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Performance Analysis of Digital Education in Higher Education Institutes: A Study on the Perception of Students in West Bengal during COVID-19

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ABSTRACT: The time when the entire humanity is fighting against an invisible deadly enemy Covid-19 that has devoured thousands of lives all over the world and taken almost the entire globe in its eclipse, has enrooted the sense of ambivalence and uncertainty in all sectors of economy. The education acted as a missile of human development is also in jeopardy. It is very topical in Indian context, where lots of students in higher education are going to be affected, to analyze performance of digital education as a substitute of physical class based education. This paper tries to investigate the performance of digital education on the students in West Bengal pursuing higher education by collecting primary data from the students. To generate the results, we have taken responses from 448 students through a well structured questionnaire using 5 point Likert scale. Different charts are used to portray the demographic details of the respondents and further cronbach's alpha has been used to test the reliability of the questions made. Normality test indicates that the constructs are not at all normal leading to application of Mann-Whitney non parametric test. The results show that level of understandability of digital education of students is dependent on type of institute and gender and students' perception of reliability of digital education with respect to type of institute and gender and level of convenience that the students derive from digital education with respect to type of institute and gender are independent in nature. Hence, we can infer that the possible reasons behind dependency of level of understandability on gender may be due to the intelligence quotient (IQ) level, level of patience, willingness, self motivation and other biological characteristics. The possible reasons behind dependency of level of understandability on type of institute are infrastructural facilities, pedagogical support, student-teacher relationship and continuous communication.

KEY WORDS: Covid-19, Likert scale, Cronbach's alpha, Normality test, Mann-Whitney non parametric test, Pedagogical support, IQ level.

I. INTRODUCTION

In this era of 21st century, technology has been prevalent across all the human activities. The growth of technology is increasing rapidly which is changing the shape of civilized human life. Education is an exigent component that helps people being civilized and enables them to be rational enough to judge their good. Education acts as an imperative for overall human development, economic growth through human resource creation and overall development of nation (Gond & Gupta, 2017). Education is a human right of people that should be ensured by nations irrespective of its citizen's caste, creed, gender, place, economic status and social condition. Smooth flow of education and its wider accessibility ought to be ensconced at whatever the situation prevails in the society. Digital education helps to establish such assurance.

Digital education means the teaching learning process is carried on using internet, computer or other digital electronics devices. It can be defined as a mix of technology, digital content and instruction. It is more effective and efficient than traditional education system (Dua et al, 2016). It does not require physical presence of students and provides any time any where learning facility. In India, there takes place drastic changes in entire education system over the period from 'Gurukul' based education (as traced in ancient Indian history) to 'Pathshala' to 'Distance education' to ' Digitalshala'. Digital or E learning is getting significance and has given rise to concept of virtual class learning where teachers deliver their lectures online and students can access to such lectures through their computers or laptops or smart phones or any other electronic gadgets.

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Digital education in India is at initial growing stage. But it has high opportunity of success and adoption in India since number of internet and smart phone users are increasing rapidly. More number of private organizations like Byju, Khan Academy is emerging in India to serve online education to different classes of students. According to a report jointly published by KPMG and Google which predicted that the industry of online education in India is likely to reach at the amount of 1.96 billion USD by 2021 from USD 247 million in 2016 and numbers of users would reach at 9.6 million by 2021 from 1.6 million in 2016. More than 75 crore Indian would be using internet which is the second highest after China.

The global community is passing through an unprecedented COVID-19 pandemic as the name officially suggested by the WHO. Since this disease is spreading rapidly from human to human, isolation, social distancing and lockdown are used as the combating measures. Such pandemic creates two concurrent global crisis – health crisis and economic crisis (Rawat, 2020). From March, all the education institutes were shut and it has significantly disrupted the higher education system which is the future of economy. The pandemic has changed the traditional chalk talk based education to digital education (Choudhary, 2020). In India, almost 320 million students would be affected due to this pandemic and government also recommended for shifting to online mode of teaching for not disrupting the smooth flow of education system (Sahni, 2020). Digital education system has become an inevitable option to carry on the teaching learning process continuously provided the required infrastructure is present.

