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A STUDY ON THE FACTORS AFFECTING STUDENTS' PERCEPTION AND ATTENDANCE OF ONLINE COLLEGE CLASSES DURING THE 'CORONA' PANDEMIC IN SELECTED DISTRICTS OF WEST BENGAL

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ABSTRACT

To counter the disruption in teaching and learning due to the nationwide 'lockdown' of educational institutions during the Corona pandemic, the government has advised all educational institutions to arrange classes in 'online mode. 'The study tries to examine the perception of the students about the efficacy of these online classes at their institution and to identify the institutional, socio-economic, demographic, and technological factors responsible for their attendance in those online classes by a binary logistic regression model. A survey was conducted to collect data from 1100 undergraduate college students from selected districts of West Bengal. The Garret Ranking method is used to rank the importance of different problems faced by the students in attending those classes. The study recommends a blended learning model, skill development of the teachers by the training programme, and infrastructural development of the institutions to facilitate online teaching and learning better. The study also recommends some essential schemes of the government to reduce the digital divide and to unmask the potential benefits of online teaching and learning.

Keywords: *Corona, Online Class, College Students, Logistic Regression, Garret Ranking Method.*

Introduction

Corona pandemic has resulted in a paradigm shift in how we learn, collaborate, and impart education in formal higher educational institutions. To break the chain of infection, the government has announced a nationwide 'lockdown' of educational institutions during this pandemic. To counter the disruption in teaching and learning and to help the students quarantined in their homes, the government has advised all educational institutions to arrange classes in 'online mode.' Due to this pandemic, the status of online teaching-learning has shifted from a mere preference to a necessity. But there is a considerable degree of skepticism regarding how far the online teaching-learning process can achieve the three cardinal principles of our education policy - access, equity, and quality. Although there is a significant surge in the use of teaching apps, video conferencing tools, and online learning soft-wares in the past few months, they have been proven insufficient to substitute the classroom experience of student-teacher interaction. Lack of technical expertise and preparedness, low bandwidth, costly internet data, and a substantial digital divide (across different regions and also across different income groups of people) raise questions about the efficacy of this mode of teaching and learning. According to the National Sample Survey (2017-18), only 23.8% of Indian households have access to the internet. Although 66% of the population of the nation lives in the rural sector, only 14.9% have access to the internet as compared to 42% in urban areas.

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Moreover, there are questions regarding how far online teaching can benefit the less proficient students who are most in need of skilled classroom teachers. Physical proximity and face-to-face interaction can bring out the best in students and kindle their imagination. Engaging all the students and encouraging them to be active online is a 'Herculean' task. Although online classes are flexible and students can manage their learning time efficiently in online mode, but the real challenge is how to bring the teacher's personality into the virtual classroom. The generation of high-quality e-content requires proper coordination between subject matter experts and technical experts (Rath & Goel, 2011).

Most of the institutions conduct online courses or classes either in terms of pre-recorded videos as Massive Open Online Course (MOOCs) orin terms of live classes in online platforms like Google Meet, Zoom, Microsoft Teams, etc. The National Mission on Education through Information and Communication Technology (NMEICT), established in India in 2009, suggested a four-quadrant e-learning model. Amongst the four stages, the first stage involves 'basic learning,' characterized by self-learning by the learners and includes necessary learning materials in the form of web-based notes, e-books, presentations, and video lectures. The second stage is 'demonstrative learning,' which involves learning with animations, visuals, interactive simulations, etc. The third stage is 'supplementary learning,' consisting of learning through consulting supplementary resources from open content or articles on the internet, case studies, anecdotal information, etc. The fourth stage is called 'interactive learning,' comprising of learning through active interactions between the learners and the content developers/instructors through discussion forums, online quizzes, chats, etc.

