

Effectiveness, Accessibility and Reliability of Digital Education System during Covid 19 Pandemic:

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ABSTRACT:

In the era of 21st century, digital technology has engulfed most of the spheres of life and economic activities and education is one of them. The nationwide lockdown as a measure of curbing the petrifying impact of COVID 19 that has shaken the entire world, has totally stopped the education system physically that creates a greater threat to students. UNESCO reports denotes 290 million students over 22 countries to be badly affected by this pandemic. In this paper we have concentrated on class 9 to class 12 students to study the effectiveness, accessibility and reliability of digital education during this pandemic. The main objectives of the study are, to measure the effectiveness of digital education to the students during covid-19 situation, to analyze the extent of students' dependency on teacher with different categories of subject, to study accessibility issue of students towards the digital class, to present probable recommendations based on data findings and students' perceptions. To study these objectives several demographic details have been provided along with some non-parametric tests like Spearman's rank tests and chi-square tests. With open ended questions the valuable comments from the students have also been shared as recommendations in this study.

KEYWORDS: Covid 19, Digital education, Pandemic, Lockdown, UNESCO,

I. INTRODUCTION

Education is a pillar of rationality and modern civilization in the world which brings forth harmoniously developed generation in the society and supports development of the nation. It acts as linkage between effective learning and effective teaching system. According to Oxford English Dictionary, knowledge means gaining of facts, information and skills through experience or education .A proper education system is not only a

pioneer of development but also a constitutional right to the people of India. Education is also an essential right as per Article 26 of the Universal Declaration of Human Rights(UDHR).Therefore lots of initiative have been taken from the both side of government and private institutes. Education system can be traced back to Vedic era where education is given through Gurukul system. Thereafter education system in India made evolution through different phases from teacher centric face to face education to distance education to audio visual based system to digital education system. "Despite being slow, continuous educational changes in Pathshala (traditional learning in classroom) took place throughout the course of Indian history that have played a major role in laying the foundation of modern 'Digitalshala (Aditi Barjatya,)

Academic institutions not only provide academic skills but also soft skills to the children which bring 'Holistic Education' system in the society. Education should be considered as way of delivering moral, emotional, physical, psychological and spiritual dimensions to the children through a holistic way so that they can feel part of wholeness of universe and paves the way for the light of life. According to Farabi, the acquisition of knowledge is an essential for a person as it makes him to be moral, generous, and intelligent. This helps in increasing and culminating excellent thought. 'The secret of living a life of excellence is merely a matter of thinking thoughts of excellence' (Charles R. Swindoll).

With the increase of Information Communication Technology(ICT) and higher penetration of internet service, mobile phones usage etc, education system is also brought into digital platform. Digital Education means application of digital tools and techniques in teaching- learning process to make 'anytime anywhere' education possible. Digital education consists of E-learning i.e, learning supported by digital technology and

effective use of digital technology during instruction (Wikipedia).

Digital learning are provided to all aspects of education starting from primary level to post graduation and competitive exams. Digital learning basically is in two forms : Blended learning where class room learning is accompanied with digital tools and computer mediated activities and Virtual learning where classes taken through online without having any physical presence. Other forms include mobile learning , personalized learning, online learning etc.

In this era of 21st century, digital technology has engulfed most of the spheres of life and economic activities and education is one of them. Therefore digital transformation in education sectors is required to deliver knowledge to make it as 'Inclusive Education System' so as to facilitate learning across the diverse geographical areas of India. It also enables the educators to come forward with customized learning solution for the students.

The nationwide lockdown as a measure of curbing the petrifying impact of COVID 19 that has shaken the entire world, has totally stopped the education system physically that creates a greater threat to the knowledge acquisition of the students. According to UNESCO report, over 91% of the world students population and over 290 million students in 22 countries are adversely affected by the covid 19 induced lockdown that has been practicing across the world. In India 32 crores students both in school and college are expected to be affected adversely. Therefore government advised the school and college authority to carry on the education as much as possible on online platform.