II. CONCEPTUAL FRAMEWORK

India is a secular country which is second largest in population in the world and constitution of India also provide for free access to education to all citizens which is a challenge for the government. Formal education though the most important form imparting rational learning to the students, still is not capable enough to cater to needs of all sorts of students in all types of situations. European Union also wants to move to e learning to mobile learning (Fetaji, 2008). Therefore, along with formal education, digital education is equally important to achieve constitutional as well as societal objective of the country. It is an essential responsibility of all those stakeholders who are involved in providing education in different part of the country, to build up proper infrastructure and platform for facilitating such digital education so as to reap the full benefit from it.

Existing Key Categories of Online Education:

a) Primary and Secondary supplemental education which provides online classes for assisting primary and secondary students.
b) Higher education which provides an alternative assistance through online classes and study materials in addition to traditional higher education courses
c) Test preparation which provides online coaching and tutorial for preparation of competitive exams like NET, JEE, UPSC, etc.
d) Re-skilling and online certification which provides courses for skill enhancement and provide certificate thereon.
e) Language and other learning which provides courses for non academic subjects for personal benefit, for example online guitar learning, spoken English or Spanish etc.

Government initiatives:

Various initiatives have been taken so far by Government of India to promote digital learning under 'National Mission on Educational through Information and Communication Technology' (NMEICT). NMEICT tries to leverage the potential of ICT so as to provide quality content and education and make it accessible to all learners in the country at free of cost. Important initiatives include:

1) Study Webs of Active Learning for Young Aspiring Minds or SWAYAM, which provides courses set by NCERT covering class 9 to Post Graduate.
2) SWAYAM Prabha which provide 32 high quality educational channels through DTH on 24X7 basis covering diverse disciplines.
3) National Digital Library (NDL) which provides virtual repository of learning resources through a single window facility. It is also available through mobile app.
4) Free and Open Source Software for Education or FOSSE promotes the use of open source software in educational institutions.
5) Other initiatives include National Academic Depository (NAD), E- Shodh Sindhu (ESS), Virtual Labs, e- Yantra, E- Acharya, E- Kalpa, SANSHAT etc.

Importance of digital education for higher education:

Incorporating technology in education system and implementing personalised learning programmes are the reflection of progression of

modern times. With the massive increase of internet and smart phone users, it is very important to strengthen the infrastructure to deliver digital learning in every corner of the country so as to augment the skills and productivity potential human resources. (Rastogi, 2019) identified following benefits of digital education system:

1) It makes students smarter and effective in self directed learning which increases efficiency and productivity in them;
2) Better information sharing among students is possible in real time which increases knowledge base;
3) It removes the geographical limitation of physical class based learning;
4) Such digital education system increases employability and make them self motivated.

Gond & Gupta (2017) also indentified some benefits which are as follows:

1) Students can be able to prepare projects and assignments online, and can get missed notes easily;
2) Students can avail library facility online and can all class time table online;
3) Parents can get all information and control their child during class time and can know all the tasks and results of exams;
4) Teachers also can manage the class and can get all class related information even if they are on leave;
5) Principal can monitor the class progression and allocate the class effectively online,

III. LITERATURE SURVEY

Following literatures from both national and international scenario have been surveyed minutely to conduct this research work:

- **Sikdar & Dey (2020)** tried to assess the effectiveness, accessibility and reliability of digital education on secondary and higher secondary students during COVID-19 pandemic. They have used primary data through a survey of 100 students and used chi square test and spearmen rank correlation test to test the hypothesis. The study also found that there is significant difference between effectiveness and type of institutes and satisfaction of students also positively related to the expectation of completion of syllabus.
- **Rastogi (2019)** has used secondary data to show the components of digital education applications and factors enabling its growth in India which include Personalized and Adaptive Learning, Two-way Conversations in E-Learning, Mobile-based Learning, Video-based Learning. He also concluded that a blended education system should be set up to protect teacher-taught relationship and also to promote digital education system.
- **Ali, Hossain & Ahmed (2018)** analyzed the effectiveness of digital education on university level students. He has used 667 respondents for his study and used Cronbach's Alpha for reliability and one sample t test for hypothesis testing. Contents structure, usability, faster learning, quick responsiveness, learning quality, time and cost friendly, usability outside of the class and appropriate for working independently are the variables used by him to measure the effectiveness and the study found that e learning is effective in university students. Digital education is less time consuming, user friendly and less costly as supposed by the students.
- **Ghaderizefreh & Hoover (2018)** used understandability, illustration, level of expectation, difficulty, clarity, pace, enthusiasm, and fostering attention as the characteristics of online learning and found that there is significant positive relation between understandability, and illustration**.** They have taken enjoyment, anger, anxiety, and boredom as the four characteristics of emotions of students and found that there is significant negative relation between enthusiasm and anger, anxiety.
- **Gond & Gupta (2017)** in their qualitative research paper explained components of digital education, benefits and future scope and possible challenges that may be faced in India. They also emphasised that democratic governance, tech-educated talent are required for the development of digital education in Indian society.
- **Dua, Wadhawan & Gupta (2016)** emphasised in their study to implement innovative classroom to provide learning and also suggested to use digitalised classroom, game based classroom etc.
- **Sood & Singh (2014)** in their study took 392 respondents to collect information regarding their opinion about e learning higher education. The study found that e-learning pattern does not depend on gender. This study also found that there is no significant relation gender and interest in software project management.
- **Sharma & Hardia (2010)** analysed the factors that affect the use of e-learning in higher education and for that they have used factor analysis test and found that comfort level with technology, group learning disciplined explorer and age are significant component that e learning usage in higher education.

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IV. RESEARCH GAP

After thoroughly analysing the different research papers and reports, it is found that sufficient study is not conducted on this topic during current situation. Very less researchers have used statistical tests to judge their objectives and hypothesis.

V. OBJECTIVES OF THE STUDY

The study is conducted to achieve the following objectives which are supposed to relevant during current socio economic time:

1. To study the level of understandability of digital education of students with respect to type of institute and gender;
2. To study the students' perception of reliability of digital education with respect to type of institute and gender;
3. To study the level of convenience that the students derive from digital education with respect to type of institute and gender.

VI. RESEARCH METHODOLOGY

6.1 Type of research

The study is merely primary in character. Literature survey which is intended for recognition of research gaps and choosing the objectives of the study is theoretical in nature.

6.2 Population, Sample and Sampling Techniques

Our population includes students pursuing higher education in West Bengal. We have collected samples through well structured questionnaires scaled at 5 points on the basis of Likert scaling. For data collection, we have used Google forms to reach towards the respondent. The sample size was finalised on the basis of Cochran (1977):

$n_0 = \frac{z^2 pq}{e^2}$ where; z = 1.96, p = 0.50, q = (1-0.50) = 0.50, e = 0.05

On the basis of the above sample size determination, the sample size (n_0) comes to 384.16 with a proportion of 50 percent which indicates a greater level of variability. We have taken a sample size of 448 to accommodate a greater number of respondents that can provide us with a better result. We have included both private and public institutes to address our research objective.

6.3 Tools used

We have applied Cronbach's alpha for scale reliability and Shapiro-Wilk test for normality test. Further, we applied Mann-Whitney test to analyze the dependency of the different constructs on gender and type of institutes. Different charts have been used to portray the demographic details. The analysis has been performed using SPSS 20.0.

VII. SIGNIFICANCE OF THE STUDY

Since India is passing through such a pandemic situation where education is one of the most adversely affected sectors in the economy, it is very relevant to assess the practical importance of digital education which is across the country used as a substitute of physical formal class room based education. It is also very necessary to understand the real applicability of digital education, so being used by the different higher education institutes to cover their curriculum, from the perception of students. This study will surely provide an insight to the understandability, reliability and convenience of the digital education that will also help the academic as well as the other persons taking decision regarding such education system.