Different studies have been conducted to understand the online learning experience of students enrolled in various types of courses across the globe at different points of time. Young and Norgard (2006) found that "developing a robust online community with student-student interaction, timely interaction between students and instructors, and technical support is critical to satisfaction with online courses.""Peer-interactions are essential in developing online learning communities and significantly affect students' online learning experiences" (McGreal & Elliott, 2004; Palloff& Pratt; 1999). The technical skill of the instructor is a critical factor in online teaching and learning (Armstrong, 2011).Also, "there is a problem of low-level preparedness among the students concerning the usage of Learning Management Systems" (Parkes et al., 2014). Moreover, the high motivation of the students is needed to complete an online course (Dennis, Bunkowski, & Eskey, 2007). Lack of personal touch and interaction due to connectivity issues are the significant drawbacks of virtual classes (Arora & Srinivasan, 2020)."Sometimes, online content is all theoretical and does not let students practice and learn effectively. Mediocre course content is also an important issue" (Dhawan, 2020). The study of Muthuprasad et al. (2020) shows that" students prefer recorded classes with quizzes at the end of each class to improve the effectiveness of learning." The flexibility and convenience of online courses make it an attractive option. In contrast, broadband connectivity issues in rural areas make it a challenge for students to make use of online learning initiatives.

Although different studies have highlighted the factors instrumental for the arrangement of a better online learning experience of the students, very few empirical studies have been conducted yet in terms of an econometric model to estimate how these different socio-economic, demographic, and technical factors can influence the participation in online classes by the students during this time of the Corona pandemic. Moreover, these surveys suffer from the problem of a small sample size. This paper is an honest attempt to bridge these research gaps.

The objectives of the study are to:

- Understand the perception of the undergraduate college students about the efficacy of these online classes at their institution
- Examine how different institutional, socio-economic, demographic, and technological factors influence their attendance in those online classes
- Suggest various schemes to improve the learning experience of the students that may help the government and education policymakers in designing and fine-tuning their policies

The plan of the paper is as follows – Section I introduces the paper by highlighting the motivation behind the study, a brief review of the literature, identification of the research gap and objectives of the study. Section II portrays the sources of data and the research methodology used in the study. Section III makes an empirical analysis of data, while Section IV concludes.

Data and Methodology

A survey was undertaken during the period from March 2020 to August 2020 in nine districts of West Bengal, namely, East and West Medinipur, Kolkata, North and South 24 Parganas, Howrah, Hooghly, East Bardhaman, and Nadia. These are the districts that rank in the top ten districts of the state,

according to the Census data 2011. These nine districts comprise 63% of the population of the state, and where the spread of the Corona virus infection was more severe than others. The data regarding the perception of online teaching and learning was collected from 1100 undergraduate college students from different streams and various institutions of these districtsthrough interviews and Google forms by a pre-tested semi-structured questionnaire designed for the purpose. A multistage random sample design was used to collect the data.

A binary logistic regression model is used to estimate how the maximum likelihood of attending online institutional classes by these students is affected by different demographic, socio-economic, and technological factors considered for the study. The study tries to estimate the coefficients of the following regression equation

$$Y_i = \log (p / 1-p) = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + u_i$$

Where Y_i = Attendance / Participation in online institutional classes by the i^{th}student

$Y_i = 1$ if the student attend the class & $Y_i = 0$ otherwise

α = constant term &β_is are the coefficients of the six explanatory variables

u_i= Error term ;$u_i \sim N (0, \sigma^2)$

Table 1 shows the explanatory variables considered in the study

Table 1: Explanatory Variables Considered in the Study

Name of the Variable	Type	Notation	Measurement
Flexible Class Routine	Dummy	X_1	1 = if Yes , 0 = otherwise
Learning Management System of the institution	Dummy	X_2	1 = if Yes , 0 = otherwise
Technological Expertise of the Teachers	Dummy	X_3	1 = if teacher is tech-savvy , 0 = otherwise
Sex of the student	Nominal	X_4	1 = if Male , 0 = otherwise
Monthly Family Income of the student	Continuous	X_5	Rupees per month
Area of Residence of student	Categorical	X_6	1 = if Rural ; 2 = if Semi urban ; 3 = if Urban

Source: Own survey (March 2020 to August 2020)