II. PROBLEMS OF DIGITAL EDUCATION DURING CURRENT SITUATION

Though the online education is very much helpful in such a situation but it is not accessible evenly throughout the country. According to National Sample Survey Report (2017-18) found that only 23.8% of Indian household has internet and 42% has access in urban area. It creates a huge digital divide in form of digital education. The main problems that may be faced are :

- 1) Lack of internet access that may create hindrance in taking and attending the online class ;
- 2) Lack of having proper devices like laptop, smart phones etc to access the content taught in digital classes'. According to Pew study, 24% of Indians have smart phones (The Hindu, Feb 08,2019)

- 3) Teachers find it difficult to express themselves who are not used to digital classes;
- 4) Data privacy and data security is a measure issue in digital education like recent examples of Zoom apps ;
- 5) Financial problem to join the online class is another issue;
- 6) Lack of inter action with the teachers will also create problem in understanding the content of a topic;
- 7) Taking evaluation and exam of the students reliably is a difficult task.
- 8) Psychological tension of attending the classes regularly due to not having electronic device may lead to suicidal attempts;
- 9) Students also find difficulties in checking their home- works and assignments in digital platform;

III. ADVANTAGES OF DIGITAL EDUCATION DURING CURRENT SITUATION

Due to nationwide lockdown and high spread of covid 19, it is tremendously beneficial to replace the physical class based education to online education. Today the advantages of digital education are more important than ever. The most important benefits that are derived from digital education during this medical emergency are as follows :

- 1) It ensures continuous flow of learning despite being closure of all schools and education institutions;
- 2) It ensures social distancing among the students – teachers as well as protects the well being of the students;
- 3) Students can avail the classes from anywhere subject to proper internet connection;
- 4) Students can feel comfortable to online classes from their home and can reduce their transportation and related expenditure;
- 5) It gives an opportunity to the students for self paced learning;

IV. REVIEW OF LITERATURE

This segment of the study will focus on some review of research papers that will build the theoretical analysis and concept building of digital education.

Thanji and Vasantha(2018) : In their study titled "A Study of Benefits and Limitations of eLearning-A Learner's Perspective" emphasized on perceived importance and limitations of e learning and found that there is a positive relation between benefits and effectiveness of digital learning.

Mahajan et.al (2018) : In this study titled "A study of students' perception about e learning"

has taken 150 respondents (2nd year M.B.B.S) and concluded that e-learning would improve performance in 99% students with 74% Male and 53% Female and also indicate better understanding of the course and also asserted that 86% Male and 92% Female disagree with adapting difficulties on implementing newer e-learning modules.

Venkataraman and Rajkumar (2020): The authors tried to examine the effectiveness of application of android mobile application in teacher education curriculum in their study named “validating the developed mobile application for teacher education curriculum execution”. They have found that after implementation of Android Mobile Application, The B.Ed., Trainees have recorded high level in the perceived effectiveness of Mobile Application and there is a statistical significant effectiveness of Mobile Android Application for the execution of teacher education curriculum perceived by the B.Ed. trainees.

Ghaderizfreh and Hoover (2018) : This study “Student Satisfaction with Online Learning in a Blended Course” authors tried to examine influence of eight characteristics of online learning (understandability, illustration, level of expectation, difficulty, clarity, pace, enthusiasm, and fostering attention) on students’ emotions (enjoyment, anger, anxiety, and boredom) and satisfaction with their online learning experience. They have found that understandability and illustration were significantly and positively related to enjoyment, Enthusiasm also was significantly and negatively related to anger and anxiety and enjoyment was positively and significantly related to satisfaction.

Hardia and Sharma (2013) : In this study titled “Measuring Level of usage of e-learning amongst students pursuing Higher Education” the authors tried to identify the impact of demographics and other factor on usage level of e learning by the students of higher education. The study indicated that the three factors (a) comfort level with technology, (b) group learning, (c) disciplined explorer have significant impact on usage level and age of students has significant impact.

Rahimjanovna(2020) : In his study on “Teaching ethics to students in technology education” based on Uzbekistan, he tried to stress on moral education system because he argued that moral upbringing develops in all aspects of a person's vigor, vigilance, and ability. He also argued that ethics is the basis for the moral education and maturity of the child and educators should pay special attention to the issues of technology education and upbringing.

Kamba (2009) : He found in his study “Problems, Challenges and Benefits of Implementing E-learning in Nigerian Universities: An Empirical Study” that in spite of having high awareness about e learning application , but its real application in universities is very poor. Students used e learning sites mostly to gather information for their research purpose and also found that there is statistically significant difference between types of universities and e learning activities.