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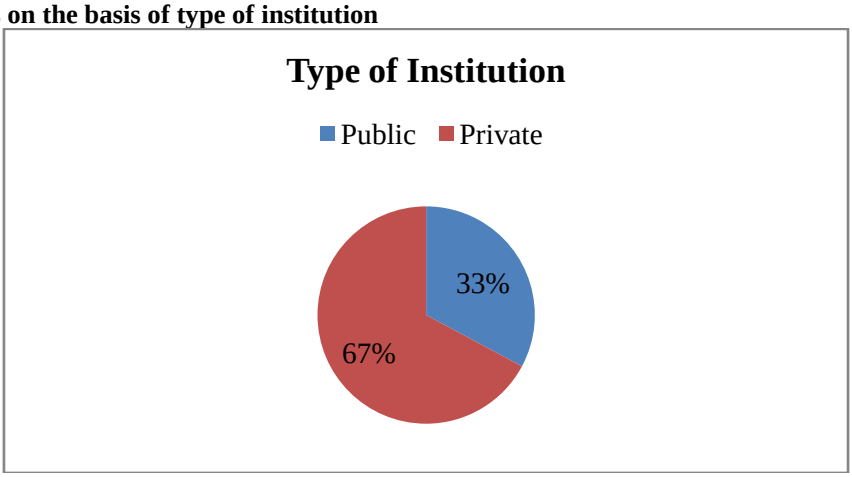
VIII. DATA ANALYSIS AND FINDINGS

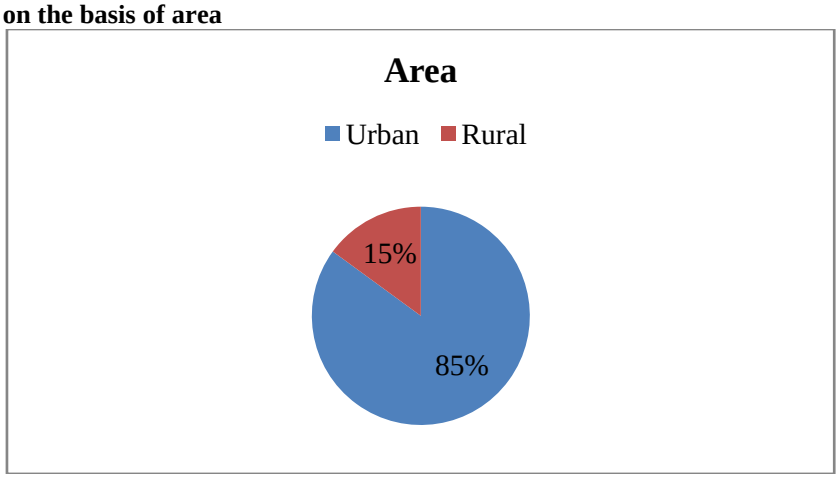
8.1 Demographic Data and Analysis

8.1.1 Responses on the basis of type of institution



The above pie chart shows the percentage of respondents from public and private institutes in our sample. Out of 448 respondents, 67 percent i.e., 301 are from private institutes whereas 33 percent i.e., 147 are from public institutes.

8.1.2 Responses on the basis of area



The above pie chart shows the percentage of respondents from urban and rural area in our sample. Out of 448 respondents, 85 percent i.e., 381 are from urban area whereas 15 percent i.e., 67 are from rural area.

