (0.097).

For the dimension ‘Grammar’, the mean scores reveal that unmarried primary school teachers are well in their perception towards writing skill than their counterparts.

Table 5 Perception of primary school teachers towards promotion of writing skill in TN English textbook and its dimensions with regard to marital status

Variable	Marital status	No	Mean	S.D	t-value	P value
Handwriting and vocabulary	Married	71	19.15	3.07	.089	0.10 NS
	Unmarried	29	19.10	2.43		
Grammar	Married	71	19.54	2.84	1.438	0.02*
	Unmarried	29	20.21	1.74		
Punctuation	Married	71	19.69	2.84	1.077	0.53NS
	Unmarried	29	19.10	2.30		
Creative writing	Married	71	19.70	3.15	0.401	0.097 NS
	Unmarried	29	19.93	2.28		
Overall PPSTTPWS	Married	71	78.08	9.67	0.157	0.05 NS
	Unmarried	29	78.34	6.43		

NS- Not significant at 5% level*Significant at 5% level

Hypothesis 5

H_o There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skill with regard to type of the school

In the table 6, since the p value (=0.010) is less than 0.05, the null hypothesis is not accepted at 5% level of significance. It shows that there is a significant difference in perception of primary school teachers towards writing skill in TN English textbook with regard to professional qualification.It is also true with the dimension Creative Writing (0.419). Significant difference found in the dimension namely Handwriting and Vocabulary, Grammar and Punctuation, Scheffe test was employed to find which of the paired mean score differ significantly and the result are given in the table 6.1

Table 6 Perception of primary school teachers towards writing skill in TN English textbook and its dimensions with regard to type of school

Dimension	Category	Source of Variation	Sum of Squares	Df	Mean of square Variation	f- value	P value
Handwriting and Vocabulary	Govt	Between	4.27	2	2.13	7.51	0.001 **
	Aided	Within	27.53	97	0.28		
	Private						
Grammar	Govt	Between	2.69	2	1.35	4.62	0.01*
	Aided	Within	28.22	97	0.29		
	Private						
Punctuation	Govt	Between	1.16	2	0.58	2.46	0.09*
	Aided	Within	22.84	97	0.24		
	Private						

Creative Writing	Govt	Between	0.52	2	0.26	0.87	0.41 NS
	Aided	Within	28.84	97	0.30		
	Private						
PPSTTPWS	Govt	Between	3.0 1	2	1.50	4.87	0.01*
	Aided	Within	29.91	97	0.30		
	Private						

** Significant at 1% level * Significant at 5% NS- Not Significant at 5% level

Table 6.1 Scheffe Test Result showing the Significant Difference in Perception of primary school teachers towards writing skill in TN English textbook and its dimensions with regard to type of school

Source of Variation	Types of Schools			Mean	Mean Difference	Std.error	P
	Govt	Govt-Aided	Private				
Handwriting and Vocabulary	19.00	31	-	21.31	0.54*	0.15	0.003**
	-	31.00	50.0	18.12	0.02	0.12	0.97 NS
	19.00	-	50.0	18.94	0.51*	0.14	0.002**
Grammar	19.00	31.00	-	20.68	0.47*	0.15	0.01*
	-	31.00	50.0	18.87	0.20	0.12	0.26 NS
	19.00	-	50.0	19.90	0.27	0.14	0.17 NS
Punctuation	19.00	31.00	-	20.47	0.21	0.14	0.33 NS
	-	31.00	50.0	19.03	0.08	0.11	0.77 NS
	19.00	-	50.0	19.46	0.29	0.13	0.09 NS
Overall PPSTTPWS	19.00	31.00	-	82.52	0.49*	0.16	0.01*
	-	31.00	50.0	75.74	0.12	0.12	0.59 NS
	19.00	-	50.0	77.98	0.36	0.15	0.06 NS

** Significant at 1% level * Significant at 5% level NS- Not Significant at 5% level

Scheffe table 6.1 comparison shows that Government primary school teachers have better perception towards writing skill than the counterparts.

Hypothesis 6

H_o There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skill with regard to locality of the school

Table 7 Perception of primary school teachers towards promotion of writing skill in TN English textbook and its dimensions with regard to locality of the school

Variable	Locality of the school	No	Mean	S.D	t-value	P value
Handwriting and vocabulary	Rural	61	19.11	2.78	0.10	0.590 NS
	Urban	39	19.18	3.09		
Grammar	Rural	61	19.43	2.73	1.54	0.571 NS
	Urban	39	20.21	2.28		
Punctuation	Rural	61	19.20	3.04	1.64	0.024*
	Urban	39	20.03	1.99		
Creative writing	Rural	61	19.20	3.16	2.71	0.104 NS
	Urban	39	20.67	2.25		
PPSTTPWS	Rural	61	76.93	9.63	1.87	0.206 NS
	Urban	39	80.07	7.09		

NS- Not significant at 5% level *Significant at 5% level

In the table 7, since the p value (=0.206) is greater than 0.05, the null hypothesis is accepted at 5% level of significance. It shows that there is no significant difference in perception of primary school teachers towards writing skill in TN English textbook with regard to Locality of the School.It is also true with the dimension namely Handwriting and Vocabulary (0.590), Grammar (0.571) and Creative Writing (0.104).

For the dimension 'Punctuation', the mean scores reveal that Urban primary school teachers have good perception towards writing skill than their counterparts.

Hypothesis 7

H_o There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skill with regard to professional qualification of the teacher

Table 8 Perception of primary school teachers towards writing skill in TN English textbook and its dimensions with regard to professional qualification

Variable	Professional qualification	No	Mean	S.D	t-value	P value
Handwriting and vocabulary	D. TEd.	33	19.15	3.28	0.02	0.20 NS
	B. Ed.	67	19.13	2.70		
Grammar	D. TEd.	33	19.69	3.12	0.08	0.05 NS
	B. Ed.	67	19.75	2.30		
Punctuation	D. TEd.	33	19.48	3.44	0.07	0.01*
	B. Ed.	67	19.53	2.28		

Creative writing	D. TEd.	33	19.91	3.43	0.30	0.47 NS
	B. Ed.	67	19.70	2.65		
Overall PPSTTPWS	D. TEd.	33	78.24	11.44	0.05	0.04*
	B. Ed.	67	78.11	7.30		

NS- Not significantat 5% level *Significant at 5%level

In the table 8, since the p value (=0.041) is less than 0.05, the null hypothesis is not accepted at 5% level of significance. It shows that there is a significant difference in perception of primary school teachers towards writing skill in TN English textbook with regard to professional qualification.It is also true with the dimension namely Handwriting and Vocabulary (0.207), Grammar (0.051) and Creative Writing (0.478).For the dimension 'Punctuation', the mean scores reveal that B.Ed Qualified primary school teachers show good perception towards writing skill than their counterparts.

Hypothesis 8

H_o There is no significant difference among primary school teachers in their perception towards TN English textbook in promotion of writing skill with regard to experience of the teacher

Table 9 ** Significant at 1% level * Significant at 5% level NSNotSignificant at 5%level

Dimension	Source of Variation	Sum of Squares	Df	Mean of square Variation	f- value	P value
Handwriting and Vocabulary	Between	2.76	3	0.92	3.03	0.03*
	Within	29.04	96	0.30		
Grammar	Between	3.24	3	1.08	3.74	0.01*
	Within	27.67	96	0.29		
Punctuation	Between	1.02	3	0.34	1.42	0.24 NS
	Within	22.98	96	0.24		
Creative Writing	Between	4.53	3	1.51	5.83	0.001**
	Within	24.84	96	0.26		
Overall PPSTTPWS	Between	3.16	3	1.05	3.39	0.02*
	Within	29.75	96	0.31		

NSNotSignificant at 5%level

In the table 9, since the p value (=0.021) is less than 0.05, the null hypothesis is not accepted at 5% level of significance. It shows that there is a significant difference in perception of primary school teachers towards writing skill in TN English textbook with regard to professional qualification.

It is also true with the dimension Punctuation (0.241). Significant difference found in the dimension namely Handwriting and Vocabulary, Grammar and Creative Writing, Scheffe test was employed to find which of the paired mean score differ significantly and the result are given in the table 9.1

Table 9.1 Scheffe Test Result showing the Significant Difference in Perception of primary school teachers towards writing skill in TN English textbook and its dimensions with regard to experience of the teacher

Source of Variation	Experience of the Teacher				Mean	Mean Difference	Std.error	P
	1-2	3-5	5-10	10&above				
Handwriting and Vocabulary	34.00	21.00	-	-	19.29	0.24	0.15	0.46 NS
	-	21.00	15.00	-	18.61	0.06	0.18	0.98 NS
	-	-	15.00	30.00	17.73	0.36	0.17	0.22 NS
	34.00	-	-	30.00	20.03	0.18	0.13	0.60 NS
	34.00	21.00	-	-	19.82	0.02	0.14	0.99 NS
Grammar	-	21.00	15.00	-	19.71	0.33	0.18	0.34 NS
	-	-	15.00	30.00	18.00	0.56*	0.17	0.01 *
	304.00	-	-	30.00	20.50	0.20	0.13	0.51 NS
	34.00	21.00	-	-	19.61	0.01	0.141	1.00 NS
Creative Writing	-	21.00	15.00	-	19.28	0.38	0.17	0.18 NS
	-	-	15.00	30.00	18.06	0.66*	0.16	0.001**
	34.00	-	-	30.00	21.13	0.27	0.12	0.21 NS
	34.00	21.00	-	-	78.02	0.04	0.15	0.99 NS
Overall PPSTTPWS	-	21.00	15.00	-	77.33	0.21	0.18	0.71 NS
	-	-	15.00	30.00	72.00	0.53*	0.17	0.03 *
	34.00	-	-	30.00	81.96	0.26	0.13	0.30 NS

** Significant at 1% level * Significant at 5% level NS- Not Significant at 5%level

In table 9.1 comparison shows that 5 to 10 years experienced primary school teachers have better perception towards writing skill than their counterparts.

VIII. Findings

1. The level of perception of primary school teachers towards TN English textbook in the promotion of writing skill in is moderate; whereas the perception of government school teachers is high.
2. There is no significant difference in the perception of primary school teachers towards TN English textbook in the promotion of writing skill and its dimensions with regard to gender, age and locality of the teacher
3. There is no significant difference in the perception of primary school teachers towards TN English textbook the promotion of writing skill and its dimensions with regard to marital status except the dimension of grammar where the mean score reveals that the primary school teachers who are unmarried have better perception than their counterparts
4. There is no significant difference in the perception of primary school teachers towards TN English textbook the promotion of writing skill and its dimensions with regard to locality of the school except the dimension of punctuation where the mean score reveals that the primary school teachers who lives in urban area have better perception than the teachers who reside in rural area
5. There is significant difference in the perception of primary school teachers towards TN English textbook the promotion of writing skill and its dimensions of grammar, punctuation with regard to their professional qualification whereas the mean scores reveals that the primary school teachers with B.Ed. degree have better perception
6. There is significant difference in the perception of primary school teachers towards the promotion of writing skill in TN English textbook and its dimensions of handwriting and vocabulary, grammar, creative writing with regard to experience of the teacher where the mean score reveals primary school teachers who have 5-10 years of experience have better perception towards TN English textbooks in promotion of writing skill
7. There is significant difference in the perception of primary school teachers towards the promotion of writing skill in TN English textbook and its dimensions of handwriting and vocabulary, grammar, punctuation with regard to type of school where the mean score reveals that the primary school teachers who work in government school have better perception than their counter parts.

IX. Implications

The findings show that primary school teachers who work in government sectors have better perception towards TN English textbooks than their counterparts. The unmarried, urban, B.Ed. completed, and 5-10 years experienced teachers show significant difference in their perception towards TN English textbooks. An orientation programme can be arranged for the government-aided and private school teachers to bring positive perception on TN English textbooks. The findings rural, D.T. Ed. Completed, and less experienced teachers have low perception towards TN English textbook. Seminars and workshops can be conducted through the Block Resource Centres in rural areas. English language enhancement programmes can be conducted to the less experienced and D. T, Ed completed primary school teachers as a part of in-service training programmes.

Conclusion

Writing is an important foundational literacy skill. Period of elementary school is an apt sphere to provide strong foundation to such skill. Educational policies and committees and commissions in India emphasizes that attaining FLS is an urgent national mission [6]. Textbooks are ready hand tools which assists the teachers and students in the process of teaching and learning. The thorough understanding about the textbooks will help the teachers to use it as an effective tool to impart knowledge. The present study has revealed the perception of primary school teachers towards TN Textbooks in promoting the writing skills.

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THE IMPACT OF ONLINE ASSESSMENT ON STUDENTS PERCEPTIONS AND PERFORMANCE

UGC CARE APPROVED

ABSTRACT

One of the most sensitive changes faced by technical colleges due to the COVID-19 crisis was the remote assessment of student learning. This study analyzed the case of massive online learning institutes that rapidly changed the final assessment (Technical students in 2020) from face-to-face exams to entirely online exams. This study focused on the influence of online assessment on academic activities and students' perception about the new methodology. Two data sources are proposed used for this assessment: A comparison of academic performance indicators (assessment, success and achievement rates, and average marks obtained) between the online examination call and previous face-to-face examinations; and a questionnaire to a sample of students (n number of students) regarding their perception of the online assessment experience. A comparison of academic performance indicators (assessment, success and achievement rates, and average marks obtained) between the online examination call and previous face-to-face examinations; and a questionnaire to a sample of students (n number of students) regarding their perception of the online assessment experience. The results show that all the academic performance indicators in the Department Courses offered at the institute increased when the final assessment method turned to online due to the pandemic crisis; and that a majority of students are more favorable to online assessment methods. The discussion places these findings in a context of rapid change, and concludes by identifying the possible implications of online assessment for student retention, organizational challenges, as well as the feasible solutions for further studies.

Keywords*: e-learning, technical education, online exams, online assessment, students' performance.*

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1. Introduction

The approach to learning assessment is a key aspect in the pedagogical model of higher education institutions. Therefore, technical institutions are very cautious about moving towards digital assessment methods. Changes are usually made with appropriate timing, allocating the necessary resources and valuing their contribution to the quality of education. But the context for introducing digital innovations in technical institution was altered by COVID-19 [1,2,3] so at that time the transition from campus-based methods to remote teaching practices took place without having time to plan and evaluate the impact of the changes.

There is much evidence to suggest the influence of using different assessment methods face-to-face, online or blended on the learning cycle of technical education students [4, 5, 6, and 7]. And therefore it is to be expected that a change in assessment format from a face-to-face to an online method will have some impact on students' performance.

Considering these reflections, in this paper we analyze the impact on students' performance of introducing an accelerated change in the final assessment of students in the case of a massive online examination, which moved from a face-to-face examination-based system to a fully online mode in June 2020, as a consequence of the pandemic. It is worth to notice that the only change was in the assessment system, as the courses were already taught at a distance before, and during, the pandemic. We aim to answer the following research questions:

- Research question 1 (RQ-1). Has the new online final assessment method had any influence on students' performance?
- Research question 2 (RQ-2). How has the sudden change resulting from COVID-19 influenced students' perceptions towards assessment?

In the first place, we introduce the background to the reasons that make it difficult for universities to implement digital assessment systems. We also explore the literature on the relationship between digital assessment and performance in technical education. This is followed by a case study at the TPEVRGPTC, VELLORE-2, where a final online assessment system was applied due to the COVID-19. We aim to provide evidence about the impact of the rapid adoption of online assessment that can inform further reflection and decision-making about assessment methods that can be used.

II. Barriers to Digital Assessment in Technical Education

Examples of digital assessment include proctored exams, multiple-choice digital tests, and virtualrealitySimulations, standardized tests, video performances, and digital portfolios. There is a lot of research on digital assessment, focusing on the application of some of these variants in different contexts [8, 9, 10, 11, 12, and 13]. In general, the results point to the integrity of remote assessment processes and a number of associated advantages [14, 15, 16]: better engagement from students; staff can choose the timing for their assessments; students can choose when and where to undertake assessments; more efficient management of assignment submissions, marking and moderation; better storage and archiving of student attainment records; ability to improve existing "human" or solely paper-based methods of marking. But, in the case of technical education and despite the abundance of evidence, most of the technical colleges have implemented any online assessment system. It has been mainly in the open and online that most pilot tests have been implemented while face-to-face institutions are reluctant to overcome the many obstacles to digital assessment. In any case, a recent study about assessment in mega technical institutions shows that "online assessment is reported to be applied all level.

III. Methodology

The main objective of the study is to determine the influence on students' performance of the change in the final assessment system at technical education, from a face-to-face to an entirely online examination system. To better understand the impact of this change on students, the study also aims to understand the influence of the speed of change, since the online assessment system was suddenly introduced as a result of the COVID-19 crisis.

Normally, the final assessment at the technical education was based on face-to-face examinations held in the colleges located in technical institutions (polytechnic- 45 centers) and others non technical institutions (19 centers). The change in assessment method meant that teachers had to convert their final face-to-face examination into a digital web-based examination. To this end, the technical institutions offered two digital assessment systems. One of these was applied mainly to courses with a low number of students enrolled, and consisted of using the assessment facilities available in the college's learning management systems (LMS). This solution involved adapting a digital infrastructure that was already in use. The second option was a new digital assessment system on which we focused on this work. This is a proctored testing platform created by technical institutions in order to scale up the large number of tests that had to be taken online due

to the pandemic. The number of online exams that took place in the new e-assessment proctored platform was about 88,000. Table 1 presents the characteristics of the final assessment methods before and during the pandemic. We remind that the only change was in the assessment system, as the courses were already delivered at a physical mode before the pandemic.