V. RESEARCH GAP

Lots of research have been conducted on digital education, online education, e classroom etc worldwide. They have taken college students, university students. Very less study has been made in India which focus on secondary and higher secondary students of private and public schools. To the best of the knowledge of researchers, study on digital education system during covid 19 pandemic situation where education system totally shifted to digital mode, are not conducted sufficiently. This study is ,therefore, emphasizing on class 9 to 12 students.

VI. OBJECTIVES OF THE STUDY

Digital education is a new concept to the formal learning system in India. It has gained momentum due to increasing use of internet and smart phone. Still such education system is not used widely across the country and its success of adoption in addition to physical class room based education depends on many factors. Therefore this research study has focused on the following relevant objectives:

- a) To study the effectiveness of digital education to the students during covid 19 situation;
- b) To analyze the extent of students’ dependency on teacher with different categories of subject;
- c) To study accessibility issue of students towards the digital class ;
- d) To present probable recommendations based on data findings and students’ perceptions;

VII. RESEARCH QUESTIONS

Based on the above research objectives the following research questions have been formulated by the researchers-

1. Does the effectiveness of the digital education vary across the different types of the educational institutions?
2. Is there any relationship between satisfaction level of the students from the digital education system and the expectation of the full completion of the syllabus?

3. To what extent do the students rely on the digital education system for their theoretical papers?
4. To what extent do the students rely on the digital education system for their practical papers?
5. Are the students facing any accessibility issues in digital education ?
6. What can be the recommendations for betterment of digital education (suggestions as received in the questionnaire from open ended questions asked to the students)?

VIII. RESEARCH HYPOTHESIS :

To answer the above research questions and to fulfil the above research objectives, the following research hypothesis has been derived

1. Ho1: There exists no significant difference of the effectiveness of the digital education across the different types of the educational institution.
2. Ho2: There exists no significant relationship between the satisfaction level of the

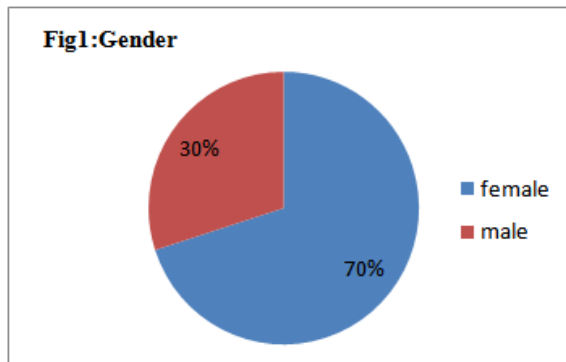
students from the digital education system and the expectation of the full completion of the syllabus.

3. Ho3: There is no significant extent of reliability on the digital education by the students for their theoretical papers.
4. Ho4: There is no significant extent of reliability on the digital education by the students for their practical papers.

IX. DATA PRESENTATION AND ANALYSIS:

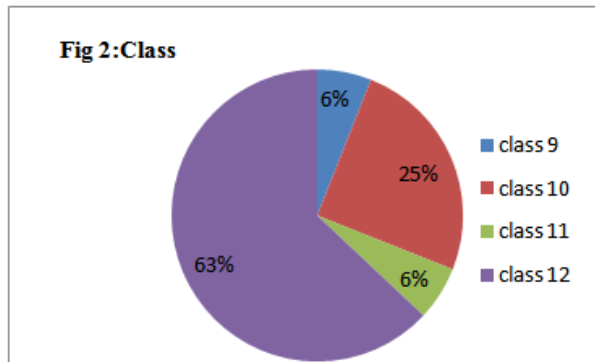
Demographic Analysis :

The following charts and figures will help us understanding demographics analysis of 100 respondents collected through a well structured questionnaire. This analysis will reveal gender, class of students and type of institutions to which they belong.



