Digital Platform: Sustainable Teaching- Learning Approach During the COVID-19 Pandemic

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.907000224

Received: 03 July 2025; Accepted: 10 July 2025; Published: 08 August 2025

ABSTRACT

This study sought to estimate students' satisfaction with digital platform-mediated learning during the COVID-19 pandemic and explores the significant factors contributing to the level of satisfaction. Empirical evidence is drawn from a sample of 214 students at undergraduate and graduate levels in a few departments at Pabna Government Edward College, Bangladesh. Students are not fully satisfied with digital platform-mediated learning during this pandemic time. Empirically tested results suggest that students' age and residential location influence digital platform-mediated learning. Likewise, teachers' prompt feedback on assignments, direction of making assignments, asynchronous online academic discussion, timely assessment, and academic support are the significant contributors to popularizing learning through digital platforms. The facts and findings of our study add a new dimension and insights into understanding students' satisfaction during the COVID-19 pandemic that help design teaching and learning practices.

Keywords: Online technology, Massive open online course, pedagogical approach, Learning satisfaction, COVID-19.

INTRODUCTION

The COVID-19 (the illness caused by the Severe Acute Respiratory Syndrome Coronavirus-2 [SARS-COV-2]) began in an animal market in Wuhan, China, and quickly spread throughout the world (Shereen et al., 2020). Health Organization (WHO) pronounced the COVID-19 episode as a crisis on January 30, 2020. In a reaction to *flatten the curve* (expand intensive care capacity and slow down the speed of contagion), every government worldwide has authorized boundary closures, movement restrictions, and quarantines in the country due to the COVID-19 pandemic, which sparked fears of an impending crisis in the education sector (Hai-Jew, 2020). Social distancing, self-disconnection, and movement restrictions have prompted a reduction in students' movement across all educational institutions in the world. More than 770 million students are now being affected by school, college, and university closures (Guha, Karim, & Beni, 2020). Restriction of students' movement is responsible for developing home-schooling in the education sector. Empirical studies show that the impacts of home-schooling reinforce inequality in learning (Gasparini et al., 2011). The education sector of Bangladesh is not free from such circumstances.

Life and livelihood destructive COVID-19 is not only to hamper students' learning but also to disturb their daily lives in many ways, such as panic and mental trauma. Detach from classroom learning from mid-March 2020 in Bangladesh may lose their learning and reading habits. Besides, it may also affect their potential, awareness, competitiveness, and confidence to be future leaders, administrators, planners, and good citizens. In this viewpoint, the aggregate demand curve for learning shifts downward during the period of COVID-19 (see **Fig. 1** for more details). The COVID-19 pandemic develops materialized demand effects that cover uncertainty about the progress of the disease, uncertainty about classroom-mediated schooling, and those will disrupt learning in school, college, and university. As a consequence, the initial aggregate demand curve for learning shifts downward from AD^0 to AD^1, and the level of learning will reduce from Q to Q^*. Likewise, the lack of practice in classroom teaching may hamper teachers' teaching quality and interest. This tendency also forces the aggregate supply curve for teaching from AS^0 to AS^1 during the COVID-19 period and the level of teaching interest from Q to Q^*. The supply of teaching and demand for learning will be changed from Q to QQ^{**} when

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

both of the curves simultaneously change. Reduced learning and teaching interest during the COVID-19 period necessitates the use of digital platforms to improve this situation in Bangladesh.

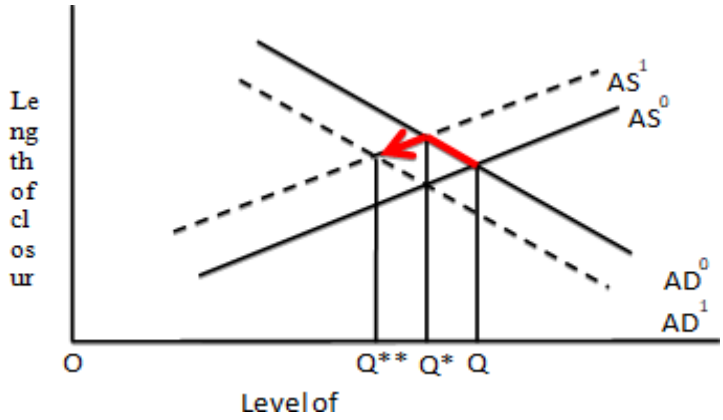

Fig. 1 Changes in aggregate demand for learning and supply for teaching curve

(**Source:** Prepared by the authors, 2021)