Table 1: Final assessment methods in Technical Education before and during the COVID-19 crisis

Key issues	**Usual Scenario**	**COVID Scenario**
Delivery of the Courses.	• Face-to-face exams. • Teachers prepare exams that students take in the technical education in respective regional centers.	• Proctored online exams. • A cloud-based application was designed with user access via the web. • Teachers prepare • exams, and students take them online from • anywhere.
Type of exams.	• Different types of exams can be prepared (MCQ, essay or open-ended questions, or mixed).	• Different types of exams can be configured (MCQ, essay or open-ended questions, or mixed).
Time to complete Exams.	• The examinations were conducted Synchronously. • Limited response time control (maximum 3 hours, minimum 1 hour).	• The examinations were conducted synchronously. • limited response time control (maximum 3 hours, average 1 hour).
Resources allowed in the Exams.	• Normally students cannot introduce or use any material (books, class notes) in the exam classroom.	• Normally students used books, electronics gadgets. • Some teachers designed open-book online exams.
Integrity of the assessment process.	• The integrity of the process was guaranteed by the exams being invigilated (by teachers and support staff from the regional examination centers). • No electronic devices are permitted.	• Integrity was ensured through control procedures that prevented students from cheating. • Camera shots during the exam, no copy and paste in the application, reduced time to complete the exam compared to the time available in the face-to-face mode.
Examination Control	• Examinations are controlled by the invigilator and strictly follow the examinations reuses and regulations.	• Examinations are not in our control and violate the examination rules and regulations

To clarify and monitor (for quality assurance purposes) the academic aspects associated with the transition from an analogical to a digital assessment system on a mass scale, the technical education designed a protocol that included guidance for the teaching staff. The technical institution's premise for its teaching professionals was to apply the same academic criteria established in the study guide for each course, making the least number of changes to the structure of the assessment, even though it was now online: i.e., if the original classroom exam was MCQ, essay or open-ended questions, or mixed to be completed in one hour, the online assessment should be similar; if the classroom exam included a MCQ, essay or open-ended questions, or mixed to be completed in 3 hours, the online exam should have the same scheme.

The transition from one system to another did not cause any organizational difficulties, although the context of the COVID-19 led to a consensus among the teaching staff that the design of the new online exams would not lead to increased difficulty. The aim was to avoid greater stress for students, considering the difficult situation associated with the pandemic.

In terms of the availability of technological infrastructures and the digital skills of students, teachers and support staff, the context of a online teaching means that these needs are essentially covered. During the enrolment process, students are asked about the need for connectivity to access online learning. Similarly, teachers and support staff are trained to operate in fully online contexts.

IV. Results

The results derive from the analysis of data from the two statistical data sources. Firstly, data on student performance over the past six years measure the impact of the change in assessment method during COVID-19.As described below, the analysis of these data in response to RQ-1 takes two forms: aggregating all Technical Diploma Degrees and measuring the variability of performance indicators in the last six years; and disaggregating each Diploma's Degree and performance indicators into these degrees.

The second analytical framework concerns data from the survey of Diploma Degree students who participated in the new online assessment. In response to RQ-2, only the items referred to students' perceptions of the sudden change in the final assessment method because of the COVID-19 have been considered.

A. Overview: general evolution of academic performance indicators

The information in **Figure 1** provides an overview of the evolution of four academic performance indicators in the cycle over the last 6 years, aggregated for all Technical education Degree courses. The data for the year 2021 correspond to the online assessment method, whereas the usual face-to-face examinations at Technical Education were used in the previous 5 years, from 2015 to 2021. In 2020 to 2021the academic performance of students increased in all 4 indicators by between 15% and 20%.

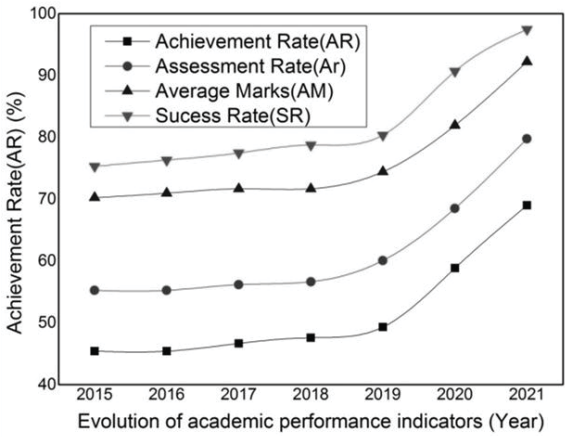

Fig 1: Evolution of academic performance indicators in Diploma. Aggregated data from all courses between 2015 and 2021

(Source: Diploma Student Data Base)

The data from the survey on students' perceptions provide a complementary view related to the Achievement Rate (AR). Students were asked what influence the fact that the method used was online had on their decision to participate in the final assessment (**Figure 2**). A majority of students said it had no influence at all (60.89%), followed by those who felt encouraged to participate (25.71%), and a minority felt discouraged (13.4%). This is directly related to students' perception of online assessment, with a positive impression (predominantly "no influence" or "positive influence" responses). Eventually, this could explain in academic terms the higher participation rate in the exams. However, the possible projection of these results to other domains should consider the context of the research, as well as the possible biases of a sample composed mainly of students who took the exams and excluding those who did not, who may also have been discouraged by the newonline exam format.

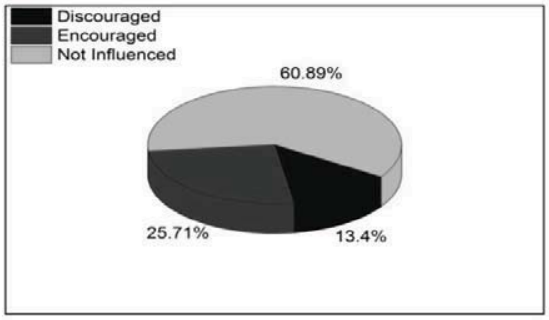

Fig 2: students' perceptions provide a corresponding view related to the Assessment Rate (RA)

Figure 3 also shows the data from the survey items on students' preference between online and face-to-face exams. The majority of Technical students prefer online exams (54.3%) to face-to-face exams (39.9%), with a small percentage expressing other preferences (5.8%). Although this is significant, it should be noted that the context is that of a online examination for diploma engineering, where there is a clear preference for digital methodologies.

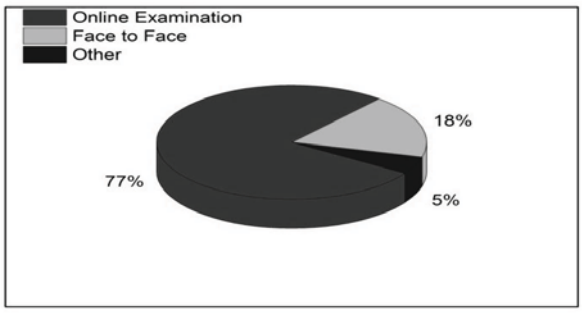

Fig 3: Assessment Method for Final Examinations

The improvement in grades is paralleled by students' perception of the online assessment method as difficult. This would be adding value to the improvement in scores, in terms of the reliability of the examination system. The data from the Lakers scale in **Figure 4** show that most students consider online assessment to be no easier than face-to-face assessment (39.5% strongly disagree; 24.3% disagree), with 25.7% thinking it is the same. In addition, the effect of a possible use of the survey by students to condition the difficulty of exams in the future could also be considered.

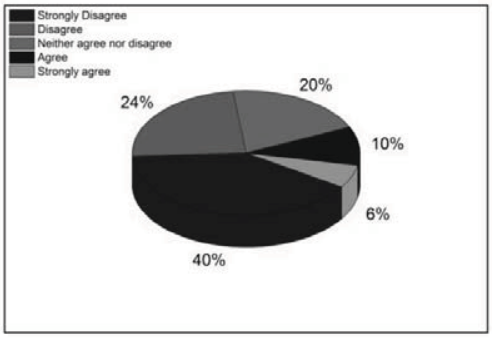

Fig 4: Online Exams Vs Face-to-Face Ones

(1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree;

(4) Agree; (5) Strongly agree

Also, the time variable is one of the most mentioned in the scientific literature on the integrity of proctored exams. It is also stressed that more time in exams does not improve student performance in terms of higher scores [17]. On this occasion, **Figure 5** shows a clear majority of students who stated that the time available was short (61%), followed by those who had sufficient time (29%) and, residually, those who claimed to have more time than necessary. These results indicate that the high-performance scores were achieved under conditions of time constraints.

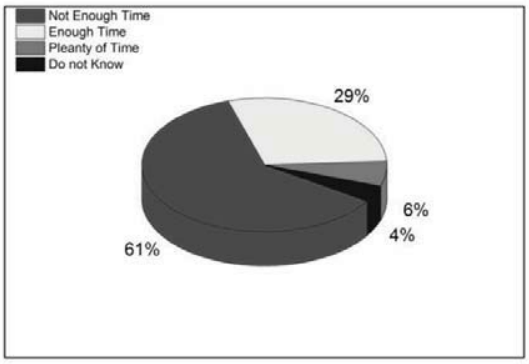

Fig 5: Examination Time Schedule Vs Students Feed back

V. Discussion

Digital learning assessment methods have proved to be useful in improving teaching, mainly because of their flexibility and ability to adapt to individual student situations [18, 19]. However, studies on its impact on academic performance have been inconclusive, and the only common element in the scientific literature is the strong link between performance and the academic conditions that frame online assessment i.e., rapid organizational change, prior training of students in assessment, circumstances in which exams are held, etc,. In the study presented here, the positive

effect of online assessment on student performance is clear. And eventually, analysis of the findings must also consider the impact of academic conditions on outcomes.

Most of the evidence found is in response to RQ-1, since the results suggest a direct correlation between the usage of an online evaluation technique and the improvement in performance across all the indicators. Therefore, the academic design of online assessment should be addressed in the response to RQ-2.

In the case of Technical Education, the academic issues that conditioned the online assessment revolved around the emergence of change because of the COVID-19. In addition, the speed of change also affected the type of technology and the assessment process in each case.

The results show that the improvement in performance indicators coincides with a high appreciation of online assessment by students; there are a residual number of students discouraged from taking exams when the system changed from face-to-face to online (Figure 2). The research suggests two factors that may explain the improvements, and these are provided below.

- The online assessment under analysis took place in June 2020 during the COVID-19 crisis that, in the case of Tamilnadu, India, led to a situation of population confinement. In this context, many Technical Students may have taken advantage of the slowdown in socio-economic activity to spend more time on academic activities. This situation may have altered the results, making it necessary to further study the impact of online assessment under "normal" circumstances.
- Another circumstance that can explain the positive results in performance is the protocol applied to design the exams. Due to the rapid change, teachers simply replicated the face-to-face exams in the online format, and tried to avoid extra difficulties for the students. It is possible that the online exams that were finally designed were less difficult than the original face-to-face version. Again, this possible bias calls for alternative research on successive cohorts of students and also adding analysis of the process of test design by teachers.

The fact that research is contextualized in a Technical Colleges also has an impact on the acceptance of online assessment, as students eventually appreciate the ease of not having to travel to the examination centers. In this sense, the results are consistent with previous studies that highlight

the preference of Technical students for online exams [20, 21, 22], and specifically in the context of Technical Learning Colleges.

Another topic of discussion is the influence of online exam time on performance. According to the results of previous studies, this research also points out that students attach great importance to the time available. Here their perception is that examination time has been low (Figure 4), although, contrary to the results of other studies [23], the scores of average mark, have been higher than in face-to-face exams with the same time available. Previous research relates time available to anxiety levels, and indicates that perceived negative factors about the dynamics of an online exam decrease after students have tried the system [24] . While this study does not address the anxiety variable, it does reinforce students' concerns about the apparent lack of time to take exams and the difficulty that comes with it.

Finally, it is worth discussing the role of cheating in research results. The scientific literature highlights doubts in the integrity of online assessment due to the possibility of cheating, among other factors. In the study, this weakness attempted to be controlled by looking at the different control mechanisms (technological, time, question focus, process monitoring, etc.) that were applied in the online exams. Table 1 shows the control technologies employed, and evidence was also collected on the difficulty of limiting the time available to take the exams (see Figure 5), which affects the intentionality to cheat in online performance situations [25,26].

Conclusion

The aim of the study is to take a broader view than the purely technical one of the consequences on academic performance of changing the assessment format use of an online versus a face-to-face system, incorporating academic factors organizational context and students' perception of rapid change which, according to the literature review, are also decisive in explaining student performance. To this end, data were collected from the technical students using an online assessment system at the Polytechnic Colleges.

The first study question focuses on the influence of the new online examination system on student performance. The study concludes that there is an increase in the academic performance of students who have taken the online exams in all the indicators analyzed, and that the differences are statistically significant, especially in Assessment and Achievement rates. Success rate and Average mark have also increased with the online assessment that was in place in 2020, but the differences were statistically significant in 50% (AM) and 35.7% (SR) of the Diploma Degree. The second

study question focused on the possible change in students' perceptions of online examinations after experiencing the new method. And the study concludes that improvement in academic performance also coincides with a better perception by Technical Students of online assessment as opposed to face-to-face assessment. In addition, the online format encouraged them to take the exams, although they did not perceive the online version to be easier and found the short time available a particular difficulty.

The contribution of the study to the issue of the integrity of the online assessment process is limited. However, the results of the survey on students' perceptions of online assessment point to a more difficult, time-sensitive and generally more complex system than face-to-face examinations. In this sense, the data indicate that students do not perceive online assessment as easy, with lower quality and less control. And in the specific case of technical learning colleges, the most relevant academic aspect resulting from students' acceptance of the online method is the increase in Assessment Rate(Ar), considering that in Technical learning College education the number of students enrolled who pass the course is usually lower than in face-to-face College Educations.

There are also limitations when it comes to attributing a motivational capacity to online exams. In the study, students expressed a favorable tendency towards online exams, insofar as they had no influence or minimal incentive to take them (Figure 2) and are preferred over face-to-face exams (Figure 3). However, this effect seems to be more related to the context of technical learning colleges where students are more likely to opt for any non-face-to-face alternative than for online exams. So, based on the data from this study, a conclusion on this aspect would require further inquiry in conventional face-to-face learning situations.

A possible implication of the implementation of the online assessment and the increase in academic performance is an expected reduction of dropout in the medium term. The significant increase in the achievement rate, which means that a higher percentage of students pass a course, can positively lead to a higher enrolment in the next year. This impact on retention has a great significance in Technical Education, where dropout has been a permanent challenge [27].

The findings show that the students' academic performance in all the indicators and all the Technical Degrees has improved, and that the general opinion of the students who responded to the survey is good about the online system. The question then is how this experience will inform and drive long-term organizational change. In the case of Technical Education, the online final assessment system was also implemented in the September 2020 call and throughout the 2020-2021 academic year. But is this still an emergency solution, and will exams be held again face-to-face as

long as the pandemic allows? Will online exams continue to be the main final assessment system after the COVID-19 crisis? Will online and face-to-face exams coexist in the future?

On the horizon, organizations are faced with questions about improving the reliability of online examinations, and administrative barriers related to agencies and quality standards. How to overcome these barriers and take advantage of the benefits of digital assessment will be factors to be analyzed in the near future.

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THE PROS AND CONS OF ONLINE EDUCATION AMONG COLLEGE STUDENTS (WITH SPECIAL REFERENCE TO COLLEGES IN VELLORE CITY)

UGC CARE APPROVED

ABSTRACT

In this era of evolving technology, the opportunities made available by the internet have been fully utilized. There was a lot of uncertainty among parents and students when it first came out. This uncertainty has subsided and has become the new normal (an unusual situation that has become routine), and both students and educators can see the benefits and drawbacks of online education. It has more positive aspects than negative ones. The views are taken from the perspective of students. Online education is a costly affair in a country like India, where it is still in its developing phase. Convenience sampling has been used to study the views of students. The researcher used a structured questionnaire to obtain responses from the students from different colleges. A total of 180 responses were received, with 16 being ignored due to response bias. Hence, a valid number of 164 samples were taken forward for analysis. Percentage analysis, Anova, and Chi square were used as tools for this paper. The researcher brings out the difficulties that are faced by students and tries to give practical solutions to make the learning process easier.

***Keywords**: Online class, offline class, software, and hackers—the new normal.*

I. Introduction

Online education is a much easier way to deliver any type of education through the internet. Online learning systems enable students and educators to gain knowledge while remaining stationary. The recent pandemic has increased the use of online education in schools and colleges. The applications available on online platforms made usage much easier, resulting in more user-friendly online classes. The vast usage of the Internet has reduced paper work a lot, saving a lot of trees, but in the same way, the implantation of mobile towers has made sparrows an endangered species. Though it makes life easier, there are some notable advantages and disadvantages raised by students about the online mode of education.

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II. Literature Review

There are many definitions of online learning. Khan (1997) has defined "online" as the one that delivers information even to a remote audience using the internet as their mediator. According to Stack Steven Dr. (2015), online education has multiplied in the last decade, and he also did not find any major dissimilarities among the students who take online and offline classes. E-learning has many advantages, according to Callan et al. (2010) and Garrison (2011), including affordability, time and money savings, and the ability to use different learning styles. Bouchnik and Marcus (2006) stated the dissatisfaction of e-learners' lack of framework, low motivation, bad study habits, and lack of learning atmosphere.