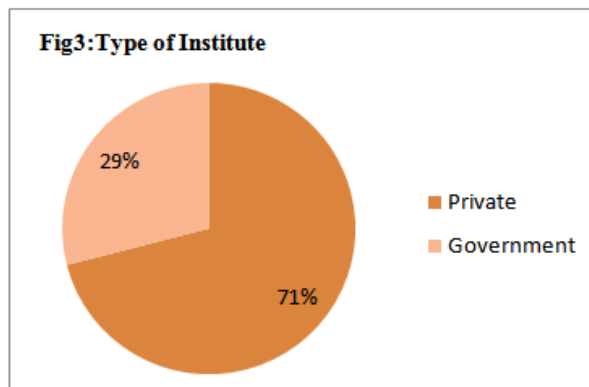
Source : Primary data

The above pie-chart (Fig1) is showing the percentage of male and female respondents for the study, which shows 70 % females and 30 % males out of total 100 respondents. Female respondents are more than twice the male respondents have participated in the study.



Source: Primary data

The above pie-char(Fig2) is showing the percentage of students in the respective classes from class 9 to class 12. Of which 63% students are from class 12, 25 % students are from class 10, 6 % students each of class 9 and class 10. Therefore most of the respondents are from class 12.



Source: Primary data

This pie-chart (Fig 3) is clearly showing the percentages of private and government schools of the respondents, that is, 71% students from classes 9,10,11, and 12 belonged to the private schools and the rest 29 % students from the classes of 9 to 12 belonged to the government schools.

For the first research question the following Null and Alternative Hypothesis has been considered for the analysis:

- H_{01} : There is no significant difference of the effectiveness of the digital education system across the different types of educational institutions.
- H_{11} : There is a significant difference of the effectiveness of the digital education system across the different types of educational institutions.

Analysis:

Chi-square Test Statistics
Table-1

	Types of Institute :	I am satisfied with the online class provided by my school
Chi-Square	17.640 ^a	51.200 ^b
df	1	4
Asymptotic Sig.	.000	.000

Source: Computed Through SPSS Software

Based on the results in the above table 1, it is clearly visible that the null hypothesis is being rejected at 5 % level of significance and at 1 degree of freedom, with a P-value of .000 ($P < .050$). Hence, there is a significant difference of the effectiveness of the digital education system across the different types of educational institutions.

For the second research question the following Null and Alternative Hypothesis has been considered for the analysis:

- H_{02} : There is no significant relationship between the satisfaction level of the students from the digital education system and the expectation of the full completion of the syllabus.
- H_{12} : There is a significant relationship between the satisfaction level of the students from the digital education system and the expectation of the full completion of the syllabus.

Analysis:

Symmetric Measures
Table 2

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Ordinal by Ordinal	Kendall's tau-b	.324	.078	3.984	.000
	Gamma	.434	.100	3.984	.000
	Spearman Correlation	.379	.090	4.054	.000 ^c
Interval by Interval	Pearson's R	.356	.090	3.774	.000 ^c
N of Valid Cases		100			

Source: Computed from SPSS Software

From the above table no. 2, we can see from the Spearman rank correlation coefficient the degree of correlation between satisfaction level of the students regarding online classes and the

expectation of the students regarding the completion of the syllabus is moderate i.e, .379 or .48(approx). Again, the null hypothesis is rejected at 5% level of significance with a P value of

.000($P < .050$), proving that there is a significant relationship between the satisfaction level of the students from the digital education system and the expectation of the full completion of the syllabus.

For the third research question the following Null and Alternative hypothesis had been formulated for the analysis:

Analysis:

**Chi-square Test Statistics
Table 3**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.511 ^a	2	.000
Likelihood Ratio	17.600	2	.000
Linear-by-Linear Association	12.540	1	.000
No of Valid Cases	100		

Source: Computed from SPSS Software

From the above table no.3, it is clearly visible that the null hypothesis is rejected at 5% of significance, and at 2 degrees of freedom with a P value of .000($P < .050$), proving that the students depend on the online classes for their theoretical subjects(papers).

For the fourth research question the following Null and Alternative hypothesis had been formulated for the analysis:

Analysis :

**Chi-Square Tests
Table 4**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.880 ^a	2	.144
Likelihood Ratio	4.406	2	.110
Linear-by-Linear Association	3.102	1	.078
No of Valid Cases	100		

From the above table no.4, it is clearly visible that the null hypothesis is accepted at 5% of significance, and at 2 degrees of freedom with a P

- H_{03} : There is no significant extent of reliability on the digital education by the students for their theoretical papers.