The advancement of the computerized stages, comprising of Zoom Cloud Meetings, Google Hangouts, Google Meeting, Skype for Business, Cisco WebEx Meetings, Blue Jeans, Slack, Big Blue Button, join.me, and Microsoft Teams Meeting, has brought about the rise of new sorts of scholarly types which enhance teachers' teaching capacity and students' learning capacity.

Despite the rapid growth of online-based learning and its critical contribution to academic progress, digital platform-assisted learning is still plagued by the online environment, asynchronous discussion, low levels of learning satisfaction, and the skill shortage of online-mediated teaching (Samadi et al., 2020). Currently, there has been growing awareness regarding the effectiveness of digital platform-mediated learning in the education sector during the COVID-19 pandemic

Recently, within the literature, there is widespread consensus regarding a range of impacts of COVID-19 on employment, poverty, trade and commerce, GDP, remittance, productivity, tourism and hospitality, aviation, and the stock market. While such factors are very significant in promoting an economy, there has been a growing acknowledgement regarding the effectiveness of digital platform-mediated learning during the COVID-19 pandemic. Though concepts related to learning satisfaction on digital platforms have been unexplored, evaluation of the viability of digital platforms in learning and learning satisfaction is profoundly needed for teachers, students, administrators, policymakers, and the government to implement, plan, and modify digital platform-mediated teaching and learning for a better academic atmosphere. Our study might be the primary endeavor to measure students' satisfaction with digital platforms during the COVID-19 period in Bangladesh.

Therefore, the motivation behind our study is to evaluate students' satisfaction with digital platform-mediated learning during the COVID-19 pandemic. The specific objectives of our study are to evaluate students' attitudes toward digital platform-mediated learning during the COVID-19 pandemic and identify the factors contributing to the level of students' satisfaction with digital platform-mediated learning in this period.

LITERATURE REVIEW

Online technology and digital platform-mediated learning

Beliefs and attitudes toward digital platform-mediated learning are the primary motivators for whether or not it will be adopted (Dellarocas, 2003). A purely digital platform-mediated learning atmosphere has the potential to be a dynamic learning environment and increase satisfaction (Siu, Inoue, & Tsujimoto, 2019). Students can enjoy and gain knowledge from such learning platforms in any situation, environment, or time (Chen, Cheng, & Chew,

2016). An early study by Chou and Liu (2005) revealed that digital platform-mediated learning had potentially greater positive consequences for better learning and satisfaction.

Digital platform-mediated learning gets more popularity during COVID-19 pandemic (Perrotta et al., 2021; Caldevilla-Domínguez, Barrientos-Báez, & Padilla-Castillo, 2021). Learners get more satisfaction from this learning platform because of its flexibility, ubiquity, and credibility (Tsai, Shen, & Chiang, 2020). Under this learning platform, they get more interaction, knowledge sharing, and feedback opportunities with their teachers, tutors, and classmates. Most students worldwide are now accustomed with digital platform-mediated learning during the COVID-19 pandemic (Zhang & Bray, 2020).

Online technology (a set of apps and software - Google Classroom, YouTube, Skype, Chat Room, Wikis, Dropbox, Wikis, Google Drive, WhatsApp, Zoom, and Microsoft Teams-essential for knowledge management and assessment of academic performance) is one of the principal components of digital platform-mediated learning (Iqbal et al., 2021; Iqbal, 2020a). Capacity, connectivity, accessibility, and availability of online technology can promote digital platform-mediated learning and learning satisfaction.