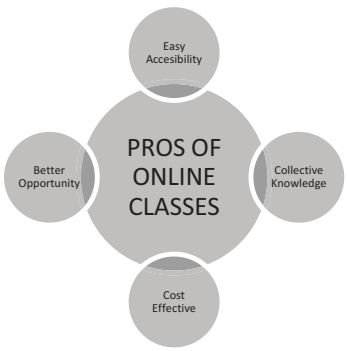
Objectives

1. To study the demographic profile of the respondents.
2. To identify the technical, psychological, and functional issues faced by the students in the online classes.
3. To analyse the technical, psychological, and functional issues challenged by the students during online classes with selected demographic variables.

Pros of online classes

Easy accessibility: As India has moved on to 5G, it has benefited from the easy accessibility of the internet and can attend classes from any part of the world.

Collective knowledge: Students gain collective knowledge as they get instruction from around the globe, which they cannot get from mere books.



Cost-effective: It reduces the burden on students, as they need not spend on transportation and accommodations.

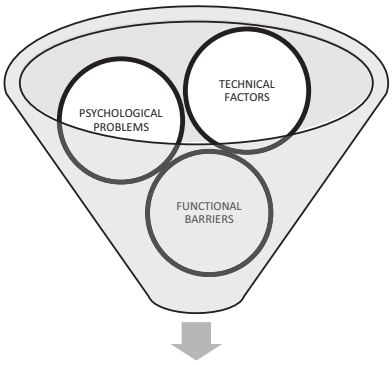
Better opportunity: As the students have the opportunity to choose various courses; it helps them get better exposure to the outside world.

Cons of online classes

The researcher has found certain cons that lead to finding certain factors like technical problems, psychological problems, and functional barriers.

Technical factors

- Network problem
- Lack of strong software facilities
- There is no frequent update.
- Lack of specialists to solve the technical issues.



CONS OF ONLINE CLASSES

Psychological problems:

- I fear that hackers can easily access my online accounts.
- I am concerned about losing my privacy and ending up in the wrong hands.
- I fear losing money due to high internet costs.
- I fear having difficulty completing the online classes successfully.

Functional barriers

- Online education is much more complicated when compared to traditional methods of education.
- Online classes would be uncomfortable and create distractions.
- Online classes may not be as effective as offline classes.
- I feel more confident during offline classes than in online classes.

Another disadvantage is that students' feedback is limited, which leads to isolation because they are not in regular classrooms. Students lose their communication skills; online learning requires strong motivation and time management to complete their day-to-day work. As there is no face-to-face communication, it may lead to cheating among students and reduce their morality. There are so many practical issues in a country like India, where there are more illiterates.

Table 1 Demographic Profile of the Respondents

Demographic Profile	Options	Frequency (N = 164)	Percent (%)
Class Group	BA	44	26.8
	B.COM	78	47.6
	B.SC	29	17.7
	PG	13	7.9
Gender	Male	123	75
	Female	41	25
Type of Institution	un-aided	29	17.7
	Aided	25	15.2
	Government	106	64.6
	Others	4	2.4
Annual income of Parents (in Rs.)	Lessthan Rs.1,50,000	29	17.7
	1,50,000 – 3,00,000	70	42.7
	3,00,000 – 4,50,000	37	22.6
	Above 4,50,000	28	17.1

A total sample size of 164 was considered for the study. Table 1 shows the demographic characteristics of the respondents, in that 47.6 percent belong to the class of B.COM. The majority (75 percent) of respondents were male. 64.6 percent of respondents are doing their graduation in government colleges, and 42.7 percent of respondents' income level is between Rs. 1, 50,000 to Rs. 3, 00,000 per annum.

III. Analysis

An exploratory factor analysis (FA) was applied in this study on the 12 items using principal component analysis with orthogonal rotation (Varimax).

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy had a value of 0.606, which is above the minimum acceptable level of 0.6 (Kaiser, 1974). Barlett's sphericity test was significant at the value of p = 0.00. . Then a reliability test was conducted to measure the internal consistency. As the value is greater than the minimum acceptable level of 0.70 (Nunally 1978), the Eigen values are greater than one and are considered for the study. Three factors explain 69.215 percent of the total variance using the varimax rotation method.

Table 2 Factor Analyses

Variables	Technological Barriers	Psychological Barriers	Functional Barriers
Network problem	0.917		
Lack of strong software facilities	0.853		
No frequent updating	0.850		
Lack of specialist to solve the technical issues	0.803		
I fear that hackers easily access my online accounts		0.910	
I am concerned about losing my privacy and ending up in the wrong hands.		0.826	
I fear of losing money due to high internet cost		0.764	
I fear of difficulty in completing the online classes successfully		0.603	
Online education is much complicated when compared to traditional methods of education			0.810
Online classes would be uncomfortable and creates distraction			0.795
Online classes may not be effective when compared to offline classes			0.580
I feel more confident during offline classes than in the online classes.			0.578
Eigen Value	3.612	3.059	1.635
Cronbach's alpha	0.888	0.801	0.742

Percentage of total variance explained (%)	28.553	23.541	17.122
Cumulative total variance explained (%)	25.553	52.094	69.215

The first factor loaded with four variables has a variance of 28.553% and is named "technological barriers." The statement "Faced more network problems" loaded with the highest value of 0.917. The second factor, psychological barriers, has a variance of 23.541 percent and is loaded with four variables. The statement "I am concerned that hackers can easily access my internet accounts" received the highest score of 0.910.

The final factor with four variables has a variance of 17.112% and is referred to as functional barriers. The statement 'online education is much more complicated when compared to traditional methods of education' has the highest value of 0.810.

Table 3 Mean and Standard Deviation of Respondents Perception Towards Online Classes

Variables	Mean	Standard deviation
Network problem	3.91	0.73
Lack of strong software facilities	3.78	0.86
No frequent updating.	3.85	0.74
Lack of specialist to solve the technical issues	3.79	0.75
I fear that hackers easily access my online accounts	3.77	0.76
I am concerned about losing my privacy and ending up in the wrong hands.	3.97	0.83
I fear of losing money due to high internet cost	3.76	0.68
I fear of difficulty in completing the online classes successfully	4.21	0.77
Online education is much complicated when compared to traditional methods of education	3.49	0.64
Online classes would be more uncomfortable and creates distraction	3.64	0.72
Online classes may not be effective when compared to offline classes	4.06	0.76
I feel more confident during offline classes than in the online classes.	3.75	0.82

Based on the mean score, 'I fear that it is difficult to complete the online classes successfully' (4.21) is the most important challenge faced by students in online classes, followed by "Online classes may not be effective when compared to offline classes" (4.06). The least mean score is

"Online education is much more complicated when compared to traditional methods of education." (3.49). The students find it difficult as the courses are over-delivered and more theoretical in nature; this demotivates them and gradually causes them to lose interest, which paves the way for the unsuccessful completion of online classes. Students feel that face-to-face interaction is more effective, which fosters a cordial relationship between them and faculties. As the students are techs savvy, only a few find complications between the online and offline classes.

***Null Hypothesis*:** There is no significant difference among class group with respect to technological barriers faced by students during online classes.

Table 4 Respondents Class Group and Technological Barriers Faced by Students During Online Classes

Technological Barriers	Class Group				F Value	P Value
	BA	B.COM	B.SC	PG		
Network problem	3.73 (0.75)	3.91 (0.40)	4.21 (1.23)	3.85 (0.56)	2.603	0.054
Lack of strong software facilities	3.68 (0.91)	3.78 (0.66)	4.00 (1.28)	3.69 (0.63)	0.857	0.465
No frequent update.	3.65 (0.80)	3.83 (0.49)	4.27 (1.03)	3.76 (0.72)	4.478	0.005
Lack of specialist to solve the technical issues	3.63 (0.74)	3.75 (0.51)	4.17 (1.13)	3.76 (0.73)	3.286	0.022

As the P value is less than 0.05, the null hypothesis is rejected at the 5% level of significance with regard to "no frequent updating" and "lack of specialists to solve the technical issues" as the technical challenges faced by students during online classes. Hence, it is concluded that there is a significant difference among the class groups of respondents with regards to "no frequent updating" and "lack of specialists to solve the technical issues the technical challenges faced by students during online classes. Hence, it is concluded that there is a significant difference among the class groups of respondents with regards to "no frequent updating" and "lack of specialists to solve the technical issues."

As the P value is greater than 0.05, the null hypothesis is accepted at the 5% level of significance with regard to the "network problem’ and the "lack of strong software facilities’ technical challenges faced by the students during online classes. Hence, it is concluded that there is no significant difference among the class group of respondents with regards to "network problems" and "lack of strong software facilities" or "lack of specialists to solve the technical issues faced by the students during online classes."

Null Hypothesis: There is no significant difference between the genders with respect to psychological barriers challenged by the students during online classes.

Table 5 Psychological Barriers Challenged by the Students in Online Classes with Gender

Psychological Barriers	Gender				t Value	P Value
	Male		Female			
	Mean	SD	Mean	SD		
I fear that hackers will easily access my online accounts	3.83	0.797	3.59	.591	2.086	0.040
I fear of losing privacy and ending up in wrong hands	3.93	0.81	409	0.91	1.013	0.315
I fear of losing money due to high internet cost	3.60	0.55	4.24	0.80	5.709	<0.001
I fear that difficult to complete the online classes successfully.	4.15	0.80	4.39	0.66	1.862	0.066

Because the P value is less than 0.01, the null hypothesis is rejected at the 5% level for the psychological barriers challenged by customers in online banking, "I fear that hackers easily access my internet accounts" and "I fear of losing money due to high internet costs," respectively. Hence, there is a significant difference between male and female respondents with regard to the above-mentioned psychological barriers. Based on the mean score, male customers have a greater psychological fear that hackers will easily access their internet accounts than female customers. Male students are much more involved in online learning, which leads them to get worried that their online accounts may get hacked while doing and submitting assignments and may not be up to the mark, which makes them feel that they are unsuccessful in the completion of the works given through online learning, and all these things lead them to spend more money on internet charges. The students must learn to float on the internet, and they must not drown in it; if they do, that may lead to a panic situation. Female customers have more fear of losing their money due to high internet costs than male students. Female students must learn to use the internet wisely.

As the P value is greater than 0.01, the null hypothesis is accepted at the 5% level with regards to "I fear of losing privacy and ending up in the wrong hands" and "I fear that it will be difficult to complete the online classes successfully." of psychological barriers challenged by the students in online classes. Hence, there is no significant difference between male and female respondents with regard to the above-mentioned psychological barriers challenged by the students in online classes.

Null Hypothesis: There is no significant difference among class groups with respect to functional barriers faced by the students in online classes.

Table 6 Functional Barriers Challenged by the Students in Online Classes with Class Group

Functional Barriers	Class Group				F Value	P Value
	BA	B.COM	B.SC	PG		
Onlineeducation is muchc omplicated when compared to traditional methods of education	3.55 (0.79)	3.69 (0.46)	2.83 (0.38)	3.62 (0.51)	17.086	<0.001
Online classes would bemore uncomfortable and creates distraction.	3.45 (0.50)	3.93 (0.78)	3.00 (0.05)	4.00 (0.70)	18.367	<0.001
Online classes may not be effective when compared to offline classes	3.72 (0.75)	4.37 (0.70)	3.68 (0.47)	4.23 (0.83)	11.569	<0.001
I feel more confident during offline classes than in the online classes.	4.00 (0.60)	3.65 (0.97)	3.68 (0.47)	3.69 (1.03)	1.774	0.154

As the P value is less than 0.01, the null hypothesis is rejected at the 1% level of significance with regard to "online education is much more complicated when compared to traditional methods of education" and "online classes would be more uncomfortable and create distraction." and "Online classes may not be effective when compared to offline classes." of functional barriers faced by students in online classes. Hence, it is concluded that there are significant differences among the class group of students with regards to the above-mentioned functional barriers.

As the P value is greater than 0.05, the null hypothesis is rejected at the 5% level of significance with regard to "I feel more confident during offline classes than in the online classes.' of functional barriers faced by the students in online classes.

IV. Findings

1. The results of the study reveal that the majority of male students are B.COM graduates from government colleges.
2. Students' apprehension about the network problem and hackers' access to their internet accounts contributes to their unease with online classes.

3. The study also reveals that the students have difficulty completing the online classes successfully, as they feel the online classes are not as effective as the offline classes.
4. When they encounter technical problems, their panic is exacerbated by the scarcity of specialists.
5. Male students are afraid of hackers, while female students are afraid of losing money.
6. The study identified some of the technical factors, psychological problems, and functional barriers experienced by the students.

V. Suggestions

To remove the cons of online classes, the students must be provided with awareness programmes on handling their online accounts carefully. Using the internet wisely aids them in identifying the hackers. They should adopt themselves to the new normal, which is to adopt unfamiliar or atypical situations. Anything that is beyond the limit is dangerous.

VI. Conclusions

Online education plays an important role in India. The researcher concluded that the fear of online classes must be removed by bringing in a strong web-based system. This web-based system should cover a student's attitude, character, cultural background, and other demographic characteristics. Instead of taking class monotonously, the faculties must ensure that they give some space to the students by allowing them to participate in online seminars and should give counselling regarding the changes that will soon become the new normal. There are plenty of government platforms like Swayam, the educational channel Swayam Praha, and the National Digital Library that students should be made aware of to make their online classes easier. Teaching faculties must try to increase interaction between students during online classes. Professors must develop peer-to-peer activity among the students and ensure the same comfort that they enjoyed during offline classes. In order to ensure the genuineness of the online classes, anti-cheating measures must be put in place by the colleges to monitor the work submitted by the students.

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THE RISE OF ONLINE LEARNING AMONG THE UNIVERSITY STUDENTS DURING COVID IN CHENNAI: OPTIMIZING THE TRADEOFF BETWEEN STUDENT'S HEALTH AND LEARNING

UGC CARE APPROVED

ABSTRACT

*The Covid19 pandemic has transformed the entire system of education from being class room oriented to completely technology dependent. In India, online education's or learning platform's Compounded Annual Growth Rate has been estimated as USD 1.96 billion by KPMG (KLYNVELD PEAT MARWICK GOERDELER)**.** The educational institutions across the globe were shut down for several months and have been conducting classes through digital platform for their students due to various restrictions imposed by the government. The online system of education has imposed varied challenges on the educators and the students. While online learning is flexible, time-saving and facilitates use of technology with creativity, it is not free from draw backs. Accessibility, affordability, infrastructure and attitude of the students towards online system of education are primary challenges to digital learning. The primary objective of this study is to understand the students' perception towards online classes and identify their needs and challenges faced by them and their satisfaction with respect to various attributes of online learning. The study is based on the data obtained from the students of one of the predominant catholic minority institutions in the city of Chennai, India. Information about various aspects of online education have been collected from students of various departments of the institution through a structured google form questionnaire. The study also enumerates the usage of technology before and during the pandemic. The infrastructure available to the students, accessibility and various technical difficulties faced by them have also been explored in this study. A factor analysis has been carried out to classify the factors influencing students' satisfaction. An ordinal regression has been used to establish the relationship between students' attitude towards online learning, their perception, health effects and their level of satisfaction. The study also explores the association between several factors influencing the effectiveness of online learning. While many institutions of higher education are at present struggling to deliver effective online learning experience to their students, the study throws light on various challenges that hinder effectiveness of online education. Based on the responses from the students, the study proposes some initiatives that could be implemented in the online learning environment for effective learning outcomes.*

Keywords: *Online learning, Educational outcome, Students' satisfaction, Perception, Attitude, Challenges, Effective learning.*

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Introduction

The COVID -19 pandemic has brought in several innovations in the educational sector. While it initially imposed a great challenge to the sector across the globe, virtual education has come to provide a helping hand. The Online Education system has provided students a wide range of choices, independence, option of blended learning, learning flexibility, multimedia and open educational resources. Students can access a variety of content, from multiple sources available in web sites and can choose based on their areas of interest, and even sources of accreditation. The blended or hybrid learning where classroom time is reduced with substantial time being used for online learning, makes learners ask questions, and broaden the learner horizon for the course content. However, students have modern technology difficulties ranging from accessibility to technology, internet connection, technical know - how, downloading errors, issues with installation, login problems, problems with audio and video, and so on. At times students also face several health-related issues due to online education. Students are also tempted to commit academic fraud in online examinations, that could risk their qualification, skills and their ethical behaviors. Therefore, efforts should be made to humanize the learning process in an effective manner.

The study offers practical insights for educators and universities seeking to use online platform for higher education. This study can further contribute to academic research with respect to challenges faced by the students during pandemic due to online education system, by revealing students' perceptions and motivations. A broad understanding of students' views on the use of online platforms may also be a step forward in understanding the relationship between use of technology and important educational outcomes such as assessment, ethical behavior, student participation and health issues. It is also essential to assess the usability of commonly applied tools for online education delivery, especially since the education delivery mode has switched to online solely in recent times. As a result, the adaptability and the utility of learning technologies has become a key factor in ensuring that online learning is effective and valuable for students.

Objectives of the study

I. To analyze the students' perception and attitude towards online education and challenges faced by then.
II. To enumerate the difference in usage of technology before and during the pandemic.
III. To identify the factors influencing students' satisfaction with online classes.
IV. To examine the effects of online education on students' health.

The study by analyzing students' perception and attitude towards online classes and the challenges faced by them would enable implementing strategies to improve their satisfaction with online classes. That would be a step forward in making online learning effective and efficient.