- H_{13} : There is a significant extent of reliability on the digital education by the students for their theoretical papers

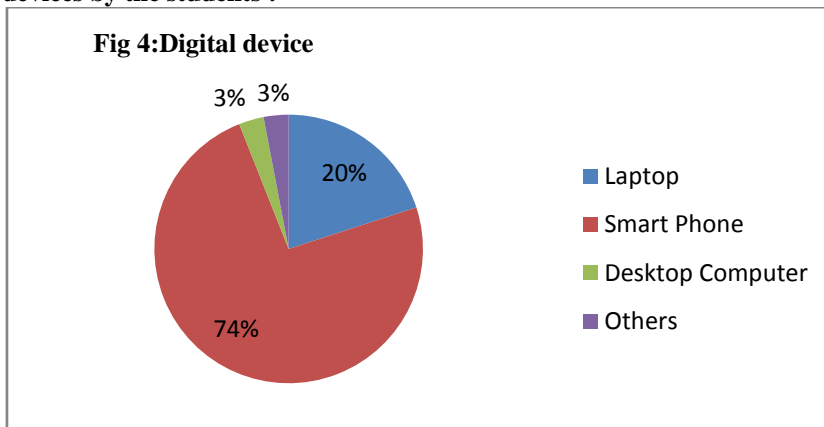
- H_{04} : There is no significant extent of reliability on the digital education by the students for their practical papers.

- H_{14} : There is a significant extent of reliability on the digital education by the students for their practical paper

value of .144($P > .050$), proving that the students do not depend on the online classes for their practical subjects (papers).

For the fifth research question following tables and charts are considered :

Usage of digital devices by the students :



Source: computed by authors from primary data

Irrespective of the classification of male and female respondents, class of the respondents, and also institutions of the respondents the above pie-chart (Fig 4) shows that for the accessibility of the online classes 74% students are using their

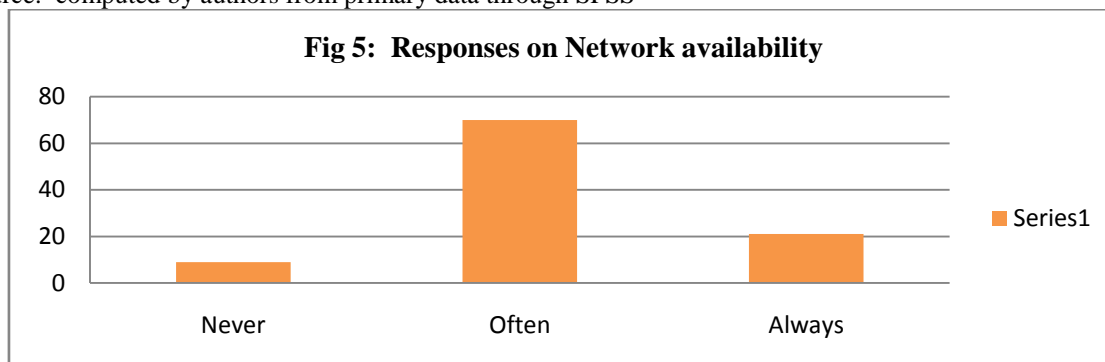
smart phones, 20% students are using laptops, and 3 % students are using desktop computers and the rest 3 % are using some other means. So smart phones are most used accessible electronic device to participate in digital classes.

The network is available and perfect throughout the online session :

Table 5: Responses on Network availability

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid NEVER	9	9.0	9.0	9.0
OFTEN	70	70.0	70.0	79.0
ALWAYS	21	21.0	21.0	100.0
Total	100	100.0	100.0	

Source: computed by authors from primary data through SPSS



Source: computed by authors from primary data through SPSS

It is understandable from the above table 5 and figure 5 that from the 100 students respondents only 9 % students face network problem while 21

% students face no network disturbance. Most of the respondents i.e. 70% students more or less confront with the network problem.