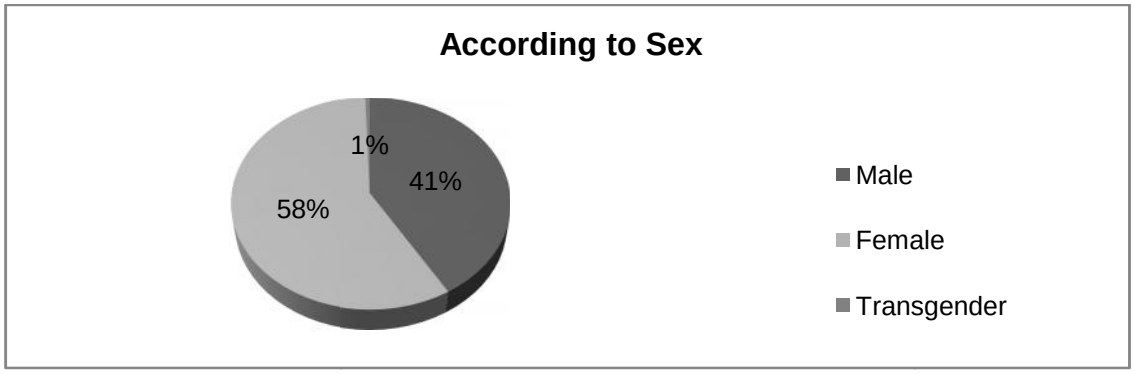
p = probability of the occurring of the event (i.e., the student is attending online class)

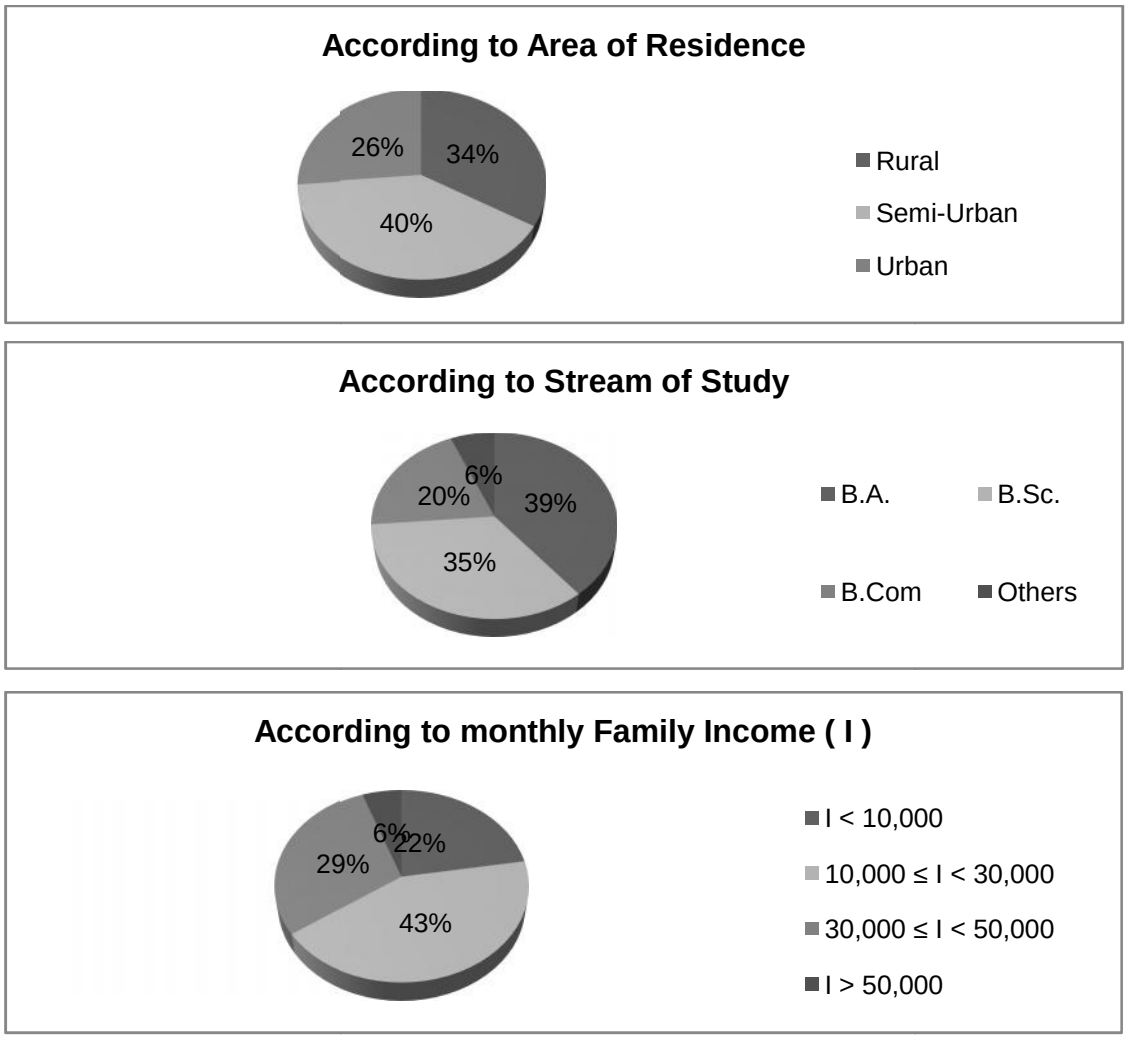
(p / 1 – p) is called the odds ratio, where $p = (e^{\alpha + \sum i \ \beta i Xji}) / (1 + e^{\alpha + \sum i \ \beta i Xji})$