Teachers' support and students' satisfaction with digital platform-mediated learning

The teacher's role is active in the digital platform-mediated learning atmosphere (Perrotta et al., 2021). A teacher can provide assignment feedback, assignment direction, asynchronous online discussion and academic sessions, timely assessment, and other academic support such as referencing and citation techniques, conceptual framework development, and note-taking strategies (Gaytan & McEwen, 2007; Goggins & Xing, 2016; Khan, Wohn, & Ellison, 2014).

Interconnection of modern teaching and learning practice in digital platforms requires prompt and significant feedback from teachers (Yu, 2016; Dyke, Harding, & Liddon 2008). Similarly, proper assignment creation in digital platforms increased participation quality, note-taking capacity, and interaction attractiveness (Xie, Yu, & Bradshaw, 2014). The popular form of digital platform is synchronous or asynchronous online discussions (Wang & Woo, 2007). Asynchronous online academic discussions are suitable for students who are engaged in part-time work or household work because of their greater flexibility in terms of place and time (Sheail, 2018). Timely assessment and academic support are another part of digital platform-mediated learning. For example, timely assessment increases more attractiveness to the digital platform-mediated learning (Ozbal, Duman, & Topaloglu, 2020). Similarly, academic support through online technology is able to provide a diversified learning strategy for learners (Peters & Romero, 2019). In line with the above reasoning, the following hypotheses are proposed:

Hypothesis 1: Prompt feedback on assignments, direction of making assignments, asynchronous online academic discussion, timely assessment, and academic support are positively related to the students' satisfaction with digital platform-mediated learning.

Age, gender and residential location and students' satisfaction with digital platform-mediated learning

Learners' age, gender, and residential location are more sensitive to digital platform-mediated learning because of their interest, restricted access to the internet for female students, and availability of internet packages and services in rural areas (Islahi, 2019; Iqbal et al., 2021). For instance, new students are more serious about academic performance and grades, and they are more likely to actively participate in a digital platform-mediated learning atmosphere than older students (Ruthotto et al., 2020).

There is a stereotypical view about the relationship between digital platform-mediated learning and gender (Weinberg & Kapelne, 2018). Female students, on average, have lower online technology skills; they spend less time participating in digital platform-mediated learning activities and are more anxious about using online technology (Ollier-Malaterre, Jacobs, & Rothbard, 2019). Moreover, cultural and psychological factors may restrict female students' access to the internet and online technology on a broader scale in low income countries like Bangladesh (Khan & Awan, 2017).

Students from rural and remote areas in Bangladesh get fewer internet facilities because of scarcity of internet

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

services and packages; lack of networking coverage area of the internet; interrupted and lower speed of bandwidth; inability to purchase computers and smartphones; and power cut problems (Dutta & Smita, 2020; Iqbal et al., 2021; Farhana et al., 2020). Moreover, students from rural and remote areas are not familiar with handling relevant apps and software for digital platform-mediated learning properly compared to urban students. Collectively, these issues may be attributed to a larger sense of learning satisfaction with digital platforms. Based on the above reasoning, we proposed the following hypotheses:

Hypothesis 2: Age, gender, and residential location are negatively related to the students' satisfaction with digital platform-mediated learning.

THEORETICAL FRAMEWORK

A society can utilize an alternative option when it fails to satisfy optimum conditions with its traditional or existing options. From this point of view, Lipsey & Lancaster (1956) first formalized the theory of the second best in their article entitled "The General Theory of Second Best," following an earlier work by James E. Meade. The main focus of their theory is what happens when the optimum conditions or social welfare situations are not satisfied in a society.

Let there be some function of the *n* variables , which is to be maximized or minimized subject to a constraint on the variables This is a formalization of the choice situation in the analysis. Let the solution to this problem be the *n-1* condition then the following condition will be focused under the theory of the second best:

If there are additional constraints imposed of the type for *i=j*, then the minimum or maximum of *F* will be subject to both and the constraint will be such that none of the attainable by Paretian conditions , will be satisfied (see **Fig 2** more details).