Review of Literature

(Gopal et al., 2021) in their study have attempted to determine the characteristics that influences students' satisfaction and performance in online classes during the COVID–19 pandemic period and the relationship that links all these variables. The data which came from 544 respondents who were enrolled in business management (B.B.A. or M.B.A.) or hotel management courses at Indian universities and completed an online survey. The datawas examined using a structural equation modelling. The findings demonstrated that the four independent criteria included in the study, namely teacher quality, course design, rapid feedback, and student expectation, have a beneficial impact on students' satisfaction.

R.K Krsihnan (2020) in his study speaks about numerous breakthroughs and trend setters in the new paradigm. The challenges discussed in this study includes the ongoing generation of new knowledge, technology tools, and applications for learning in the virtual world, as well as the analysis, evaluation, and implementation of that knowledge as needed. The second problem is self directed learning, greater peer learning, and a focus on symmetrical and asymmetrical learning methods. Critical thinking, independent-deep learning methods, and the use of technology are few of the attributes that the students use to build their talents. Finally, the study concludes with the fact that teachers/ facilitators should entail instructing students with the ability to regulate their own learning throughout their lives, so that they can achieve their goals.

(Lemay et al., 2021) studied many aspects of human endeavor that affected online education around the world during pandemic. Students' perceptions of the effectiveness and trustworthiness of

the online learning programme were obtained, which had the highest mean score of (3.77), while problems that students faced during online teaching and learning received the lowest mean score is (3.51). As E-learning is on the rise, more institutions are expected to adopt suitable online platform, offering online courses to an ever-increasing number of students.

(Ayebi-Arthur, 2017) conducted a study to find the impact of seismic activities on education. The study showed that the college became more resilient to online learning after the disaster. Though the technology has helped them to a great extent, respondents opined that only a robust IT infrastructure can help to meet the growing demand.

(Khalil et al., 2020) explored the undergraduate medical students' perceptions regarding the effectiveness of synchronized online learning at Unaizah College of Medicine and Medical Sciences, Qassim University, Saudi Arabia. The study attempts to capture some of the challenges, including methodological, content perception, technical, and behavioral challenges during sessions and online exams. Most of the preclinical students preferred online learning for the upcoming academic years. The study also showed that synchronized online classes were well-accepted by the medical students. This represents significant and promising potential for the future of medical education. The analysis concluded that the principles of online learning model and learning outcomes should be regularly evaluated to monitor its effectiveness.

(Yang & Cornelius, 2004) carried out a study using qualitative methodologies to explore students' impressions of the quality of online education based on their own online learning experiences at two universities and one community college. Three students were subjected to interviews and observations. Various documents, both digital and paper, were gathered. Students' positive and negative experiences were investigated. Those experiences are influenced by a number of factors. The results of this study demonstrated that flexibility, cost-effectiveness, and electronic research are all important factors. Students praised the accessibility to the Internet, as well as the well-designed class interface which helped in achieving efficient learning outcomes.

The use of online platform across the educational setting is on the rise. Subsequently, the body of research on this topic is highly spirited and rising. Recent literature has studied the challenges, preferences and experience associated with the use of online instruments in the classroom, but has not studied student's own views about their satisfaction and attitude towards online learning. Not much research has also been explicitly done to examine the association between students own opinion and their level of satisfaction with online classes. Further, a wide range of other influencing aspects of online education has also not been explored. The present study attempts

to explore students' perceptions and challenges faced by them due to online education and its association with health, infrastructure, ethical behavior and satisfaction level.

Research Methodology

The study is based on a primary survey among the Undergraduate and Post Graduate students in the city of Chennai. The students are from diverse socio-economic backgrounds. Several initiatives have been adopted during the pandemic of Covid 19, to provide online education to the students. The extent to which these initiatives have been successful in reaching out to the student community has been explored in this study. Adhering to the salient features of the study, quantitative variables like family income, usage of data, technology used, amount spent on data package before and during pandemic for online classes have been examined in this study. Further qualitative aspects like student's ethical behaviour, sources of internet data, heath aspects, online courses pursued other that regular academic courses, were also examined to find out the interaction between these variables in shaping students' satisfaction with online education.

The data has been collected using a structured questionnaire prepared in Google forms, which was circulated to the students across all the institutions in Chennai region. Data collected through Google form questionnaire well suited to achieve the objectives of the study. Students' perceptions towards online education based on their own experiences have been assessed with the help of a Likert's scale. Appropriate statistical tools using SPSS 22.0 has been applied to carry out the analysis. The study gauges the effectiveness of online education and helps in understanding the behavior and attitude of the students towards online learning. It also enables identification of the gaps in existing mechanism and recommends appropriate measures that could be adopted to achieve effective learning outcomes. The study also explores the perceptions and challenges faced by the student in online education. Exploratory factor analysis has been applied to identify the latent factors based on the information collected on various aspects of online learning. An ordinal regression has been used to establish the relationship between students' attitude towards online classes, its health effects as perceived by students, availability of infrastructure essential for online classes and the overall satisfaction of the students with respect to online classes. Satisfaction or dissatisfaction towards one's own experience with a particular product, condition, is a judgement or feeling of an individual which is often used as a tool by psychologists, social scientists, political scientists and marketing experts for various evaluative exercises. Satisfaction judgements and feelings reveal how far the utility has been maximized. Since, utility improvements are associated with welfare

improvements, the present study is a reflection of students' welfare through the lens of students' satisfaction with online classes. The findings would pave way for improving the online learning environment in order to achieve the desired educational outcomes.

Results and Discussion

The present study was carried out in in the city of Chennai. About 724 students participated in the survey and after elimination of the incomplete responses the analysis has been carried out with 626 responses. 57 percentage of the students were from the Science stream, 29 percentage from the Arts and 14 percentage were from other Vocational streams.

About 70 percentage of the students who had taken the survey are from Urban areas and 17 percentage from rural areas and 13 percentage from Semi-Urban areas. The pie chart below gives the distribution of students by level of income.

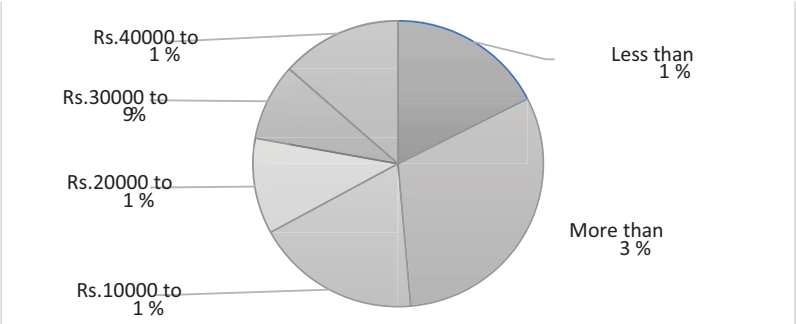

Figure 1 Distribution of students by level of income

Source: Computed from primary data

The distribution of students by income level indicates diversity of students with respect to their economic backgrounds. While 18 percentage of the students have a family income of less than Rs.10000 per month, about 31 percentage of the students have a family income of more than Rs.50000 per month.

All the students who had taken up the survey have been attending online classes. About 88 percentage of the students have been attending online classes for about 4 to 6 hours per day. About 47 percentage of the students are attending online classes only with mobile phones, about 25 percentage of the students are using laptops for online classes while about 17 percentage of the students use both laptops and smart phones for attending online classes.

Few of them (about 10 percentage) use I Pads, Tabs or Personal Computers for their online classes. Majority (46 percentage) of the students have stated that they consume about one to two GB of data while about 24 percentage of them have stated that they consumer two to three GB data per day for their online classes. About 13 percentage of them have stated that they consume more than four GB per day for online classes. Students who have access to Wi-Fi(about 36 percentage) are observed to have access unlimited data, while those who are using data from their mobile network (about 53 percentage) have only limited availability of data. Only about 8 percentage of the students have access to unlimited mobile data. Very few students are using data dongle with limited and unlimited data plans. Majority (42 percent) of the students using their mobile network for online classes, spend about Rs.300 per month on an average on mobile recharge per month. About 30 percentage of the students are spending about Rs.500 per month on an average. And about 15 percentage of them are spending more than Rs.600 per month towards mobile recharge. Fifty three percentage of the respondents have opined that they have enrolled for other skill development / courses outside college which shows that online education has highly instigated the students to avail online platform to build their capacity.

Table 1 Paired Sample Test showing difference in amount of mobile recharge before and during the pandemic

Mobile Recharge (per month)	Mean	SD	t value	p value
Before the Pandemic	270.28	225.19	16.86	0.000**
During the Pandemic	430.65	275.32		

Source: Computed from primary data

Note: ** indicate significance at 1 percent level.

The table above indicates that there is significant difference (at one percent level) in the average amount of mobile recharge before the pandemic and during the pandemic. The amount spent on mobile recharge during covid-19 is about 60 percent higher than the average amount spent before the pandemic. There has also been a significant increase in the amount spent on Wi-Fi.

Table 2 Paired Sample Test showing difference in amount spent for Wi-Fi before and during the pandemic.

Wi-Fi charges (per month)	Mean	SD	t value	p value
Before the Pandemic	458.20	614.11	12.22	0.000**
During the Pandemic	690.02	772.96		

Source: Computed from primary data

Note: ** indicate significance at 1 percent level.

The table above indicates that the average amount spent on Wi-Fi has also increased during the pandemic and it is significant at 1 percent level. About 68 percentage of the students have stated that their expenditure on internet has increased during the pandemic. The students have also purchased electronic devices for the purpose of attending online classes. About 58 percentage of the students have purchased new mobile phones, 40 percentage of the students have purchased laptops, 15 percentage of them have purchased power banks and few of them have also purchased software and data dongle to support online classes. About 64 percentage of the students have at least two members in the family attending online classes or working from home.

Students are observed to face varied problems with respect to internet connectivity. An analysis of the infrastructure facilities available to students reveal several deficiencies faced by the students. Only about seven percentage of the students have rated their internet connectivity to be excellent, and 48 percent of the students have rated it to be good. Whereas about 20 percent of them have rated it as fair or poor. Although the use of technology has proven a lot of improvement in terms learning and acquiring new knowledge among the students, it can also be limiting, especially to a country like India. Many students in India still face a challenge in terms of access to the computers and internet. Education institutions who aspire to deliver online learnings during such situtaions,need more understanding on the feasible and possible approaches 7(Deepika, 2020). Technological issues can widen the student teacher relationship gap which can affect the efficacy of the educational outcome. Lack of standards for quality, quality control, e-content and e-resources delivery needs to be tackled immediately in order to ensure the benefits of quality education via e-learnings. (Cojocariu & Boghian, 2014) To understand the students' perception about online classes and the challenges faced by them, information was collected on about 20 different attributes about online classes and students' opinion about online classes. An exploratory factor analysis has been carried out in order to understand the relationship between the observed variables and latent variables. The results of the factor analysis of the 20 attributes are presented below in the following table:

Table 3 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.87**
Bartlett's Test of Sphericity	Approx. Chi-Square	5557.749
	Df	190
	Sig.	< 0.001**

Source: Computed from primary data

Note: ** denotes significance at 1 percent

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is a statistic that indicates the proportion of variance in variables that might be caused by underlying factors. The Kaiser-Meyer-Olkin value of 0.87 which is greater than 0.50 indicate that the factor analysis is appropriate to the data (Mishra, 2019). Bartlett's test of Sphericity tests the hypothesis that correlation matrix is an identity matrix, which would indicate that variables are unrelated and therefore unsuitable for structure detection. Since P value is less than 0.01, the hypothesis is rejected and it may be stated that the variables are related.

The table no.4 indicates that four factors have been extracted based on the criterion that only factors with eigen values of one or more should be extracted. The cumulative percentage of variance shows that the five factors, extracted from the 20 variables, together account for 60.622 percent of the total variance. Factor I which is named as “Perception”, which indicates students’ perception about online classes is a combination of ten original variables. Their percentage extraction is 28.679. The subsequent six factors pertaining to the health has an eigen value of 3.189 with percentage extraction of 15.945. The third factor named as “Online Infrastructure” is a combination of three factors with an eigen value of 2.025 and percentage extraction of 10.124 and the fourth factor named as “Connectivity” combination of three factors with an eigen value of 1.175 and a percentage extraction of 5.874.

Post identification of the major factors influencing online learning an ordinal regression has been done to identify the factors affecting overall satisfaction of the students with online classes.

The table no.5 which shows the model fit information shows how well the model fits the data. The model fit is statistically signification as the p-value is lesser than 0.05.

The Nagelkerke Pseudo R square in table no. 6 indicates that 37.3 percentage variation in the overall satisfaction with online classes can be attributed to the independent variables namely the students’ perception about online classes, health effects of online classes, infrastructure and connectivity.

Table 4 Factor Analysis of the online learning attributes

Factor	Attributes of online learning	Factor Loading	Eigen Values	Percentage of Variance	Cumulative Percentage
I (Perception)	Online classes are very interesting	0.826	5.736	28.679	28.679
	Online classes are more convenient	0.793			
	Online classes are interactive	0.758			

	Online classes are very effective	0.747			
	Online classes saves time	0.730			
	Online classes are very creative	0.727			
	Online exams /tests are more convenient and easy	0.693			
	Online classes easily accessible	0.677			
II (Health Effects)	Online classes causes back pain	0.754	3.189	15.945	44.624
	Online classes causes neck pain	0.746			
	Online classes causes fatigue	0.745			
	Online classes causes headache & stress	0.725			
	Online classes causes sleeplessness	0.708			
	Online classes causes strain in the eyes	0.692			
III (Online Infrastructure)	I do not have a proper device	0.799	2.025	10.124	54.748
	Facilities at home are not appropriate for online classes	0.773			
	Laptop / mobile is incompatible	0.682			
IV (Connectivity)	I have a poor network	0.812	1.175	5.874	60.622
	I face call drop or disconnection	0.794			
	I face powercuts during online classes	0.551			

Source: Computed from primary data

Table 5 Model Fit Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1871.086			
Final	1547.778	323.308	4	<.001**

Source: Computed from primary data

Table 6 Pseudo R-Square

Cox and Snell	0.330
Nagelkerke	0.373
McFadden	0.186

Source : Computed from primary data

Table 7 Test of Parallel Lines

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	1130.321	7.983	4	0.092
General	1122.338			

Source: Computed from primary data

The table above tests the proportional odds assumption. Since the significance of the chi-square statistic is greater than 0.05 the proportional odds assumption holds.

Table 8 Parameter Estimates

Parameter Estimates		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Overall Satisfaction=1.00]	0.821	0.619	1.762	1	0.184	-0.391	2.034
	[Overall Satisfaction =2.00]	3.219	0.632	25.930	1	<.001	1.980	4.459
Location	Perception	1.482	0.118	157.471	1	<.001	1.251	1.714
	Health Effects	-0.258	0.110	5.546	1	0.019	-0.473	-0.043
	Infrastructure	-0.147	0.095	2.358	1	0.125	-0.334	0.040
	Connectivity Issues	-0.268	0.107	6.220	1	0.013	-0.478	-0.057

Source: Computed from primary data

The threshold estimate in the table above represents the cut-off value between the different levels of satisfaction stated by the students. The independent variables namely, perception, health effects and connectivity are statistically significant at 5 percent level as indicated by their significance value. However, the infrastructure is observed to be insignificant. The coefficient for perception is 1.482 which indicates that for every one unit increase in the perception level there is a predicted increase of 1.482 in the log odds of achieving a higher level of satisfaction with online classes. Thus, there is an increased probability of a higher level of satisfaction as the perception of students about online classes improves. There is no doubt that massive technological advances in the world, demand a paradigm shift in way we approach our educational goals and aspirations (Ali, 2020).

The coefficient for health effects is negative (-0.258) which indicates that for every unit increase in the health effects there is a predicted decrease of 0.258 in the log odds of being at a higher level of satisfaction. That is, students face health issues due to longer hours of online classes or longer screen time there is a decreased probability of a higher satisfaction from online classes. Instruction, content, motivation, relationships, and mental health are the five important things that an educator must keep in mind while imparting online education (Martin, 2020). Thus health factor plays a vital role in influencing student's satisfaction level towards online education.

The coefficient for connectivity issues is -0.268 which also indicates that for every unit increase in the connectivity issues there is a predicted decrease of 0.268 in the log odds of being at a higher level of satisfaction. Thus, students' perception towards online classes, availability of adequate infrastructure for online classes and connectivity issues are found to significantly affect students' satisfaction with online classes. Students feel that lack of connectivity, technical problems, and difficulties in understanding instructional goals are the major barriers for online learning 12 (Song et al., 2004). Though no significant association was found between the region of residence and connectivity issues faced by students, there is a significant association (at 5 percent level) between connectivity and the source of internet and device used for online classes. While 46 percent of students using Wi-Fi have rated their connectivity as excellent or very good, only 16 percent of the students who use mobile internet have rated their connectivity as excellent or very good. Only 13 percent of the students using Wi-Fi have rated their connection as fair or poor. About 31 percent of the students who use mobile internet have rated their connection as fair or poor. While about 47 percent of the students using laptop or a personal computer have rated the connectivity as excellent or very good, only 25 percent of those using mobile phones for attending online classes have rated

their connectivity as excellent or very good. About 13 percent of students attending online classes using laptop or computers have rated their connectivity as fair or poor, while about 24.2 percent of the students using mobile phones for attending classes have rated their connectivity as fair or poor. The family income was also observed to be a determinant of access to the required online infrastructure for attending classes. While students belonging to higher income group had access to unlimited Wi-Fi and mobile network and favourable infrastructure facilities at home for attending online classes, students in lower income group were more vulnerable to face several issues with respect to network and infrastructure for attending online classes. Thus, there is a need for coordinated efforts from institutions and policy makers to ensure an inclusive online learning environment for the students.