Table 6 : cross- tabulation of network availability and attending online classes by the students :

Network available & perfect throughout the online session		I attend online classes			Total
		Never	Often	Always	
Never	Count	0	3	6	9
	% Within Availability of network	0	33.3	66.7	100.0
Often	Count	4	19	47	70
	% Within Availability of network	5.7	27.1	67.1	100.0
Always	Count	0	1	20	21
	% Within Availability of network	0	4.8	95.2	100.0
Total	Count	4	23	73	100

Source : computed by researchers through SPSS from primary data

From the above table 6 it is seen that from 100 student respondents 73 students attend the class regularly and 47 students i.e. 64.38% of regularly attended students face problem often in attending online classes due to non availability of network and 20 students i.e. 27.39 % of regularly attended students face no problem in attending

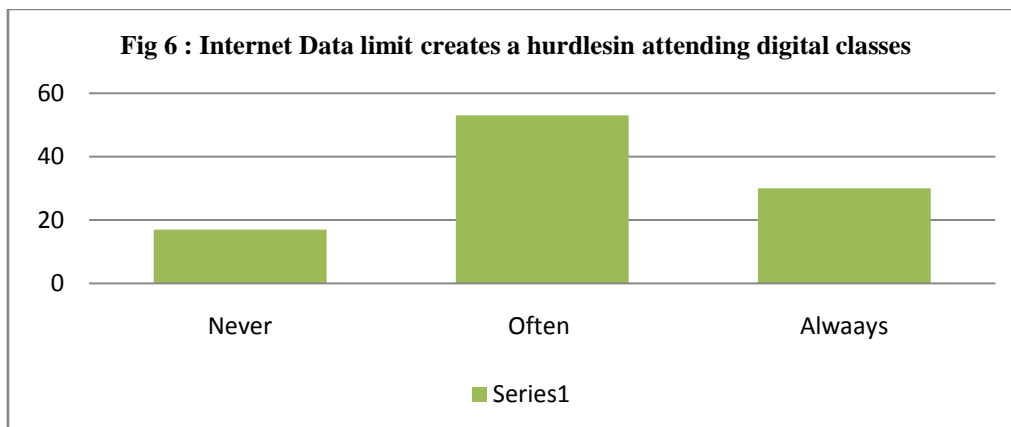
online classes due to non availability of network. Therefore, 53 students i.e.72.60% who try to attend regular online classes face internet network problem always or sometimes during their classes. Those, who take online classes often, account for 23 students and of them 19 students i.e. 82.61% students face sometimes network problem.

Internet Data limit creates a hurdle in attending digital classes :

Table 6 : Internet Data limit creates a hurdle in attending digital classes

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid NEVER	17	17.0	17.0	17.0
OFTEN	53	53.0	53.0	70.0
ALWAYS	30	30.0	30.0	100.0
Total	100	100.0	100.0	

Source: computed by authors from primary data through SPSS



Source: computed by authors from primary data through SPSS

It is observable from the above table 6 and figure 6 that from the 100 students respondents, 17

% have not faced any data limit problems, 53% always suffer from data limitation problem. have faced data limit problem often, and 30%

Table 7: Internet Data limit creates a hurdle in attending digital classes and I attend online classes :

Internet Data limit creates a hurdle in attending digital classes		I attend online classes			Total
		Never	Often	Always	
Never	Count	2	2	13	17
	% Within Availability of network	11.8	11.8	76.5	100.0
Often	Count	1	10	42	53
	% Within Availability of network	1.9	18.9	79.2	100.0
Always	Count	1	11	18	30
	% Within Availability of network	3.3	36.7	60.0	100.0
Total	Count	4	23	73	100

Source: computed by authors from primary data through SPSS

From the above table 7 it is seen that from 100 student respondents 73 students attend the class regularly and 18 of them i.e. 24.66 % always face problem of internet data limitation and 42 of them i.e.57.53 % face this problem often, 13 students i.e. 17.81% face never such problem in attending online classes. Those 23 students who