Garret Ranking Method is used to rank the problems faced by the respondents in attending online classes of their institution.

The demographic and socio-economic profile of the respondents is shown in Figure 1. If one considers the sex composition of the respondents, then 58% are female. About 40% of the Respondents reside in the semi-urban area, 34% live in rural areas, and 26% live in urban areas. If one considers the stream of study of the respondents, then 39% read in B.A., whereas 35% and 20% of them read in B.Sc. and B.Com, respectively. Most respondents (43%) have a monthly family income ranging from Rs 10,000 to Rs 30,000, while 29% have a monthly family income between Rs 30,000 to Rs 50,000. About 22% of the respondents have a monthly family income of less than Rs 10,000, while only 6% have their monthly family income more than Rs 50,000.

Figure 1: Demographic and Socio-Economic Profile of the Respondents





Source: Own Survey (March 2020 to August 2020)

Empirical Analysis

To understand the perception of the students about their online college classes, they were asked to express their views in terms of their degree of agreement with few statements regarding online teaching and learning on a five-point Likert scale. The responses of the students are summarized in Table 2. Students perceived that e-learning is more flexible than classroom learning and enables efficient use of learning time. They opined that although online classes are exciting but face to face interaction with teachers and chalk and talk methods of teaching promotes clarity in understanding lessons. They expressed that hands-on experience of doing laboratory practical classes and assessments are difficult to administer online. According to them, E-learning demands the teachers to be technology-friendly, which, unfortunately, is not the case always, and parental or family support and motivation are vital for doing online classes.

Table 2: Students' Perception of Online Teaching and Learning

Sl. No.	Statement	Strongly Agree	Agree	Cannot Say	Disagree	Strongly Disagree
1	Online teaching-learning enables efficient use of learning time compared to the traditional classroom learning	20 %	55 %	5 %	11 %	9 %
2	Online learning is more exciting and interesting than the traditional classroom setting	17 %	31 %	24 %	20 %	8 %

3	E-learning is more flexible than classroom learning as students can access lessons sitting anywhere in the world	71 %	19 %	5 %	3 %	2 %
4	E-learning demands the teachers to be technology-friendly, which, unfortunately, is not the case always	73 %	21 %	4 %	1 %	1 %
5	Face-to-face interaction with teachers and chalk and talk method of teaching in a physical classroom promotes clarity in understanding lessons	78 %	18 %	1 %	2 %	1 %
6	Parental / Family support and motivation is important for doing online classes	63 %	17 %	12 %	5 %	3 %
7	Hands-on experience of doing Laboratory practical classes are difficult in the online mode of teaching	82 %	9 %	5 %	3 %	1 %
8	Performance assessment is more challenging to administer online	31 %	63 %	4 %	1 %	1 %
			Cronbach's Alpha = 0.871			

Source: Own Survey (March 2020 to August 2020)

The value of Cronbach's alpha is 0.871, which signifies that the questionnaire design is internally consistent and thus can be used for further research with reliability.