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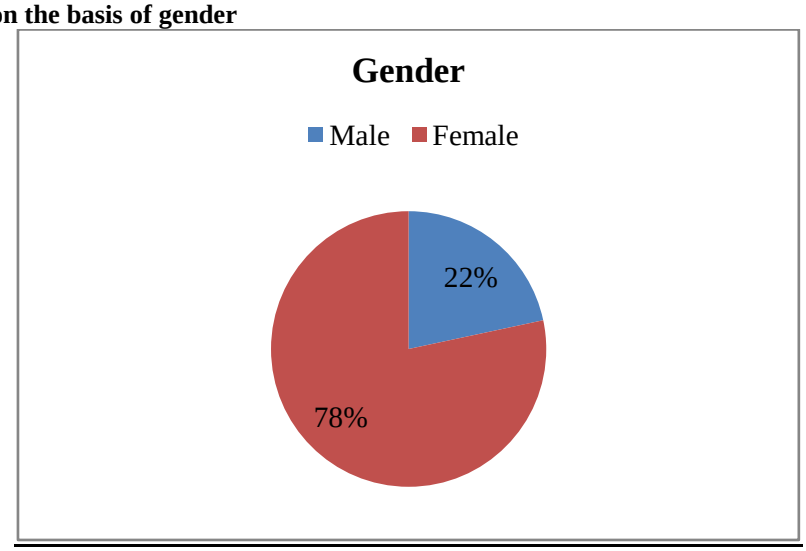
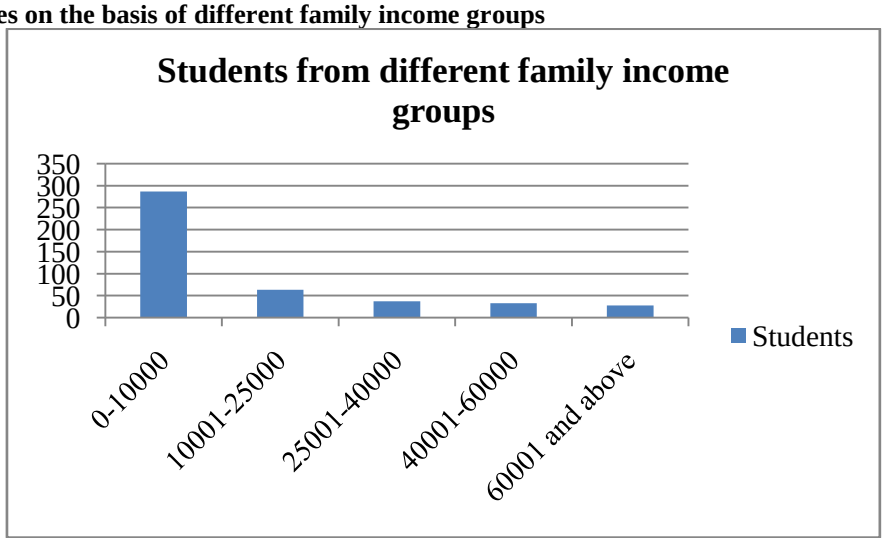
8.1.3 Responses on the basis of gender



The above pie chart shows the percentage of male and female respondents in our sample. Out of 448 respondents, 78 percent i.e., 351 are female whereas 22 percent i.e., 97 are male.

8.1.4 Responses on the basis of different family income groups



The above bar chart shows the number of respondents in our sample on the basis of their family income. Out of 448 respondents, 287 are from the group where family income is between 0 to 10000, 63 are from the group where family income is between 10001 to 25000, 37 are from the group where family income is between 25001 to 40000, 33 are from the group where family income is between 40001 to 60000 and 28 are from the group where family income is 60001 and above.

8.2 Scale Reliability Test

Reliability Statistics		
Constructs	**Cronbach's Alpha**	**No. of Items**
Understandability	0.733	6

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Reliability	0.879	10
Convenience	0.885	11

The above table depicts the results of scale reliability test through Cronbach's Alpha. Cronbach's Alpha indicates the consistency in the scaling. We can see that understandability has a Cronbach's Alpha value of 0.733 which indicates that 73.3 percent of the variance in scores is reliable. Similarly, reliability has a Cronbach's Alpha value of 0.879 which indicates that 87.9 percent of the variance in scores is reliable. Convenience has a Cronbach's Alpha value of 0.885 which indicates that 88.5 percent of the variance in scores is reliable. Hence, the overall result forecasts that we can progress with our study.