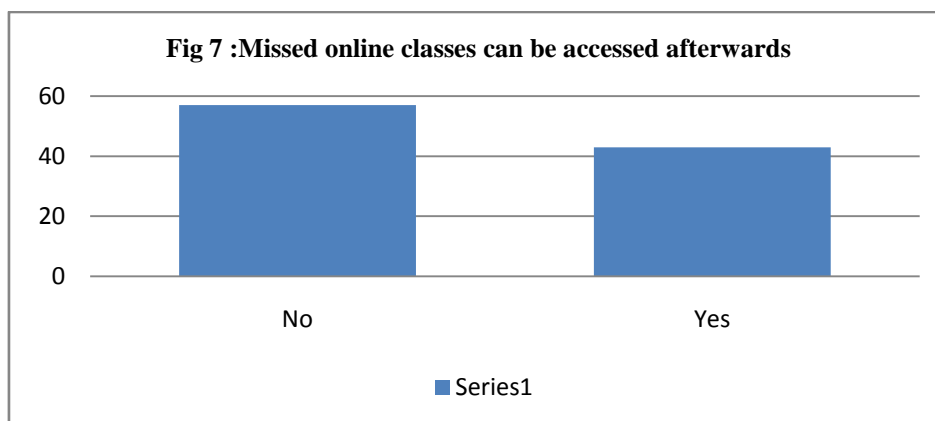
take online classes often, 10 of them i.e. 43.48% face internet data limitation problem sometimes and 11 students i.e. 47.82% face this problem always. Therefore, 21 students i.e. 91.30% of often attended classes to whom internet data limit creates a hurdles in attending their digital classes.

Missed online classes can be accessed afterwards :

Table 8 : Missed online classes can be accessed afterwards

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid NO	57	57.0	57.0	57.0
YES	43	43.0	43.0	100.0
Total	100	100.0	100.0	

Source: computed by authors from primary data through SPSS



Source: computed by authors from primary data through SPSS

It is observed from above table 8 and figure 7 that from 100 students respondents, 57% have no access to the missed online class whereas 43 % have that opportunity to access the past missed online classes.

X. LIMITATIONS OF THE STUDY :

In this study samples are collected from Kolkata and its neighboring cities in West Bengal. This study has taken only class from class 9 to 12. Therefore this study does not reflect all students' opinion in whole of this state West Bengal and the nation India. This study also faces problem of time shortage just to depict the current situation of digital education on the students. Still this study reflects some fruitful relations and results that may help for further research on this topic.

XI. CONCLUSION AND RECOMMENDATION:

It is obviously truth that progress of digital education is on the rise in India and its potentiality of huge acceptance to students is also very high. It is very important to have a greater look into this take off stage of digital education.

This study depicts that there is a significant difference between the effectiveness of digital education and two types of institutions such as private and government institutions [with a P-value of .000 ($P < .050$)]. This study also proves that students' satisfaction also positively related to their expectation of completion of the syllabus through digital education, and also statistically significant [$r = .379$, P value of .000 ($P < .050$)]. Thirdly this study also reveals that students depend on teacher in online classes for theoretical subjects but not for practical subjects. Fourthly, this study depicts that most of the students (74%) used their smart phones for accessing to digital classes. Internet network issue more or less affects the 70% students and 72.60 % of regular class attending students. Internet data limitation package on their smart phones also creates hurdles in attending their online classes. 53% of students are often affected by this problem and 30% suffer it badly in attending their e classes and who are attending online classes regularly 24.66 % of them face it always and 57.33% face it sometimes in attending classes. Fifthly, this study also shows that more than half of the respondents (57%) have no opportunity to get back to those classes which are missed by them.

On the basis of data findings and comments made by respondent students, the following relevant recommendations are suggested:

- a) Though the online education is an only option during this time, but school authority and respective teachers should be cautious enough to ensure that no students getting depressed and everyone is free to express their problem.
- b) It should be taken care of that privacy of classes and students' data are kept properly. No intruders can enter the class without authorization.
- c) Classes hour and total no. of classes per day should not exceed 70 % of total normal internet data limit per day. Because, students have right to use their internet data for their personal activities.
- d) Online class lectures should be supported by easily understandable study materials so that those who are interrupted by network problem or not understand the concept in online class, can decipher the meaning of the whole class lecture.
- e) Due to absence of collaborative environment among students, digital classes should be made as fun and interactive as possible so that can students can be motivated and encouraged.
- f) Since physical is missing, for a teacher, it is not possible to look after all the students in a class. Therefore, digital class should consist of as small no. of students as possible so as to ensure proper attention to all students in the online class.
- g) Students may not have smart phone or other devices, so they can use their parent's smart phone. It may not be possible sometimes to get the phone, for that reason they may not join the class. Therefore school authorities should upload all class lectures to schools' website.
- h) School authority may organize quiz or assignment , and on the basis of which they may distribute e- certificate that can increase morale of students.

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