One significant problem that often arises in the case of the estimation process is the problem of Multicollinearity. It is a statistical phenomenon in which two or more explanatory variables are highly correlated among themselves. Thus it becomes difficult to come up with reliable estimates of the coefficients of those explanatory variables under study. The problem of Multicollinearity is checked by the value of the Variance Inflation Factor (VIF) and Tolerance (1/VIF), as shown in Table 3. VIF measures how much the variance of the estimated regression coefficient increases if the explanatory variables are correlated.A VIF value of less than 2 indicates no problem of Multicollinearity. In this study, the mean value of VIF is 1.25 (<2), which confirms that there exists no problem of Multicollinearity among the explanatory variables considered for the study.

Table 3: Values of VIF& Tolerance

Name of the variable	VIF	1/VIF
Flexible Class Routine	1.61	0.620
Learning Management System of the institution	1.62	0.617
Technological Expertise of the Teachers	1.04	0.962
Sex of the student	1.02	0.980
Monthly Family Income of the student	1.12	0.895
Area of Residence of student	1.10	0.906
Mean VIF = 1.25		

Source: Own Survey (March 2020 to August 2020)

Table 4 shows the Goodness of fit of the model in terms of the likelihood ratio test and the Hosmer & Lemeshow test. The likelihood ratio test is a chi-square test that checks whether the model chosen with the explanatory variables is significantly better than the model with no explanatory variables in explaining the response variable. If the test statistic is statistically significant at a 5% level of significance, we can conclude that the model with the chosen explanatory variables is significantly better than the model with no explanatory variable. In this model, the chi-square value is significant at a 5% level, and thus we can conclude that the chosen model fits good. The pseudo R squared value is 0.47.

Table 4: Goodness of Fit Test

Likelihood Ratio Test	
Estimation terminated at iteration number 4 as parameter estimates changed by less than 0.001	
Number of Observations = 1100	
Likelihood Ratio chi-square (6) = 232.03	prob> chi-square = 0.000
Log Likelihood = -272.898	Pseudo R Square = 0.47
Hosmer-Lemeshow Test	
Number of groups = 10	
Hosmer-Lemeshow chi-square (8) = 11.80	prob>chi-square = 0.1603

Source: Author's calculation

The Hosmer-Lemeshow(H-L) test divides the entire data set into groups (usually ten groups) and then compares the observed and fitted values within each group. If the discrepancy between the observed and the fitted values are small, then it will result in a small Hosmer-Lemeshow test statistic and the corresponding high p-value. Thus, if the p-value is greater than 0.05, the model fits good. In this study, in the case of the H-L test, prob>chi-square = 0.1603 > 0.05. So the model fits good.

Table 5 shows the Classification table, sometimes called the Confusion matrix. This table shows that in this model,

Specificity = [(True Negative) / (False Positive + True Negative)] * 100 = 65%

Sensitivity = [(True Positive) / (True Positive + False Negative)] * 100 = 85.6%

Accuracy = [(True Positive + True Negative) / (True Positive + True Negative + False Positive + False Negative)] * 100 = 79.2%

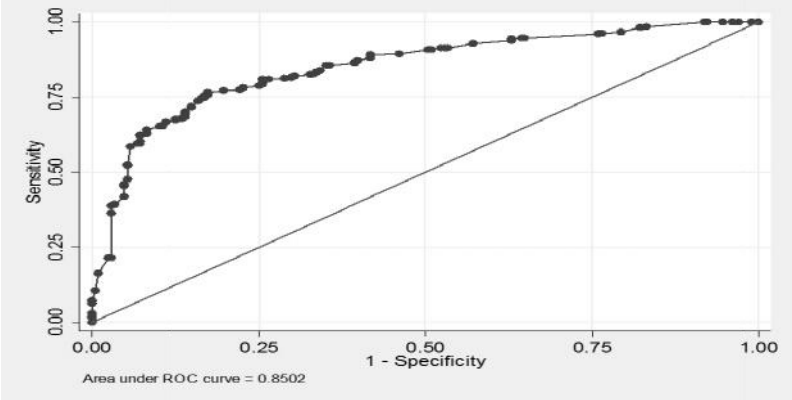
Figure 2 shows the Receiver Operating Characteristic (ROC) curve. It is a plot of False Positive Rate (=1 – Specificity) in the horizontal axis against the True Positive Rate (= Sensitivity) in the vertical axis for different threshold values of probability for discrimination. The Area under the curve (AUC) measures the discriminative ability of the model. In this case AUC = 0.8502, which indicates that the model has satisfactory discriminative ability and a good classifier model.