8.3 Normality Test

Shapiro-Wilk Test (1965)				
Constructs	**Gender**	**Statistic**	**df**	**Sig.**
Level of Understandability	Male	0.772	99	0
	Female	0.774	351	0
Level of Reliability	Male	0.872	99	0
	Female	0.853	351	0
Level of Convenience	Male	0.862	99	0
	Female	0.830	351	0

The above table provides us with the results of normality test that is explained by Shapiro-Wilk test considering gender to be the factor. We find that all the constructs are non normal in nature due to p value less than 0.05. Hence, we reject the null hypothesis and accept the alternate hypothesis that the construct variables are not at all normal.

Shapiro-Wilk Test (1965)				
Constructs	**Type of Institute**	**Statistic**	**df**	**Sig.**
Level of Understandability	Private	0.851	300	0
	Public	0.840	150	0
Level of Reliability	Private	0.861	300	0
	Public	0.863	150	0
Level of Convenience	Private	0.830	300	0
	Public	0.853	150	0

The above table provides us with the results of normality test that is explained by Shapiro-Wilk test considering type of institute to be the factor. We find that all the constructs are non normal in nature due to p value less than 0.05. Hence, we reject the null hypothesis and accept the alternate hypothesis that the construct variables are not at all normal.

8.4 Testing of Hypothesis

Our study comprises of the following hypothesis:

1. Null Hypothesis (H_0): There is no interdependency between level of understandability and gender.
2. Null Hypothesis (H_0): There is no interdependency between level of reliability and gender.
3. Null Hypothesis (H_0): There is no interdependency between level of convenience and gender.

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4. Null Hypothesis (H_0): There is no interdependency between level of understandability and type of institute.
5. Null Hypothesis (H_0): There is no interdependency between level of reliability and type of institute.
6. Null Hypothesis (H_0): There is no interdependency between level of convenience and type of institute.

Gender (Grouping Variable)	Level of Understandability	Level of Reliability	Level of Convenience
Mann-Whitney U	14581.000	17108.000	17015.500
Z	-2.644	-.250	-.344
Asymp. Sig. (2 tailed)	.008	.803	.731

The above table depicts the result of Mann-Whitney (U) test. This test indicates whether the two groups are interdependent or not. P values of the test are less more than 0.05 indicating acceptance of alternate hypothesis and rejection of null hypothesis. Hence, we accept the alternate hypothesis of 1 and conclude that there is interdependency between level of understandability and gender. P values of the test are more than 0.05 indicating acceptance of null hypothesis and rejection of alternate hypothesis from 2-3. Hence, there is no interdependency between level of reliability and gender and level of convenience and gender.

Type of Institute (Grouping Variable)	Level of Understandability	Level of Reliability	Level of Convenience
Mann-Whitney U	18467.000	18654.000	19810.500
Z	-2.018	-1.835	-.867
Asymp. Sig. (2 tailed)	.044	.066	.386

The above table depicts the result of Mann-Whitney (U) test. This test indicates whether the two groups are interdependent or not. P value of the test is less than 0.05 indicating acceptance of alternate hypothesis and rejection of null hypothesis of 4. Hence, we conclude that there is interdependency level of understandability and type of institute. P values of the test are more than 0.05 indicating acceptance of null hypothesis and rejection of alternate hypothesis from 5 to 6. Hence, we accept the null hypothesis and conclude that there is no interdependency between level of reliability and type of institute and level of convenience and type of institute.

IX. CONCLUSION

From the above analysis it is found that level of understandability of digital education of students is dependent on type of institute and gender as portrayed from Mann-Whitney test.

Students' perception of reliability of digital education with respect to type of institute and gender and level of convenience that the students derive from digital education with respect to type of institute and gender are independent in nature. Hence, we can infer that the possible reasons behind dependency of level of understandability on gender may be due to the intelligence quotient (IQ) level, level of patience, willingness, self motivation and other biological characteristics. The possible reasons behind dependency of level of understandability on type of institute are infrastructural facilities, pedagogical support, student-teacher relationship and continuous communication.

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