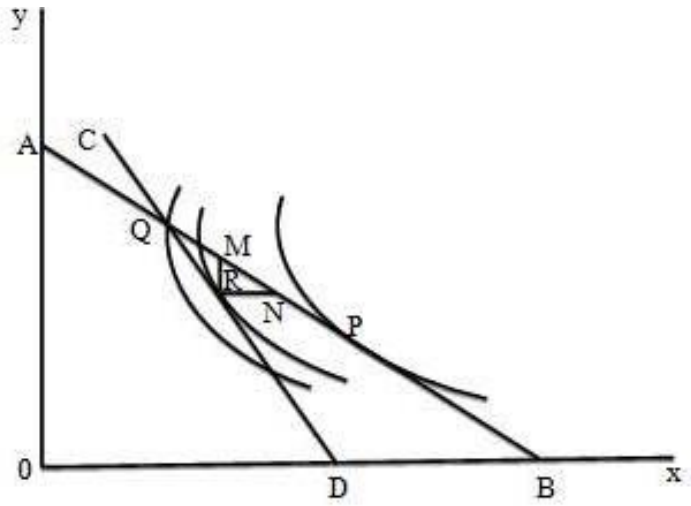

Fig. 2 Social welfare curve

(**Source:** Adapted from Lipsey & Lancaster, 1956)

Ox and *Oy* show the quantities of two goods, *x* and *y*. The linear line *AB* highlights a transformation function (to be considered as a boundary condition) and *CD* presents a constraint condition. In the absence of the *CD*, the optimum position will be some point, e.g., *p* takes a position on the transformation line at the point of its tangency with one of the contours of the welfare function. The constraint condition must be satisfied only if points *CD* can be preferred, and the optimum point *P* is no longer attainable. A point on the transformation line (*Q*) is still attainable. If the welfare contours and the constraint line are located in the diagram, then the second best point will be at the point R, inside the transformation line.

Lipsey and Lancaster's results have important implications not only for trade policy and public finance but also for digital-mediated teaching and learning practices during the COVID-19 situation, because classroom-based teaching and learning practices fail to establish a desirable academic atmosphere in such a situation.

METHODOLOGY

Ethical consideration

The study was approved in line with guidelines from the ethical committee of Government Edward College, Pabna. The respondents were assured that their participation was voluntary, their responses would be handled confidentially, and they could withdraw themselves from the survey at any time. This form also presented the details about the collection of data and offered a range of concepts and ideas in which consent was sought, and every respondent was requested to provide support, information, and data. Oral informed consent was obtained from all the respondents after the survey objectives and procedures were explained. They were also assured that they were not identifiable in any resulting presentations or publications that arose from the study. This study assigned a unique ID code to each respondent's data and separated personal identification information from the response data to maintain the data's high confidentiality and protect the respondents' anonymity. All sets of data were password protected and saved in different places.

Participants and study design

Our study sought to examine the proposed relationship between students' satisfaction and digital platform-mediated online learning. In recent times, digital platforms have worked as a catalyst to coordinate students' satisfaction and online learning. Students' satisfaction is defined as *students' subjective assessment of their performance and experiences in the learning environment* (Elliott & Shin, 2002). Similarly, *use of online technologies through the internet provides a larger array of solutions to students and learners for knowledge acquisition and management and academic performance and is known as digital platform-mediated learning* (Greenhow & Askari, 2017). Data for this study came from undergraduate and graduate students in a few departments of Pabna Government Edward College, Bangladesh in the months of October 17 November 22, 2020. With the assistance of a few teachers and using the chain's electronic mail service, semi-structured and close-ended questionnaire packages were distributed to a total of 177 students across the four participating departments (such as the Department of Economics, Department of Sociology, Department of Political Science, and Department of Bangla) of this college. These departments frequently conduct academic sessions through Zoom and other convenient online technologies. Students from these departments are requested to send back their completed online questionnaire within the next two months. Regular fortnightly e-mails were also sent out to participant students to remind them of the questionnaire. For proper understanding, the questionnaire was constructed in the local language, Bangla. A total of 114 usable responses were obtained, covering an overall response rate of 64.40%, where 46.69% were female respondents and the rest 53.31% were male respondents. The average value of satisfaction is 10.17 (standard deviation = 2.09) which indicates that a majority of respondents are not fully satisfied with digital platform-mediated learning during the COVID-19 pandemic. All respondents have an average age of approximately 19.1 years (standard deviation = 4.29). About 67.93% of respondents were covered at the undergraduate level and the rest, 32.07%, were covered at the graduate level. Approximately 83.68% of respondents were from urban areas, while only 16.32% of respondents were from rural areas. The collected data is compiled, coded, and analyzed in the Statistical Package for Social Science (SPSS: version 24) accordingly based on our research objectives.