Table 5: Classification Table (Confusion Matrix)

Observed		Predicted		
		Class Attendance		Percentage Correct
		NO	YES	
Class Attendance	NO	246	133	65 = Specificity
	YES	104	617	85.6=Sensitivity
Overall Percentage		79.2 = Accuracy		
Cut off is 0.5 by default				

Source: Author's Calculation

Figure 2: Area under ROC



Source: Author's plot using STATA

The values of the estimated coefficients of the explanatory variables of the binary logistic regression model and the marginal effects are summarized in Tables 6 and 7, respectively. The result shows that all the explanatory variables are statistically significant in explaining the attendance of students in online college classes.

Table 6: Results of the Logistic Regression Model

Variables	Coefficient	Std. Err.	Z value	Odds Ratio
Flexible Class Routine	1.648***	0.244	6.74	5.191
Learning management System of the institution	1.021***	0.238	4.22	2.731
Technological Expertise of the Teachers	1.096**	0.493	2.22	2.991
Sex of the student	0.404***	0.141	2.86	1.497
Monthly Family Income of the student	0.391*	0.219	1.78	1.478
Area of Residence of student	0.560***	0.139	4.01	1.751

Source: Author's calculation by using STATA

Table 7: Marginal Effects after Logistic

Y = Pr(Attendance of college online class) (predict) = 0.721			
Variables	**dy/dx**	**Std. Err.**	**Z value**
Flexible Class Routine	0.334***	0.047	7.11
Learning management System of the institution	0.209***	0.050	4.15
Technological Expertise of the Teachers	0.255**	0.122	2.09
Sex of the student	0.081***	0.028	2.85
Monthly Family Income of the student	0.078*	0.043	1.81
Area of Residence of student	0.113***	0.028	4.08
(*) dy/dx is for discrete change of dummy variables from 0 to 1			

Source: Author's calculation using STATA

From Table 7 and 8, we see that all the explanatory variables are statistically significant in explaining the attendance of online college classes of the students.

The results of the binary logistic regression model show that the likelihood of attending online college classes by the students rises if the college authority follows a flexible class routine. A flexible class routine helps many students balance their work, family responsibilities, and study requirements. This is particularly true in rural and semi-urban areas. Due to the loss of jobs of their parents during this corona pandemic, students have to engage themselves in whatever jobs available for them to support their families during the time of their regular college classes. In many cases, students are not the primary users of the android devices they use to attend classes. Arranging classes online beyond the stipulated college hours help them to attend those classes easily. In this study, the odds of attending online classes with a flexible class routine is 5.191 times more than the odds of attending classes without a flexible class routine. The marginal effect shows that if the college routine changes from fixed to a flexible structure, the probability of attending the online college classes by the students rises by 33% (when the rest of the explanatory variables are at their mean values). The result is significant at a 1% level.

Secondly, as the result shows, the likelihood of attending online college classes by the students rises if the college possesses a learning management system. A learning management system helps the college to administer classes better and in a more systematic way due to better organizational preparedness. The study shows the odds of attending online classes by the students if the college has a learning management system is 1.021 times more than the odds of attending classes without a learning management system. The marginal effect shows that if the college adopts a learning management system, the probability of attending the online college classes by the students rises by about21% (when the rest of the explanatory variables are at their mean values). The result is also significant at a 1% level.

Thirdly, the technological expertise of the teachers is also a crucial factor in conducting online classes. In the survey, the students opined that e-learning demands the teachers to be technology-friendly, which, unfortunately, is not the case always. Teachers, more proficient in the use of technology, can develop quality and innovative course content and can deliver them to the students in a much exciting manner. This promotes the interest of the students to attend the classes. As the study shows, the odds of attending online classes by the students for techno dexterous teachers is almost three times more than the odds of attending classes for those teachers who are not tech-savvy. The marginal effect shows that if the teacher is technologically proficient, the probability of attending the online college classes by the students rises by about 25.5% (when the rest of the explanatory variables are at their mean values). The result is significant at a 5% level.