The level of students' satisfaction is also associated with their adherence to digital ethics. Students who observe digital ethics during online classes have reported higher levels of satisfaction than those who resort to unethical behaviors such as putting aside the device after logging in, logging off after answering the attendance, copying or taking help from others during online assessments, not adhering to appropriate dress code, never turning on the video, pretending to have connectivity issues and browsing or messaging during the classes. The table below summarizes the chi-square test results showing the association between aforesaid behaviors and satisfaction levels.

Table 9 Summary of Chi-square statistic showing association between students' behaviour during online classes and their satisfaction levels with online classes.

Students' behaviour during online classes	Chi-square statistic	P-Value
I login and put aside the device and do not bother to listen	23.573	0.003*
I log off after answering my attendance	24.968	0.002*
I copy during online tests/ assessments	24.614	0.002*
I take help from others during online tests / assessments	17.982	0.021*
I do not have to be bothered about dress code during online classes as I always turn off my video	17.448	0.026*
I will never turn on my video during online classes	35.426	< 0.001**
I pretend to have connectivity issues if my name is called	14.938	0.060
I keep browsing /messaging or doing other work during online classes	28.779	<0.001**

Source: Computed from primary data

Note: * denotes significance at 5 percent level and ** denotes significance at 1 percent level

Barriers like online teaching, social distancing preeminent during this period, may have significant negative effects on learning opportunities. Educational institutes were struggling during the pandemic to find options, ways and means to deal with the unforeseen challenging situation. The present study has synthesised various challenges and its association with the students' satisfaction and attitude towards online education. Students' satisfaction is an essential component for better learning outcomes. Hence, educators, institutions and policies should focus on creating an enabling learning environment keeping in mind the needs and aspirations of the students. The following initiatives have the scope of creating a positive transformation in the attitude of the students towards online learning.

- Identifying students with severe infrastructural deficiencies and providing them the basic infrastructure for online classes at institutional level.
- Redesigning the curriculum to meet the online learning environment. - Introducing activity-based learning.
- Using creative online tools that captures students' attention.
- Revisit the traditional evaluation patterns and conducting creative and interactive assessments that would prevent students from resorting to unethical practices.
- Adopting effective time limits for online classes, to reduce screen time and the resultant health effects.
- Encourage self-paced learning among students.

These initiatives could enhance the students' satisfaction with online classes motivating them for better learning outcomes.

Conclusion

The study has thus explored students' perception about online education as an effective teaching instrument. The qualitative data such as perception of health, attitude towards online classes, challenges in infrastructure and ethical issues has provided deeper insights on how students reciprocate during online classes.

The results divulge the impact of online education and uncovers the interaction effects that provide practical significance. The analysis shows that there has been a significant rise in amount spent on the data network before and during the pandemic.

The study offers an in depth understanding about challenges faced during online class due to infrastructural bottlenecks faced by the students. The relationship between overall satisfaction with online education and health, infrastructure, attitude towards online education reveals that there is an increased probability of higher level of satisfaction as the perception of students about online class improves. Students who are neutral (41 percent) about their satisfaction with online classes indicate that they are not very satisfied with the education received, or they did not perceive that the online education they received is of high quality or standard. Further, when their likeliness towards online education were examined, most of the students opined that they were all eager to switch back to regular classes at institution which indicates that they were either lost, frustrated, or have felt isolated with online mode instruction. The study can be concluded that in the process of ensuring the quality of online education, access to technology, availability of data and learning environment has to be given at most importance.

In order to ensure an effective, interactive, productive and meaningful online program, students must not only know how to cope up with the fast-paced online classes but they also need to have a sound computer and technological skills to learn from online sessions (Martin, 2020). Thus, it is very obvious that improved learning environment can enable students to perform better, because technology becomes an essential part of their environment. On examining students' ethical behavior towards online education and satisfaction level, it can be understood that participants' ethical behavior may have some bearing on how responsible they are to own their own online mode of learning. Students need to be motivated to mould their own behaviors such as to be an enthusiastic learner, and to make effective use of time and technology. While many students are now becoming obsessed with technology, to learn and master their specific subject domain, teachers have a greater responsibility to set time limits and reminders to enhance their creative and analytical skills. The tradition assessment methods should be replaced with more dynamic and participative methods. It may thus be concluded that a paradigm shift towards online education should go hand in hand with the outcome-based learning in this ever-evolving world.

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TRUSTED FRAMEWORK FOR E-LEARNING USING BLOCKCHAIN TECHNOLOGY (E-LBC)

UGC CARE APPROVED

ABSTRACT

Blockchain plays an important role in the real-world applications by providing immutability, provenance, and peer- executed smart contracts. The prominent characteristics of a blockchain, could increase security, trust, and openness to online learning. In this work, it is proposed a blockchain-based e- learning platform that has been developed as a proof-of-concept to improve assessment transparency which enables curriculum customization in the higher education sector. The development of a framework for learning using blockchain has the ability to issue credentials and automate assessments which is considered as an effective E-learning mechanism. The proposed framework demonstrates to end users, including students and teaching staff, the advantages of a blockchain back-end, The development is both pedagogical and content-neutral. Smart Contract built for the access in different levels enables trust in access. The Preliminary analysis of the framework built is analyzed on a real time basis which shows improved performance and provides assurance in online education providers, assessment processes, educational portfolio for their credentials.

Index Terms: *Blockchain,Credit System, E-Learning, SecuredLearning, Smart Contract.*

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I. Introduction

The power of the technology involved, blockchain, which is predicted to generate significant disruptions in a number of industries, including financial products, management of supply chains and identity management, has been proved by the rise of cryptocurrencies. Smart contracts, which are integrated self-executing programmes that establish a contract and

automatically implement promises through the exchange or exchange of digital assets when certain conditions are satisfied, are embedded in blockchains that can execute them. This is referred to as blockchain 2.0. Smart contracts may be incredibly powerful and can run any user-defined code since they can be Having to turn, as is the case for well-known ecosystems like the Blockchain and Hyperledger deployments, which allow user-defined machine states and unrestricted com- putations. [1]

[2] raised the possibility of smart contracts for e-learning by stating that ”education payment systems may automatically validate the execution of online courses through standard- ized online evaluations.” Blockchain technology and smart contracts can benefit poor countries or emerging markets by allowing reliable corporate transactions. [3]. According to, this may lead to higher-quality academic qualifications, more mutual recognition, and an open, global education market in e-learning.

II. Related Work

A. Assessing E-Learning Complexity

The unique characteristics of e-learning, determining its ef- fectiveness requires combining evaluations of students' learn- ing outcomes using conventional methodologies (such as final exams) with evaluations of their learning process by examining students' varied e-learning information . E-learning assessment is difficult because of the wide range of e-learning data, though. An autonomous e-learning assessment paradigm is required in order to lessen the workload for online educators and to increase the impartiality of the e-learning evaluation.[4]

B. Lack of a unified e-learning assessment standard

Usage of the same e-learning platform, courses may well have e-learning assessment demands that differ substantially from one another. [5] The inability to recognise and transform learners' e-learning successes into credit or certification results in a significant drop in student interest and prevents the growthof online education. [6]

C. Insecurity of e-learning digital certificates

The majority of certifications gained through online edu- cation are awarded and maintained as certificate authorities, which are quicker to locate than paper credentials but also more prone to theft and manipulation because of internet risks (such as hackers). [7] For the moment being, the

security of cryptographic keys still depends on the centralised manage- ment of the Provides The control (CA) ecosystem. However, the CA ecosystem's repute is rapidly declining and on the verge of collapse. [8]

One of the most cutting-edge technologies of recent years, blockchain technology offers potential for fresh approaches to the aforementioned issues. One of the most innovative new technologies of recent years, blockchain, has gained appeal in a variety of contexts, including academic, business, and research ones. [9] Satoshi Nakamoto first introduced the idea for a friend electronic system of payment in his paper titled "The Blockchain." Bitcoin was invented in 2008. Distributed ledgers, consensus-building procedures like PoW, PoS, and DpoS, timestamps, PBFT, and encryption methods like SHA256, a hash encryption method, and the digital asym- metric block cipher are some of the key technical concepts. The advantages of block - chain for decentralization, security, auditability, and anonymity are also discussed. [10]

Blockchain application possibilities in the field of education include the construction of a global knowledgebase for edu- cation, security or self-verification of educational credentials, secure tuition payments, and the distribution and management of educational funding. [11] [12] Due to a lack of documented application areas and theoretical support, the utilization of blockchain education technology is still in its infancy. [13] It might be difficult to find a specific example that applies to blockchain-based online learning platforms. When it comes to credit allocation and certifications for online courses, a blockchain-based approach called EduCTX was proposed, although it only solved the security problem of credit storage. [14] [15]

D. Overview of all related work

III. Proposed Work

The exception of straightforward token transfers, all network nodes in the conventional ledger cryptocurrency system have the same obligations and are completely equal to one another in terms of authority. The three main types of blockchains are public, consortium, and private, each with various degrees of decentralisation. While private blockchain chooses to give up sovereignty in favour of speedier networks and less expensive reading and writing costs, public blockchain chooses to be completely dispersed but operates gradually in case of network propagating and block reading and understanding.

A. System Architecture

The network structure of the blockchain-based typical exam- ple is more intricate than the process that takes place, which must enable the realisation of several educational activities. Additionally, the network design with a node role and a single blockchain is inappropriate for usage in e-learning systems since the learning system's uniqueness requires that the user nodes be segregated into at least two different roles, instructors and learners. In the structure created, the network allows user.

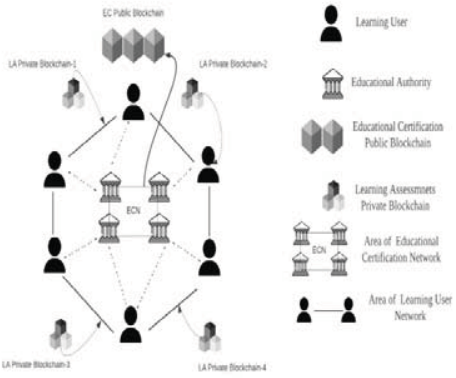

Fig. 1. Architecture Diagram for E-LBC

Nodes to enter and exit in two different sorts of roles, and each role has particular powers:

- Learning Users, shown in Figure by the red nodes.
- Education Authorities, represented in Figure as the blue nodes
- Education Certification Network (ECN): The blue region in the center of the Figure designates the ECN
- Learning Assessment Local Networks

1. *Learning Users:* The enthusiastic individuals in using the systems to study online can join up for a private account and apply to become a learner user node. There is greater than one Course Credit Wallet and a Certificate Wallet under the learner user's individual account. The credits earned from the learning user's online learning activities are added to his or her own Course Credit Wallet. Once a course has been successfully completed, the training user can utilise their remaining course credits to exchange the authentication process for the associated courses.

2. *Education Authorities:* Universities, private schools, training facilities for certain talents, etc. are only a few exam- ples of the types of schools or other educational institutions that might join the network as an education authority node and conduct online classes or tests using the technology. Just before the courses are formally exposed to the learning users, the education authority node can add the learning assessment rules of its own courses to each related smart contract for course credit calculation.

A smart contract is implemented on the proposed system's blockchain once it has been submitted by the education author- ity and approved by all of its learners. After then, the education authority is no longer the owner of the smart contract due to the autonomous execution of the smart contracts, and is com- pletely free to stay out of the course learning assessment and management process. Additionally, the system only allows the education authority nodes to issue legitimate digital certificates for their own courses.

It is developed that the network topology of the blockchain- based e-learning evaluation and certification system based on various node responsibilities and the connections between them.system, which includes three different network types and two different blockchain types. The network structure of the proposed system is described in detail below using the depiction in Figure: (LUN): Learning User Network The largest red region in Figure represents the LUN, a completely decentralised P2P network made up of all nodes of learning users who join the system for e-learning activities. Each learning user's personal account identity is tied to all infor- mation pertaining to his or her learning data records, learning accomplishments, and digital certifications. Users who arelearning can send messages using their own account IDs inan anonymous manner.

3. *Education Certification Network:* The blue region in the center of the Figure designates the ECN, which is a completely decentralized P2P network comprised of all nodes with depart- ment of education in the system. The blue blockchain symbol in Figure, referred known as the Educational Certification Public Blockchain, correlates to the ECN. All ECN nodes are responsible for the ongoing upkeep and distributed of the Public Blockchain. When a ministry of education issues a new digital certificate, its contents are broadcasted to every- one education authority nodes throughout the ECN and then verified using a consensus method. Prior to being included to the Public Blockchain for enduring preservation, the issuing authority encrypts a validated digital certificate as a digital signature.

4. *Learning Assessment Networks:* (LANs; sometimes known as LLN-X for the Learning Assessment Local Network of Education Authority X): In the system, each LAN is a local network that's also dynamically constructed by a single education department. Each LAN is depicted in Figure as an area with a purple edge containing a node of an education department and all of the nodes of its real-time learning users. The node of the education department X, which acts as the central node of the local network, is close to each node of a LAN-real-time X's learning users. Users of the actual learning in education department X can publish learning data for the related courses in LAN-X and download materials.

The Learning Evaluation Private Chain X (LA Private Blockchain-X) is shown in Figure as a purple blockchain- icon next to the LAN-X and corresponds to the LAN-X of the education authority X. Each learning user's LAN-X data is automatically analysed and transformed into course credits by turning on the smart contracts implemented just on LA Private Blockchain-X. The original learning data and course credits are subsequently bundled in blocks and persistently kept just on LA Private Blockchain-X as a source for future digital certificate issuance.

B. Smart Contract Design

The suggested system is made up of three functional com- ponents that may be described as follows and is based on the network architecture that was previously provided.

- The module for transmitting course credits and assessing e-learning runs in each LAN by creating course value blocks or uploading them to the relevant LA private blockchain.
- Tokenized issue and secure storage module: The LAN and the ECN both make use of this useful module. Check the LA Public Blockchain in LAN once the learning user's course credits have indeed been resolved before determining whether or not to offer the digital certificate. The education authority produces the SSL signing, which is placed into to the EC Open Chain following completing double digital signing, if the credits are sufficient to satisfy the need of completion of the course. After asking a third party to pay a quick visit to the EC Public Blockchain, the learning user may use both of their public keys. Decrypting and verifying the user's ssl signature requires both the learning user and the educational authority.
- The "e-learning certification distribution module" is an active module that uses a smart contract to work in the LUN. E-learning vouchers are automatically distributed based on the

percentage of learning accomplishment ratings. The learning success scores of each educational user within the LUN are periodically totaled throughout a certain time frame. Only the learning user is permitted to use the vouchers for the suggested system.

1. *E-Learning Assessment and Credit Exchange:* Any min- istry of education X inside the scheme it has the capacity to create and carry out the Course Generation Contract (CGC- X), an outsource the work. The CGC-X contract can fully autonomously compute learning users' specific course credits based just on points scored criteria of multi - variable e- learning information (including such durations of study time, exam scores, online comment activities, etc.) specified inside it. The idea of the Scholastic Credit Bank, which aims to standardise the assessment of e-learning by creating a set of universal standard credits, may also be helpful to us. The ability to create one's own LA Private Blockchains for one's Standard Credit Contracts X is available to educational bodies (SCC-X). Through these agreements, some course credits can be automatically converted to the system's accepted common standard credits.

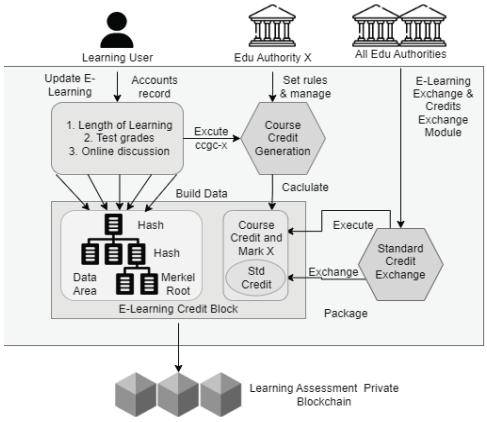

Fig. 2. Block Diagram for credit exchange

- Initializing the login in step one
- Record the data from the online course.
- The next step is calculating the course credit.
- Exchange of the regular credit is step four.
- The course credit wallet is filled up in step 5 when creditsare earned

2. *Digital Certificate Issuance and Secure Storage:* The education authority will examine the learning user's program credit balances when the learning user has finished the course study and submits a certification application. If the course point balances reach the appropriate level for course comple- tion, a digital certificate containing complete information is created and successively validated by the education department as well as the learning user. The double digital signature-enabled modern electronic certificate block has been put permanently to the EC Public Chain. The relevant learning accomplishment score is added to the studying user's Certificate Wallet while the credits for the class digital identity are concurrently removed from the Course Credit Wallet.

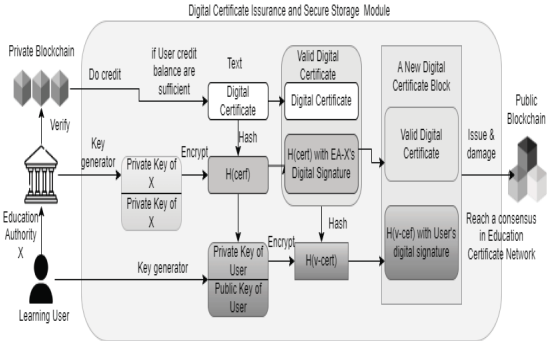

Fig. 3. Block Diagram for a secure storage and certifcate issuance

- Settlement of the course credits is the first step.
- The education authority's digital signature
- The learning user's digital signature
- Storage of the digital certificate block is the fourth step.