Measures

The proposed questionnaire has two sections. The first section covered the respondents' age, gender, and residential location. The second section highlighted respondents' ongoing experience in a digital platform-mediated online learning environment during the COVID-19 pandemic. The attributes such as prompt feedback on assignment, direction of making assignment, asynchronous online academic discussion, timely assessment, and other academic supports (such as citation and referencing technique, access to bibliographic database and e-library, information dissemination about internship and summer course, and others) were selected from Gaytan and McEwen (2007), Goggins and Xing (2016), and Khan, Wohn, and Ellison (2014).

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

The variables of age, gender, and status of residential location of all respondents are considered explanatory variables. Empirical studies suggest that such explanatory variables are influential contributors to adopting digital platform-mediated learning (Iqbal et al., 2021; Herrera et al., 2021). Age is counted by number of years. Respondents are asked their gender (Male = 1 and Female = 0), and residential location (Urban = 1 and Rural = 0). Our explanatory attributes are measured on a 4-point Likert scale for every attribute. The lowest number, 1, expresses strong disagreement, while the highest number, 4, expresses strong agreement. Examples of a few attributes are expressed as "*I think that prompt feedback on assessment is essential for satisfaction with digital platform-mediated learning*" and "*I am fully satisfied with digital platform-mediated learning during the COVID-19 pandemic*". Finally, the outcome variable (e.g., students' satisfaction with digital platform-mediated learning) for each respondent is figured out by the sum of all the points associated with our five attributes, ranging from 5 to 10 (1 5 to 2 5) for dissatisfaction and 15 to 20 (3 5 to 4 5) for satisfaction. The summation of all possible high scores (4) can generate a total of 20 (4 5). On the contrary, the summation of all possible low scores (1) can generate a total of 5 (1 5). However, values from 11 to 14 indicate the ambivalent or indifferent zone and accommodate any score in this range. Score 5 to 10 indicate the dissatisfaction level, and score 15 to 20 indicate the satisfaction level with digital platform-mediated learning during the COVID-19 period. The Cronbach alpha is calculated at 0.83 for all the attributes of our online survey. The calculated value of Cronbach alpha indicates that all of our attributes are reliable and consistent.

RESULTS

Table 1 below outlines the findings based on the descriptive statistics and bivariate correlation. Pearson's correlation is applied to measure the relationship between the main variables of our study.

Table 1 Descriptive statistics and correlation matrix of major items

Variable/Attribute Mean SD 1 2 3 4 5 6 7	Mean	Mean	SD	1	2	3	4	5	6	7
1. satisfaction		10.17	2.09	1						
2. age		19.01	4.29	0.46*	1.00*					
3. feedback		2.78	1.36	0.62**	0.09*	1				
4. direction for assig.		2.53	0.41	0.37*	0.17**	0.07	1			
5. asynchronous sess		2.98	0.49	0.37*	0.25**	0.09	0.19	1		
6. timely assessment		1.07	0.14	0.21**	0.03*	0.33**	0.07	0.43*	1	
7. academic support		2.59	0.16	0.16*	0.29	0.03	0.29	0.18	0.38**	1

** $p < 0.05$ level (1-tailed), *$p < 0.01$ level (1-tailed)

The findings indicate that age is significantly correlated with all the attributes. However, age is insignificantly correlated with the academic support that is expected as older students are less likely to expect lower academic support from their respective teachers. All of our proposed attributes are also significantly correlated with the students' satisfaction with digital platform-mediated online learning.