Fourthly, the study shows that male students are more likely to attend online college classes than female students. As the study shows, the odds of attending online classes by male students is 1.5 times more than the odds of attending classes for female students. The marginal effect shows that if the student is male, the probability of attending the online college classes rises by about 8% (when the rest of the explanatory variables are at their mean values). The result is significant at a 1% level. This reveals the gender gap in the area of study in case of access to information and technology. Access to phones and the internet is not just an economic factor but also a social and cultural one. According to this survey, in most cases, particularly in rural areas, female students are not the primary users of android devices. Quite often, if one family has only one phone, there is a good chance that the wife or the daughter will be the last one to use it. Moreover, female students are usually much more involved in doing daily household activities than the male counterpart. As a result, the chance of attending the online college classes diminishes for a female student.

Fifthly, as the study portrays, the likelihood of attending the online college classes by the students rises with the rise in the family income of the students. As the study shows, the odds of attending online classes by students with higher monthly family income is 1.5 times more than the odds of attending classes for students with low monthly family income. The marginal effect shows that with the rise in monthly family income by one unit, the probability of attending the online college classes rises by about 8% (when the rest of the explanatory variables are at their mean values). The result is significant at a 10% level. The result is reasonable because students with higher family income can better afford to android devices and internet data plan than the poor. Thus it raises their chance to participate in the online classes.

Lastly, attendance in online college classes by the students also depends upon their area of residence. The paper has already mentioned a substantial digital divide in rural and urban areas in the nation. Students residing in rural and semi-urban areas suffer from a lack of mobile towers, low bandwidth, and inadequate income to purchase internet data. As the study shows, the odds of attending online classes by students residing in urban areas is 1.75 times more than the odds of attending classes for students who live in rural or semi-urban areas. The marginal effect shows that if the student lives in urban areas, the probability of attending the online college classes rises on average by about 11% (when the rest of the explanatory variables are at their mean values) than for those students who live in rural or semi-urban areas. The result is significant at a 1% level.

The students were asked to rank the problems they face in attending their online college classes by providing them a list of a few possible issues. Each student ranked those problems (factors) according to their own experiences. Finally, the overall ranking of those problems has been determined by the average Garret score, as shown in Table 8.

Table 8: Ranking of Problems Faced by the Students in Attending their Online College Classes by the Garret Ranking Method

Important Factors	Average Garret Score	Rank
Internet Connectivity and Technical Glitches	63.03	1
Costly Internet Data	61.05	2
Lack of Accessibility to Android devices and computers	58.13	3
Self Motivation	51.4	4
Lack of Technical Expertise and Preparedness	43.03	5
Health Hazards	37.65	6
Cyber security Issues	36.04	7

Source: Author's Calculation

Students revealed that internet connectivity and technical glitches are the most critical problem they face in attending online classes. The second most important problem is the purchase of costly internet data to participate in online classes. Lack of accessibility to android devices and computers are the third most crucial problem. The fourth most important problem that they have revealed is self-motivation in doing those classes. Online teaching requires students to be active learners. But, quite often, the students tend to lose focus during virtual lectures as there is a lack of face to face interaction with teachers and their peers.Lack of technical expertise and preparedness for this new normal mode of education is the fifth most crucial problem. According to the responses of the students, health hazards and cyber security issues are the next two vital issues in attending online classes.

Conclusion

This paper highlights some essential points regarding online teaching and learning, having significant policy relevance. Firstly, society is witnessing a rapidly changing landscape of teaching and learning due to technological innovations and a massive surge in e-learning materials and teaching apps recently. But students still believe that face-to-face interaction with the instructors, along with chalk and talk methods of teaching in a physical classroom promotes clarity in understanding lessons. So this paper proposes a blended learning model of teaching and learning for the future. Secondly, the paper recommends the capacity building of the teachers in terms of teachers' training programme to upgrade the skill and expertise of the teachers in taking online classes efficiently. Thirdly, the paper points out infrastructural upgradation of the academic institutions in developing the Learning Management System for better management of online classes. Lastly, this paper suggests the active role of the government to transfer cash directly to the account of the poor students such that they can afford to costly internet data. The government should also provide the necessary android devices to needy students, particularly in rural areas, to reduce the digital divide and encourage the telecommunication service providers to enhance their infrastructure in rural areas. But to conclude, one can quote George Couros, "Technology will not replace great teachers, but technology in the hands of great teachers can be transformational."

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