C. Protection against Attacks

Given a sharding-based blockchain protocol, the probability of a successful attack (assumed by an adversary) can be computed as follows:

$$\mathcal{P}'' = \sum_{s=m}^{\mathcal{K}} \frac{\binom{\mathcal{M}}{s}\binom{\mathcal{N}-1}{\mathcal{K}-s}}{\binom{\mathcal{N}-1+\mathcal{M}}{\mathcal{K}}} \left(1 - \frac{[x^m]\,\Psi(x)}{\binom{\mathcal{N}}{m}}\right). \quad (1)$$

The probability of successful attack is given by:

$$\begin{aligned}\mathcal{P}'' &= P(\mathcal{X} = nr)\mathcal{P}' + \cdots + P(\mathcal{X} = \mathcal{K})\mathcal{P}' \\ &= (P(\mathcal{X} = nr) + \cdots + P(\mathcal{X} = \mathcal{K}))\mathcal{P}' \\ &= \sum_{k=nr}^{\mathcal{K}} P(\mathcal{X} \geq k)\mathcal{P}'\end{aligned} \tag{2}$$

Implement a proof-of-work or proof-of-stake system to make it difficult for an attacker to insert erroneous blocks into the chain. To guarantee the accuracy of the information in each block, use cryptographic hash functions. Utilize digital signa-tures to verify the parties to each transaction's identification. To defend against network-based assaults, use network security tools like firewalls and secure sockets layer (SSL).Update the system frequently to include the most recent security measures and fixes.To prevent unwanted access to the system, put user authentication and permission controls in place.To identify and stop unwanted access or system tampering, use intrusion detection and prevention systems.

1) Joint Hypergeometric Distribution Approach: In a more recent work, Hafid et al. proposed a novel methodology-based joint hypergeometric distribution to analyze the security of sharded protocols, which can be summarized in below Now, let Yi be a random variable that computes the number of Sybil

Algorithm 1 Protection Against BlockChain Attacks

1: Implement proof-of-work or proof-of-stake mechanism
2: Use cryptographic hash functions
3: Use digital signatures
4: Implement network security measures
5: Regularly update system
6: Implement user authentication and authorization controls
7: Use intrusion detection and prevention systems

IDs in shard i. Theorem 1 computes the probability that at least one shard fails using HDA Theorem 1: In a sharding- based blockchain protocol, the probability that at least one shard fails using JHDA can be expressed as following:

$$\mathcal{P}' = 1 - P\left(\mathcal{Y}_i \leq nr, i \in \{1, 2, \ldots, \lambda\}\right) \tag{3}$$

where,

$$P\left(\mathcal{Y}_i \leq nr, i \in \{1, 2, \ldots, \lambda\}\right) \tag{4}$$

$$= \sum_{m_1=0}^{nr} \sum_{m_2=0}^{nr} \cdots \sum_{m_\lambda=0}^{nr} \prod_{i=1}^{\lambda} \binom{n}{m_i} / \binom{\mathcal{K}}{\mathcal{M}'} \tag{5}$$

2) Probability of a Successful Attack: In this section, computation of the probability of a successful attack (the failure probability of the entire network); this means that consideration of the probability of selecting Sybil IDs from the ID Pool as well as the probability of at least one shard takeover attack.Given a sharding-based blockchain protocol, the probability of a successful attack (assumed by an adversary) can be computed as follows:

$$\mathcal{P}'' = \sum_{s=m}^{\mathcal{K}} \frac{\binom{\mathcal{M}}{s}\binom{\mathcal{N}-1}{\mathcal{K}-s}}{\binom{\mathcal{N}-1+\mathcal{M}}{\mathcal{K}}} \left(1 - \frac{[x^m]\,\Psi(x)}{\binom{\mathcal{N}}{m}}\right). \tag{6}$$

where,

$$\begin{aligned} \mathcal{P}'' &= P(\mathcal{X} = nr)\mathcal{P}' + \cdots + P(\mathcal{X} = \mathcal{K})\mathcal{P}' \\ &= (P(\mathcal{X} = nr) + \cdots + P(\mathcal{X} = \mathcal{K}))\mathcal{P}' \\ &= \sum_{k=nr}^{\mathcal{K}} P(\mathcal{X} \geq k)\mathcal{P}' \end{aligned} \tag{7}$$

IV. Security Analysis

A. Non-Interactive Zero-Knowledge (NIZK)

A type of cryptographic technique called Non-Interactive Zero-Knowledge (NIZK) is used to confirm the veracity of a statement without disclosing any further information about the statement or the individuals taking part in the proof.A prover (the party making the statement) can demonstrate to a verifier (the party receiving the statement) using an NIZK proof that the statement is true without disclosing any personal information about the prover or the statement. This is accomplished through the use of a number of mathematical protocols and algorithms that enable the prover to validate the truth of the statement without disclosing any extra information.

Assume that the relation R = x, w, where x is a public instance and w is a witness, can be computed. Here, the prover uses x and w to calculate a verifiable evidence. The verifier can check a single evidence upon x after getting it from the prover. A trapdoor information td and two PPT simulators S = (S1, S2) are present in such a way that

$$\begin{aligned}
&\Pr\left[\begin{array}{ll} crs \leftarrow G_{crs}(\lambda) & \\ (x,w) \leftarrow \mathcal{A}_1(crs) & : \\ \pi \leftarrow \mathrm{P}(crs,x,w) & \mathcal{A}_2(crs,x,\pi)=1 \end{array}\right] \\
&-\Pr\left[\begin{array}{ll} (crs,td) \leftarrow S_1(\lambda) & \\ (x,w) \leftarrow \mathcal{A}_1(crs) & : \\ \pi \leftarrow S_2(crs,x,td) & \mathcal{A}_2(crs,x,\pi)=1 \end{array}\right]
\end{aligned} \quad \begin{array}{l} (x,w) \in R \\ \\ \\ \\ \\ = \mathrm{negl}(\lambda \\ (8) \end{array}$$

The completeness follows by single message verification and multiple message verification. The first case is between Gen- Proof and VerifyProof referring a single message/signature pair generation and verification. The second case is that a batch of message/signature pairs can be checked by BVerifyProof simultaneously. The completeness property of the scheme can be proven as follows:

$$\begin{aligned}
R_i =& z_i\left(C_i^{1,j}+P\right)+e_iC_i^{2,j} \\
=& \left(r_i-e_isk_i\right)\left(C_i^{1,j}+P\right)+e_i\left(u_jPK_i+PK_i\right) \\
=& r_iC_i^{1,j}-e_iu_jsk_iP+r_iP-e_isk_iP+ \\
& e_iu_jsk_iP+e_isk_iP \\
=& r_iC_i^{1,j}+r_iP \\
=& R_i
\end{aligned} \tag{9}$$

where,

$$\begin{aligned}
\sum_{i=1}^{n}v_iR_i =& \sum_{i=1}^{n}v_iz_iC_i^{1,j}+\left(\sum_{i=1}^{n}v_iz_i\right)P+\sum_{i=1}^{n}v_ie_iC_i^{2,j} \\
=& \sum_{i=1}^{n}v_ir_iC_i^{1,j}-\left(\sum_{i=1}^{n}v_ie_iu_isk_i\right)P+ \\
& \left(\sum_{i=1}^{n}v_ir_i\right)P-\left(\sum_{i=1}^{n}v_ie_isk_i\right)P+ \\
& \left(\sum_{i=1}^{n}v_ie_iu_isk_i\right)P+\left(\sum_{i=1}^{n}v_ie_isk_i\right)P \\
=& \sum_{i=1}^{n}v_i\left(r_iC_i^{1,j}+r_iP\right) \\
=& \sum_{i=1}^{n}v_iR_i
\end{aligned} \tag{10}$$

B. Quantum Blockchain

A quantum blockchain is a sort of blockchain technol- ogy that makes use of quantum computers to boost the network's security and efficiency.A network of nodes makes up a blockchain, a distributed ledger technology that uses a database of shared transactions to store and manage data.

These transactions are organised into blocks and connected to one another by a chain using cryptography. A list of transactions and a cryptographic hash of the block before it are both included in each block. Because it is challenging to cange a block's contents without leaving a trail, this structuremakes blockchains safe and transparent.

Quantum computers are extremely powerful computers that carry out calculations using quantum-mechanical phenomena like superposition and entanglement. They may be beneficial for things like cryptography and data processing since they have the potential to be much faster and more powerful than conventional computers. Quantum computers are utilised in a quantum blockchain to increase the security and performance protection of the network by supplying more cryptographic protection and speeding up transaction processing. By executing calcula- tions that are impossible for classical computers to complete, quantum computers, for instance, could be used to verify the validity of transactions in a quantum blockchain. Attackers may find it more challenging as a result to breach the network or forge transactions.

The proposed quantum is an open and permissionless blockchain that satisfies the following characteristics. It will gothrough the overall structure of the protocol in the following section.

- Decentralized systems
- A shared common quantum database, a quantum system
- with a distributed ledger
- Each node in the network having quantum capabilities including quantum caching and quantum state preparation.

Most of classical voting schemes are based on public- key cryptographic algorithms as in Table 1, which may be cracked by quantum algorithms. But quantum voting schemes based on the principles of quantum mechanics can resist attacks initiated by quantum computers. Recently,[4] proposed a quantum voting protocol by using two special quantum entangled states, which is fair,private, self-tallying, verifiable, and non-reusable.The first m level and n-particle quantum state is described as:

$$|\delta_n\rangle \equiv \frac{1}{m^{\frac{n-1}{2}}} \sum_{\sum_{k=0}^{n-1} j_k \bmod m=0} |j_0\rangle_C |j_1\rangle_C \cdots |j_{n-1}\rangle_C \quad (11)$$

It can be rewritten as

$$|\delta_n\rangle = \frac{1}{\sqrt{m}} \sum_{j=0}^{m-1} |j'\rangle_{\mathcal{F}} |j'\rangle_{\mathcal{F}} \cdots |j'\rangle_{\mathcal{F}} \quad (12)$$

where,

$$|j'\rangle_{\mathcal{F}} = \mathcal{F}|j\rangle_C = \frac{1}{\sqrt{m}} \sum_{k=0}^{m-1} e^{\frac{2\pi i j k}{m}} |k\rangle_C \quad (13)$$

Quantum algorithms and protocols are used in a quantum blockchain to accomplish consensus, encryption, and verifi- cation. Quantum signatures, for instance, enable the verifica- tion of transactions without disclosing their contents, while quantum key distribution (QKD) enables the secure exchange of cryptographic keys between parties.Quantum blockchains may employ consensus protocols like quantum voting or quantum proof-of-stake, which take advantage of the special characteristics of quantum systems to guarantee the objectivity and fairness of the consensus procedure.The genral outline of using quantum blockchain is:

- The act of initiating a transaction: A user adds a trans- action to a pool of unconfirmed transactions.
- Quantum key generation: To encrypt the transaction, the user generates a quantum key using a quantum method like QKD.
- Transaction broadcast: The network receives the en- crypted transaction for verification.
- Quantum verification: The validity and integrity of the transaction are confirmed using quantum methods, such as quantum signatures.
- Consensus: If the transaction is confirmed, it is added to the quantum blockchain, and a consensus mechanism is employed to make sure that all nodes on the network concur on the ledger's current state, such as quantum voting or quantum proof-of-stake.
- Execution of the transaction: Following the achievement of consensus, the transaction is carried out, and the user'saccount is updated appropriately.

Results

A. Comparative Analysis

Contrary to typical blockchain systems, the proposed method reduces the complexity caused by the large node scale of blockchain networks by complementing public and private blockchains. As a result of the private blockchain's fast speed and cheap cost, every education authority's classroom and online procedure is carried out on its individual local area network (LAN) and associated blockchain platform as in Figure 4,5, allowing real-time e-learning evaluation and storage space savings. This assures assessment effectiveness and dynamism. The public ledger and cryptographic technol- ogy of the blockchain also makes it possible to permanently preserve educational achievements and assure that they are reliable, secure, and cannot be faked, in contrast to traditional e-learning platforms. Centralized databases are the foundation of current systems.

In order to guarantee the dependability and validity of both the credentials, the transparency and openness of the certifica- tion program, and the simplicity and effectiveness of certificate authority verification for business owners and other third parties, certificates are issued and stored using the worldwide network (ECN) as well as the associated public cryptocurrency (EC Public Blockchain) as in Figure 6. The use case that successfully mixes both private and public blockchains encour- ages system structure optimization. Additionally, the smart contracts automatically carry out the production and trading of course credits, and the point accumulation of account Courses Credit Wallet, during the operation of e-learning evaluations.

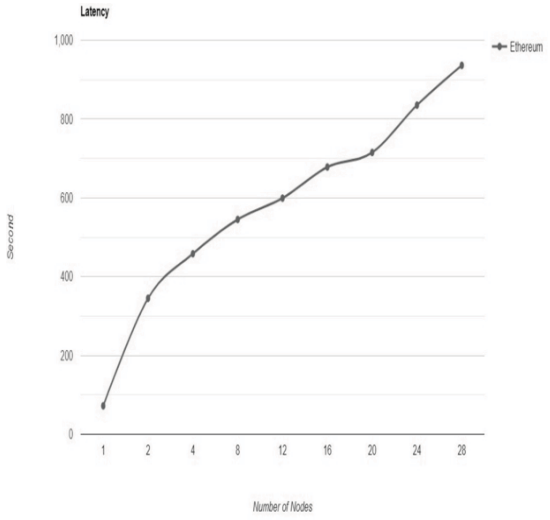

Fig. 4. Latency achieved through ethereum platform for hashing

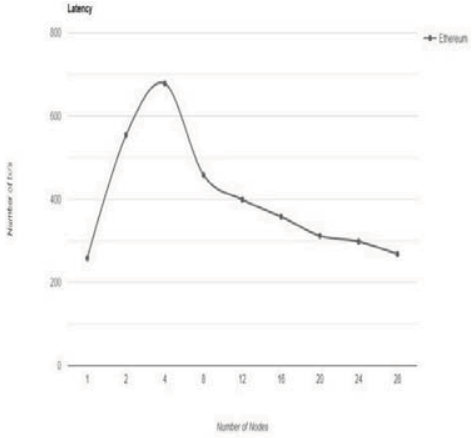

Fig. 5. Latency achieved through ethereum platform for bit wise node growth

VI. Conclusion

The global COVID-19 pandemic has impacted the educa- tional system throughout the world. Due to this latest health catastrophe, billions of students are currently absent from class. The closing of schools has indeed been authorised in more than 100 nations, according to UNESCO. After then,

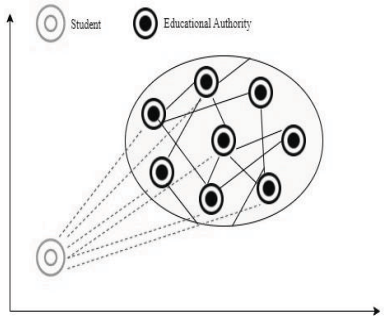

Fig. 6. Visualization of private block

Table I Protection Against Attacks

Technique	Classic Attacks	Quantum Attacks
Liu et al. [6]	No	Yes
Hung N.Q. et al. [11]	No	No
Lakhan et al. [14]	Yes	No
Proposed E-LBC	Yes	Yes

control of the public educational system is transferred to the EL systems, where pupils get interactive online training. However, there are a number of disadvantages to it, including the scarcity of internet-connected devices, particularly in rural regions, the bandwidth problem, connection challenges, etc. To improve the current educational system, two significant issues must be resolved.

Learning providers are unable to select a solution that meets their needs because they are unaware of the options accessible. Additionally, the EL system involves student per- sonal information that needs to be protected from unauthorised access. This paper initially gives a taxonomy of the available remote learning systems in order to solve these problems. The common EL methods are compared in the following section based on crucial requirements imposed by educational systems. the blockchain-based layered architecture, which is promoted as a means to strengthen the security of current EL solutions. The suggested architecture will eventually be put to the test with a real EL system.

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USAGE OF DIGITAL TOOLS FOR FORMATIVE ASSESSMENT TO IMPROVE TEACHING LEARNING OUTCOMES

UGC CARE APPROVED

ABSTRACT

Outcome-Based Education (OBE) leads to guarantee that a graduate student will be qualified for their profession and be able to be accepted globally by establishing the courses that students have finished by the time they graduate. During the learning process of an individual student, formative assessment helps to analyze the outcomes, strengths and weaknesses of students. There are many effective modern digital ICT tools available for formative assessment to improve the teaching learning outcomes, such as Socrative, Mentimeter, Slido, Google Classroom, Flipgrid, Pear Deck, Poll Everywhere, Edulastic, Classkick, Nearpod, Kahoot, Padlet, Quizizz, Quizlet, Testmoz, Spiral.ac and Google Forms, etc. Now a day's student's attention span and concentration is very low. Formative assessment figure out whether a student's doing well or needs help by monitoring the learning process and teachers can provide the feedback about the learning level of the individual students. If formative assessment is made a digital practice students will actively listen & engage themselves in classroom activities joyfully. Interim & summative evaluation takes place after the learning process when a course or module is completed. The grades assessed through interim & summative assessment will tell whether the student achieved the learning goal or not. The completion of Course Outcomes and Programme Outcomes mapping is required in order to continuously improve the quality of OBE. This proposed work aim to practice digital tools in formative assessment of students, students' performance improvement will be tracked progressively. Feedback shall be given to the students by the .teachers who shall change the pace & method of teaching according to the students learning capacity. Later it emphasis the value of framing COs for various courses in the curriculum, performance indicators for 7 POs, accurate CO-PO mapping, and methods for evaluating its efficacy or attainment. A sample CO-PO accomplishment computation will be addressed.

Index Terms: *Formative Assessment, Interim Assessment, Summative Assessment, Modern Tools, Outcome-Based Education.*

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I. Introduction

Knowledge retention after the learning time is essential if the "graduate" is to be able to apply and depend on a thorough understanding of that knowledge for application in their chosen area. This deeper learning is often reached when learning is not restricted to memorization of a list of unconnected facts but occurs from the learner actively participating in the learning process and thoroughly understanding and recalling the knowledge in its context.

By providing feedback to students throughout the learning process and resulting in improved learning outcomes, formative assessment is intended to support learning. Offering formative assessment chances has been acknowledged as having a substantial positive impact on student learning. In order to motivate pupils to learn, formative evaluations are typically methodical in approach and intended to be made available to them during a certain study period. Although it has been suggested that the focus should be on three specific drivers when designing any formative assessment, it is generally agreed that the outcome of any formative assessment should be one that ultimately helps improve learning: using a method to inform students of gaps in their learning, familiarising students with the expectations of summative assessments, and providing feedback that directs the direction of student learning [8].

By following teachers' examples, giving advice, giving directions, and providing specific information about assessment and success criteria, students can eventually become active and effective self-monitors of their own learning. Feedback is intended for both teachers and students. It was developed and is used by teachers to make decisions on the preparation, diagnosis, and

remediation of student learning. In order to highlight successful or excellent elements and adjust or improve problematic elements, students utilize it to keep track of the strengths and flaws in their performances. Formative assessments, in contrast to summative ones, should ideally take place in a relaxed setting, be given at a time that is relevant to the students' learning process, and involve active participation from the students. Formative evaluation will only help students advance if they can take use of the possibilities and identify areas where they need to improve their knowledge or abilities [4], [7] & [9].

The main component of formative assessment is ongoing communication between teachers and students to address specific needs. In classroom activities like continuing discussions and feedback loops, where prompt feedback is utilised to guide future learning, formative assessment is widely used. As a result, evaluation is crucial to the learning process. Peer and self evaluation, for instance, is an essential part of formative assessment and can help students comprehend what and why they are learning.

Numerous conceptualizations of formative assessment place differing emphasis on different elements of the process as a result of divergent underlying theoretical ideas. The focus on gathering information about student learning and using it to guide student learning is the main characteristic that links all of these characteristics.

Feedback is recognised as a crucial component of formative assessment in order to achieve this [2]. Feedback, in the words of Hattie and Timperley, is "input concerning one's performance or comprehension supplied by an agent such as an instructor, classmate, book, parent, or experience" [5]. Evans argues that all interactions enabled by assessment design, occurring both inside and outside the current learning environment, overt or covert, and importantly drawing from a variety of sources, can be considered as feedback [3]. Teachers may change their lesson plans or provide feedback to their students in response to test results. Students can influence their own learning processes for the better by having this information [2].

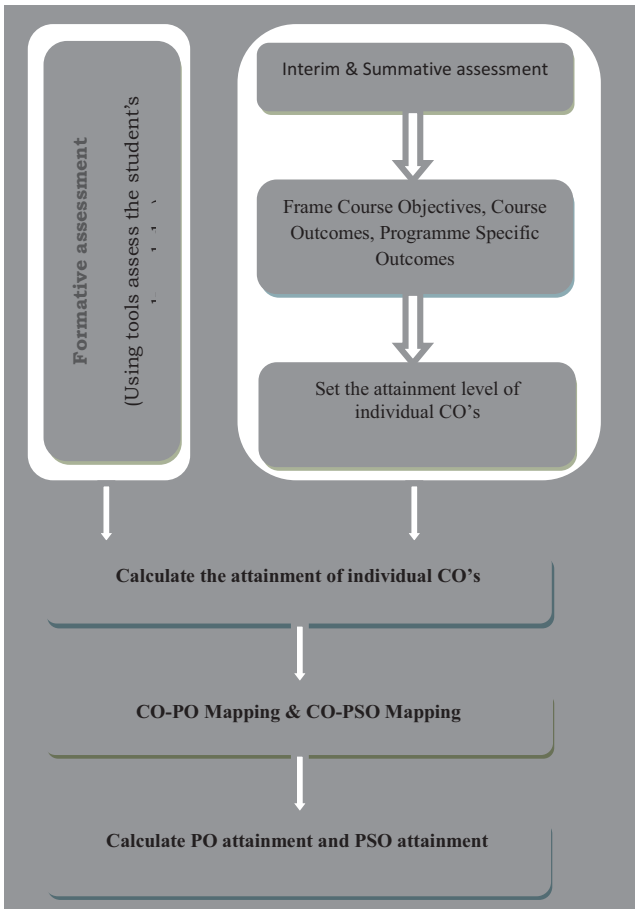


Fig. 1. Outcome Based Assessment Process

Two approaches to formative assessment are Socrative and Slido. These approaches can complement each other, and elements of each approach are often used by teachers in their classroom practice. A brief outline of each approach is provided in the subsequent section.

The proposed work is organized as follows. In Section II, we discuss about the online assessment methodologies to contribute the design of\ online formative assessment tools. Section III will discuss about interim and summative assessment procedures. Section IV illustrates the results of formative and summative assessment with detailed analysis. Section V provides a concluding discussion.

II. Proposed Online Assessment Methodologies

A. Formative assessment

There are many different ways to approach assessment, which enables both the teacher and the student to track their progress toward reaching the learning objectives. The term "formative assessment" refers to methods for spotting problems, learning gaps, and misconceptions along the

route and evaluating how to close them. When students recognize that the objective is to increase learning rather than apply final marks, it can even strengthen their capacity to take ownership of their learning. Students may evaluate their performance using a variety of methods, such as quizzes, polls, observations, journals, picture exercises, interviews and focus groups, tag feedback, gathering several sources of evidence, and more.

Formative assessment, which is conducted continuously throughout a class or course, aims to increase student attainment of learning objectives by using strategies that can accommodate unique student requirements.

Summative assessments, on the other hand, measure students' learning, knowledge, proficiency, or accomplishment at the end of a teaching period, such as a unit, course, or programme. Summative tests are virtually always officially graded and frequently given a lot of weight (though they do not need to be). Instructors can examine a variety of methods to combine these approaches, and summative assessment can be utilized in conjunction and alignment with formative assessment to great advantage.

Both assessment methods can differ in a number of ways:

- Informal / formal
- Immediate / delayed feedback
- Embedded in lesson plan / stand-alone
- Spontaneous / planned
- Individual / group
- Verbal / nonverbal
- Oral / written
- Graded / ungraded
- Open-ended response / closed/constrained response
- Teacher initiated/controlled / student initiated/ controlled
- Teacher and student(s) / peers
- Process-oriented / product-oriented
- Brief / extended
- Scaffolded (teacher supported) / independently performed

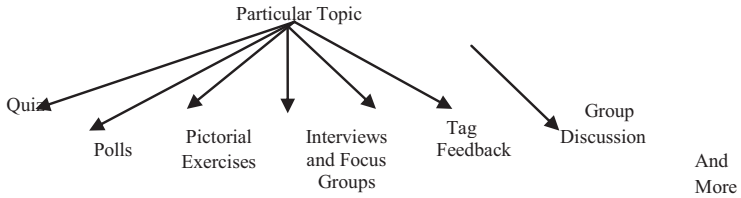


Fig. 2. Formative Assessment pattern for Theory courses

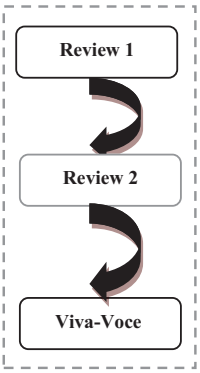


Fig. 3. Formative Assessment pattern for Internship and Project work

B. Online Formative Assessment Framework (OFAF)

The OFAF framework was created to pinpoint places where students' comprehension of the primary ideas covered in the sessions might be strengthened in order to enhance both learning and teaching methods. The suggested tool for this study and upcoming experiments is Socrative inside this paradigm. A set of questions addressing the major ideas of the lecture are prepared by the teacher during the assignment phase. Each session will conclude with a test. When all students have responded to a question or the allotted time for the question has passed, the question is then displayed in the application phase, where there is an option to select the proper response for each answer option. The numbers of students who have afterwards, during the feedback phase, the reported findings provide instructors with rapid feedback on the degree of knowledge acquisition and in-depth comprehension of the session material among learners. Additionally, students get the chance to evaluate themselves and determine which portions of the lesson they did not comprehend. At the conclusion of the quiz, the suggested tool Socrative tracks each participant's progress and presents overall findings as bar charts. Educators can look over the data they've gathered and identify themes that students frequently struggled with in class.

Purpose of OFAF is as follows:

- Enhance learning
- Proper teaching practise

The OFAF process is classified into 4 which are shown in the following figure.

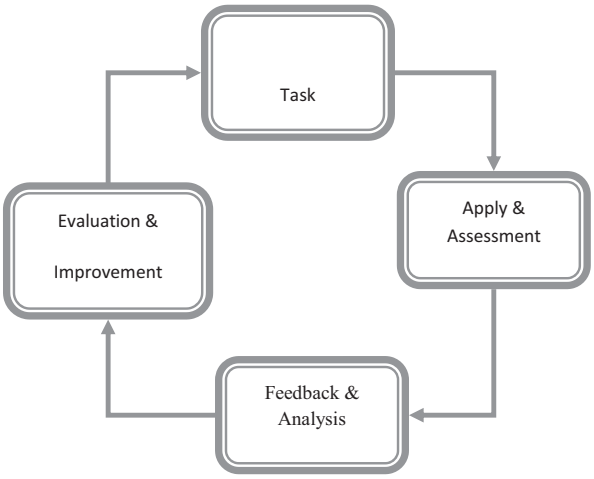


Fig. 4. Online Formative Assessment Framework (OFAF)

- Task - Prepare game-quiz questions based on LOs
- Apply - Conduct the quiz after each session to cover the learning outcomes
- Feedback & Analysis – It will give immediate feedback for learners and educator. Also find common areas of weakness and identify areas of improvements
- Evaluation and Improvement – It will help to update the Curriculum and Teaching pedagogies

Additionally, teachers can elicit additional details from students regarding their failure to identify the proper response. This could be further commentary and clarification to double-check your findings. Therefore, during the evaluation and improvement phase, educators decide whether the teaching methods they have adopted need to be changed, or whether new teaching methods need to be replaced or combined with the methods currently practiced. Additionally, educators can develop and improve curricula to support the student learning process. Finally, once common areas of weakness are properly identified, educators can assess whether the reason lies in the teaching method or curriculum they have chosen. Thus, educators can identify future improvement areas for course delivery and design. It aims to improve learning and teaching practices and to better plan for future program development.

The detailed steps of socrative are listed in the following table.

Table 1 Socrative Procedure

Register with Google account/Create Account	✓
Login	✓
Create the test and Launch	✓
Student can enter room for taking test	✓
Complete the test and see the Score	✓
Faculty can monitor individual students performance question wise	✓
Give Feedback to the students	✓

III. Interim and Summative Assessment

A. Interim Assessment

Interim assessment is a technique for evaluating students' knowledge and skills within a constrained time frame. used to assist in decision-making in classrooms and elsewhere. Interim tests may be given after a student has learnt or demonstrated knowledge in a subject area, at predetermined intervals, or immediately after (competency-based assessments). In this overview, we look at how states can replace summative exams with many interim exams spread out throughout the course of an academic year. To test student performance in relation to state standards, the unit assessments employed in this study are being developed as modular, scenario-based assessments. In order to help teachers comprehend their students' present conceptual knowledge of a subject matter, detect gaps before and after instruction, and select the most productive pedagogical activities, such as individualised and group instructional next steps, these evaluations are being developed. The "cognitive lens" through which teachers evaluate their students' current levels of conceptual, procedural, and strategic knowledge of crucial concepts may therefore be feedback provided within a framework of LPs and KPs. Such feedback should be developed to help teachers assess not only the students' current level of comprehension but also to identify particular areas of underlying misconceptions or gaps in knowledge within the domain and to provide direction to teachers about the upcoming instructional stages [10], [11] & [13].

B. Summative Assessment

Any evaluation technique that assesses pupils' cumulative learning over a predetermined time period, usually a course or a school year, against predetermined standards. Summative test results are used in various ways by different states and districts, including as a benchmark for students to compare their performance to, as part of state and local accountability systems to

measure school performance, as part of teacher evaluations, and in some cases as a requirement for graduation. An evaluation of learning at the conclusion of a unit of teaching or at a certain time is known as a summative assessment. The comparison is made between student knowledge and skill levels and benchmarks.

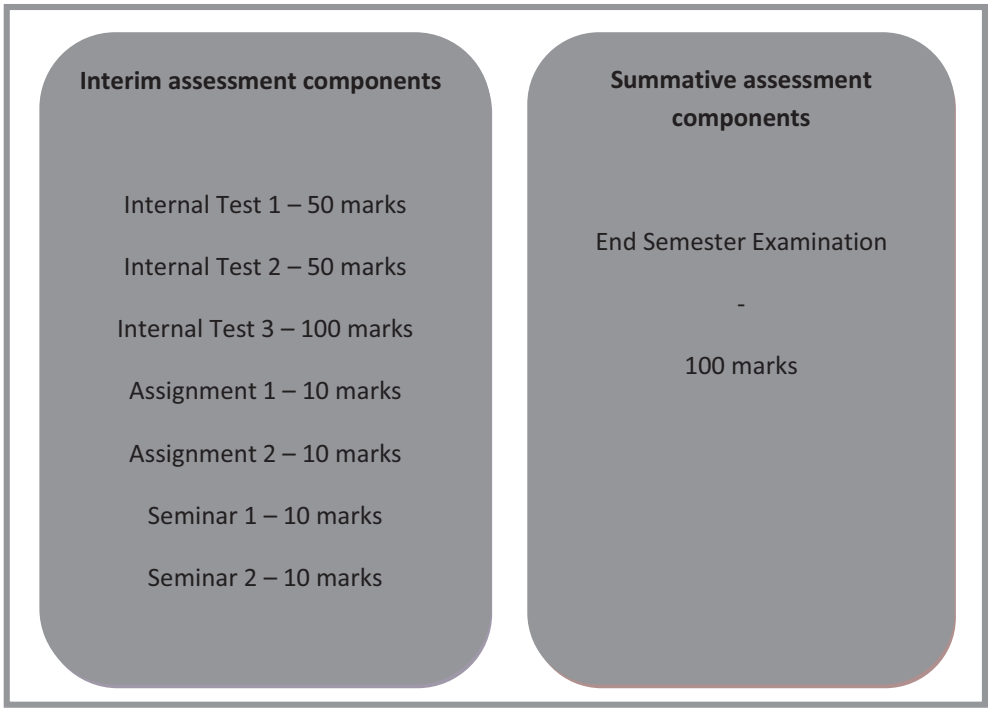


Fig. 5. Assessment Components

The outcomes of learning are assessed by course outcome and programme outcome. The sample course outcomes for the subject computer architecture as given below.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,
TAMILNADU DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N-SCHEME
Course Name : 1052:Diploma in Computer Engineering
Subject Code : 4052410
Semester : IV Subject Title : Computer Architecture

Course Objectives	
Know the fundamental blocks of computer Realize the function of I/O in different operation modes Use of I/O processor Know about different memory types and their operations Study about the fundamental blocks of CPU Know about the computer arithmetic Study the different processors	
Course Outcomes	
CO1	Able to Understand the basic Structure of the computers
CO2	Able to know the benefits of the I/O processor
CO3	Able to learn the various memory management techniques
CO4	Able to understand the concept of Parallel processing, pipelining and advanced processors
CO5	Able to express the view of hardware designs
Programme Outcomes	
PO1	Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems
PO2	Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.
PO3	Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
PO4	Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
PO5	Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
PO6	Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities

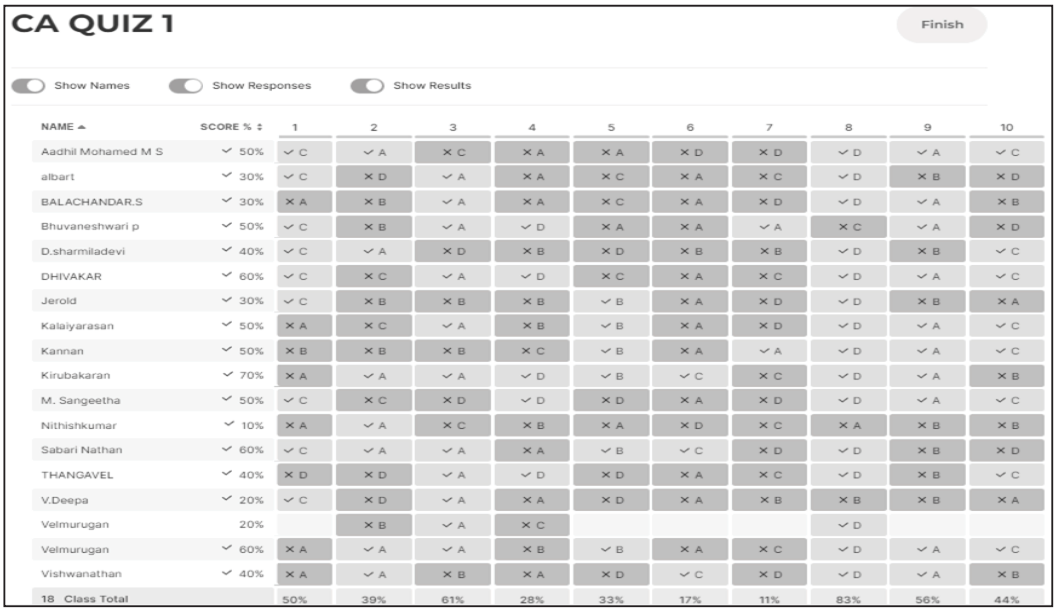
PO7	Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes.

To attain the Program Outcomes (POs) and Program Specific Outcomes (PSOs), curriculum is used. Course outcomes (COs) for each course are unique and are matched to PSOs and POs. Using a set of performance evaluation criteria, COs are quantitatively evaluated. The implementation of outcome-based education in institutions can result in better learning outcomes as well as a forward-thinking approach to education.

IV. Results and Discussion

The process of assessment is crucial to both teaching and learning. It encourages educators and students to evaluate both the instructional strategy and the learning results. Teachers must first assess the level of student learning before deciding whether to go on to the next lesson and how well the pupils are actually understanding it. Both formative and summative evaluations are used in the classroom, and each type is appropriate for both online and traditional learning settings. For a course to be effective, both sorts of assessments must be used, and a successful blending of these two assessment techniques can enhance student learning. This study examined the rapid advancement of technology and its significant influence on formative assessment. The continued development of technology will almost certainly have a substantial impact on formative assessment.

The sample formative assessment for the course Computer Architecture and Relational Database Management System is shown in figure 6 & 7. The question wise result analysis of the same course for formative assessment is given in the figure 8. Table 2 depicts the detailed analysis of student's feedback about the formative assessment. We collected the course instructor feedback also to improve the results of formative, interim and summative assessments. The obtained results shows that the online modern tools enhance the outcome based education through the above assessments.



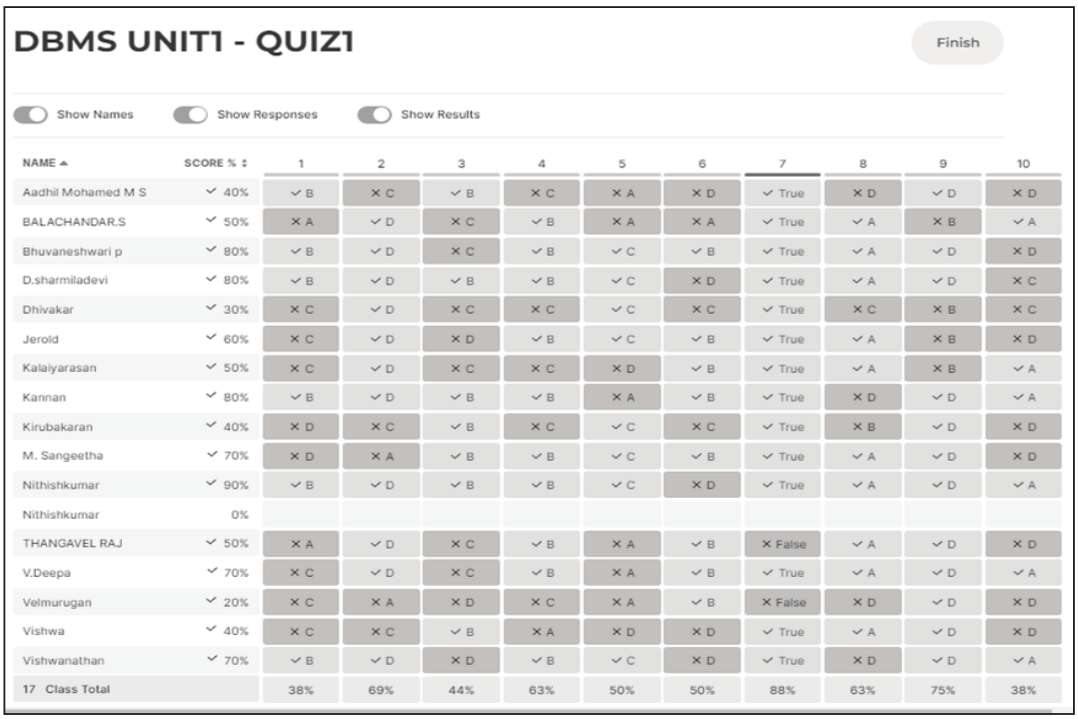
CA QUIZ 1

Finish

Show Names Show Responses Show Results

NAME	SCORE %	1	2	3	4	5	6	7	8	9	10
Aadhil Mohamed M S	50%	✓ C	✓ A	✗ C	✗ A	✗ A	✗ D	✗ D	✓ D	✓ A	✓ C
albart	30%	✓ C	✗ D	✓ A	✗ A	✗ C	✗ A	✗ C	✓ D	✗ B	✗ D
BALACHANDAR.S	30%	✗ A	✗ B	✓ A	✗ A	✗ C	✗ A	✗ D	✓ D	✓ A	✗ B
Bhuvaneshwari p	50%	✓ C	✗ B	✓ A	✓ D	✗ A	✗ A	✓ A	✗ C	✓ A	✗ D
D.sharmiladevi	40%	✓ C	✓ A	✗ D	✗ B	✗ D	✗ B	✗ B	✓ D	✗ B	✓ C
DHIVAKAR	60%	✓ C	✗ C	✓ A	✓ D	✗ C	✗ A	✗ C	✓ D	✓ A	✓ C
Jerold	30%	✓ C	✗ B	✗ B	✗ B	✓ B	✗ A	✗ D	✓ D	✗ B	✗ A
Kalaiyarasan	50%	✗ A	✗ C	✓ A	✗ B	✓ B	✗ A	✗ D	✓ D	✓ A	✓ C
Kannan	50%	✗ B	✗ B	✗ B	✗ C	✓ B	✗ A	✓ A	✓ D	✓ A	✓ C
Kirubakaran	70%	✗ A	✓ A	✓ A	✓ D	✓ B	✓ C	✗ C	✓ D	✓ A	✗ B
M. Sangeetha	50%	✓ C	✗ C	✗ D	✓ D	✗ D	✗ A	✗ D	✓ D	✓ A	✓ C
Nithishkumar	10%	✗ A	✓ A	✗ C	✗ B	✗ A	✗ D	✗ C	✗ A	✗ B	✗ B
Sabari Nathan	60%	✓ C	✓ A	✓ A	✗ A	✓ B	✓ C	✗ D	✓ D	✗ B	✗ D
THANGAVEL	40%	✗ D	✗ D	✓ A	✓ D	✗ D	✗ A	✗ C	✓ D	✗ B	✓ C
V.Deepa	20%	✓ C	✗ D	✓ A	✗ A	✗ D	✗ A	✗ B	✗ B	✗ B	✗ A
Velmurugan	20%		✗ B	✓ A	✗ C				✓ D		
Velmurugan	60%	✗ A	✓ A	✓ A	✗ B	✓ B	✗ A	✗ C	✓ D	✓ A	✓ C
Vishwanathan	40%	✗ A	✓ A	✗ B	✗ A	✗ D	✓ C	✗ D	✓ D	✓ A	✗ B
18 Class Total		50%	39%	61%	28%	33%	17%	11%	83%	56%	44%

Fig. 6. Socrative Analysis for the Course Computer Architecture



DBMS UNIT1 - QUIZ1

Finish

Show Names Show Responses Show Results

NAME	SCORE %	1	2	3	4	5	6	7	8	9	10
Aadhil Mohamed M S	40%	✓ B	✗ C	✓ B	✗ C	✗ A	✗ D	✓ True	✗ D	✓ D	✗ D
BALACHANDAR.S	50%	✗ A	✓ D	✗ C	✓ B	✗ A	✗ A	✓ True	✓ A	✗ B	✓ A
Bhuvaneshwari p	80%	✓ B	✓ D	✗ C	✓ B	✓ C	✓ B	✓ True	✓ A	✓ D	✗ D
D.sharmiladevi	80%	✓ B	✓ D	✓ B	✓ B	✓ C	✗ D	✓ True	✓ A	✓ D	✗ C
Dhivakar	30%	✗ C	✓ D	✗ C	✗ C	✓ C	✗ C	✓ True	✗ C	✗ B	✗ C
Jerold	60%	✗ C	✓ D	✗ D	✓ B	✓ C	✓ B	✓ True	✓ A	✗ B	✗ D
Kalaiyarasan	50%	✗ C	✓ D	✗ C	✗ C	✗ D	✓ B	✓ True	✓ A	✗ B	✓ A
Kannan	80%	✓ B	✓ D	✓ B	✓ B	✗ A	✓ B	✓ True	✗ D	✓ D	✓ A
Kirubakaran	40%	✗ D	✗ C	✓ B	✗ C	✓ C	✗ C	✓ True	✗ B	✓ D	✗ D
M. Sangeetha	70%	✗ D	✗ A	✓ B	✓ B	✓ C	✓ B	✓ True	✓ A	✓ D	✗ D
Nithishkumar	90%	✓ B	✓ D	✓ B	✓ B	✓ C	✗ D	✓ True	✓ A	✓ D	✓ A
Nithishkumar	0%										
THANGAVEL RAJ	50%	✗ A	✓ D	✗ C	✓ B	✗ A	✓ B	✗ False	✓ A	✓ D	✗ D
V.Deepa	70%	✗ C	✓ D	✗ C	✓ B	✗ A	✓ B	✓ True	✓ A	✓ D	✓ A
Velmurugan	20%	✗ C	✗ A	✗ D	✗ C	✗ A	✓ B	✗ False	✗ D	✓ D	✗ D
Vishwa	40%	✗ C	✗ C	✓ B	✗ A	✗ D	✗ D	✓ True	✓ A	✓ D	✗ D
Vishwanathan	70%	✓ B	✓ D	✗ D	✓ B	✓ C	✗ D	✓ True	✗ D	✓ D	✓ A
17 Class Total		38%	69%	44%	63%	50%	50%	88%	63%	75%	38%

Fig. 7. Socrative Analysis for the Relational Database Management System

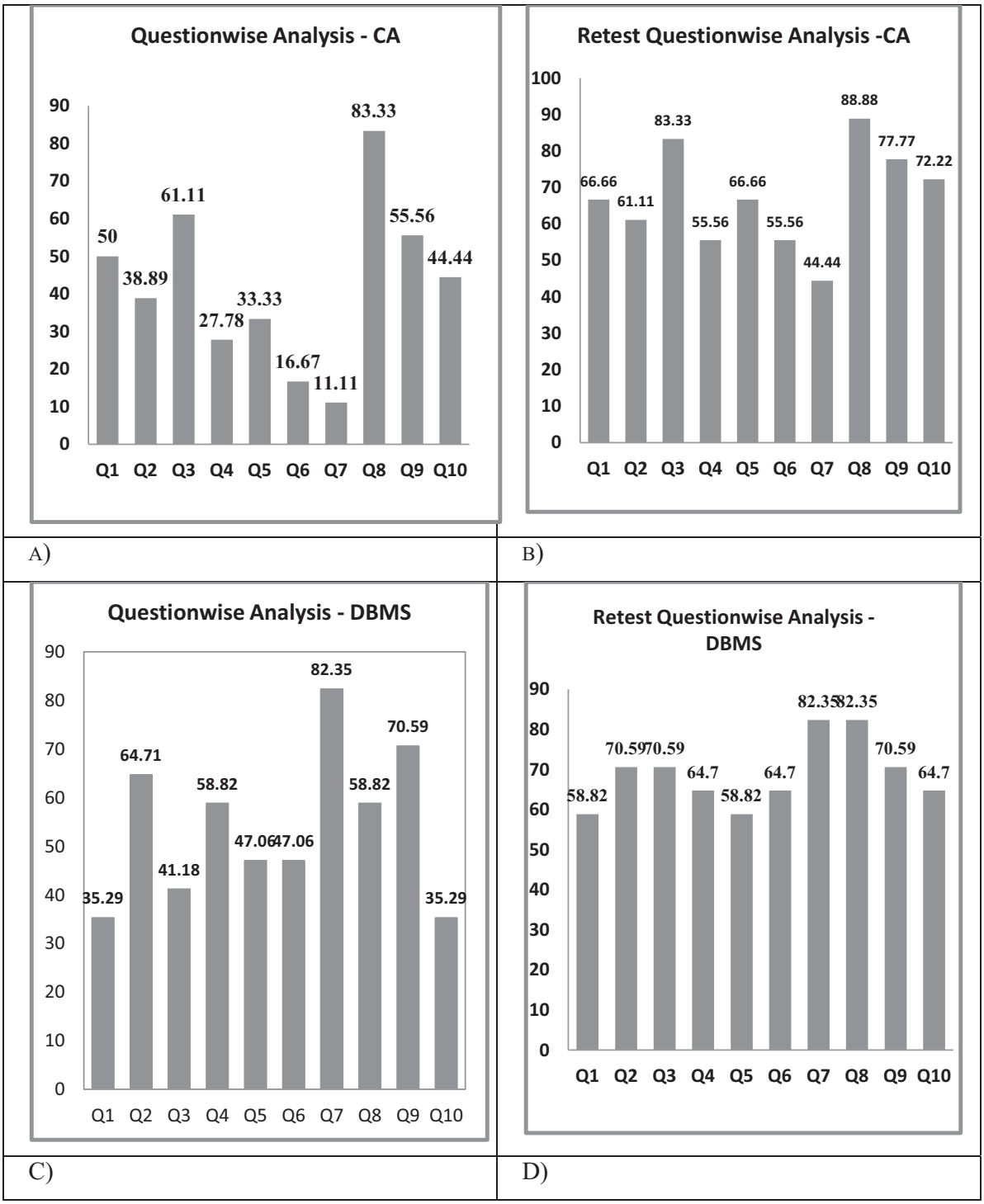
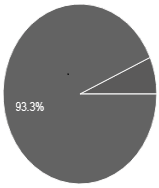
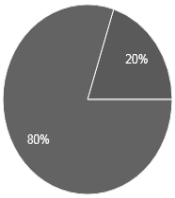
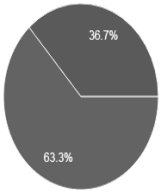
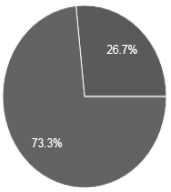
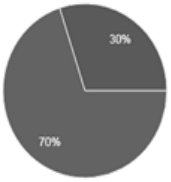
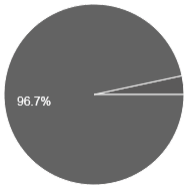
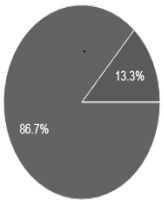
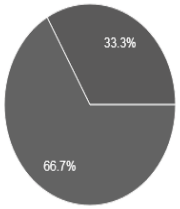
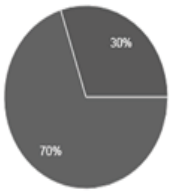


Fig. 8. Question wise Analysis for sample courses

Table 2 Students Feedback Analysis About Formative Assessment

Q.No	Feedback Questions	Analysis	Q.No	Feedback Questions	Analysis
1.	Did you feel motivated to learn through the formative assessment? Formative assessment-ன் மூலம் கற்றுக்கொள்ள உந்துதலாக உணர்ந்தீர்களா?		2	Did the formative assessment evaluation help you to improve? Formative assessment மதிப்பீடு உங்களை மேம்படுத்த உதவியதா?	
3.	Whether the answers are discussed? பதில்கள் விவாதிக்கப்படுகிறதா?		4.	Whether the instructor's feedback on my report was useful? அறிக்கை(Answer) குறித்த பயிற்றுவிப்பாளரின் கருத்து பயனுள்ளதாக இருந்ததா?	
5.	Did the formative assessment refine your skills in analyzing and critical thinking **Formative assessment** பகுப்பாய்வு மற்றும் விமர்சன சிந்தனையில் உங்கள் திறமைகளை மேம்படுத்தியதா?		6.	Was the faculty accessible to you to clarify your doubts? உங்கள் சந்தேகங்களைத் தெளிவுபடுத்துவதற்கு ஆசிரியரை அணுக முடியுமா?	

7.	Were you satisfied with the teaching in general? கற்பித்தலில் நீங்கள் திருப்தி அடைந்தீர்களா?		8.	Were you satisfied with class discipline in general? பொதுவாக வகுப்பு ஒழுக்கத்தில் நீங்கள் திருப்தி அடைந்தீர்களா?	
9.	Is your self-assessment activities increased? உங்கள் சுயமதிப்பீட்டு நடவடிக்கைகள் அதிகரித்துள்ளதா?		10.	Any other comments வேறு ஏதேனும் கருத்துகள்	Most of the students asking daily formative assessment
● ஆம் ● இல்லை					

V. Conclusion

Overall, our proposed studies on formative assessment using digital tools have shown that students can become engaged, self-aware, proactive, and confident in their learning if they are given good opportunities for feedback and portfolio creation through formative activities in all modules. This evaluation incorporated knowledge from numerous courses and was thorough and organised. The findings emphasise the significance of the teacher's participation in formative assessment and point out numerous significant influencing elements that must be taken into consideration. Instead of focusing just on receiving a passing mark during formative assessment, students are attempting to fill in any learning gaps by taking ownership of their learning. In this way, formative assessment makes sure that learners are capable of to enhance the performances in examination and grading standards. The opportunity for students to reach for the goal and assess how they are doing to attain it is provided by the ability to discuss the learning outcomes of the lessons at the beginning of each lesson and to remind them throughout the course.

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