Hypothesis testing

We used hierarchical multiple regression for empirical assessment of the effects of our proposed variables and attributes on students' satisfaction with digital platform-mediated learning. We run two regression models, such as a basis model formed by only attributes and an extended model consisting of our proposed attributes and respondents' age and residential location at 1%, 5%, and 10% levels of significance. Both of our models are

satisfied with passing a few diagnostic tests. For instance, our regression model is not affected by multicollinearity because all of our estimated predictors in the correlation matrix in Table 1 are less than 0.80. We also measured the variance inflation factor (VIF) and tolerance statistics for further investigation of multicollinearity detection in our models. All estimated values of VIF lie below the cutoff of 10 as recommended by Field (2013) and tolerance statistics take the position of 0.30 to 0.90 larger than the 0.20 recommended cutoff.

As shown in **Table 2**, most of the attributes fail to predict significantly in the basic model. To overcome this problem, we run the extended model where the attributes and respondents' characteristics are entered.

Table 2 Regression models

Variable/Attribute	Basic model			Extended model		
	β	T	Sig	β	t	Sig
constant	0.239	0.013	0	0.159	0.047	0
feedback	0.032	0.153	ns	0.089	0.275	0
direction for assig	0.203	0.462	ns	0.137	0.093	0.102
asynchronous discussion	0.019	0.015	0	0.143	0.074	0.034
timely assessment	0.07	0.029	ns	0.226	0.056	0.101
academic support	0.175	0.198	ns	0.078	0.224	0.002
age				-0.037	0.272	0
gender				0.003	0.423	ns
residential location				-0.056	0.139	0.067
Observation (n)	114			114		
Goodness of fit (R^2)	0.274			0.423		
Log-likelihood	-401.459			-388.074		

Note. ns stands for not significant.

As shown in Table 2, asynchronous academic online discussion in both models is found to have significantly predicted satisfaction (the basic model and for the extended model) with digital platform-mediated learning. Estimated parameters of asynchronous academic online discussion in both models support the statements under hypothesis 1. Likewise, other attributes and variables in the basic model are found to be insignificant, but in the extended model they are found to have significantly predicted learning satisfaction because of their inclusion and interaction with students' characteristics such as age, gender, and residential location. Estimated parameters of attributes and variables in the extended model support the statements under all of our hypothesis except gender. Under this ground, it is possible to say that our proposed attributes and variables of age and residential location have significant effects on satisfaction with digital platform-mediated learning during the COVID-19 pandemic. In contrast to theoretical expectations, gender has not been found to have a significant relationship with digital platform-mediated learning ( ). Hence, the relationship between gender and satisfaction with digital platform-mediated learning is not supported by our hypothesis 2. The estimated values of the log-likelihood test suggest that all the variables and attributes are accepted. It is possible to estimate the overall explanatory power

or goodness of fit by using *R*-square (Iqbal, 2020b). A*ccording to Bennett and Blamey (2001), R-squared statistics between 0.20 and 0.40 are considered adequate.* The estimated values of *R*-squared of the our basic and extended regression models are 0.274 and 0.423, respectively, which maintain an adequate level of goodness of fit. These values imply that 27% and 42% of the total variation of the outcome attribute of the basic and extended models can be explained by the variety of attributes and variables of the regression models.

DISCUSSION

Students' satisfaction has long been treated as a principal catalyst for ensuring quality and desirable digital platform-mediated learning. Certain attributes of digital platform-mediated learning may be of critical importance to the success of teaching and learning practices during the COVID-19 pandemic, and the techniques through which such attributes are developed ought to be explored. Our study seeks to address deepening understanding regarding students' satisfaction with digital platform-mediated learning during the COVID-19 pandemic. In particular, the notion of satisfaction with digital platform-mediated learning gives a way of significantly understanding the emergence of such attributes. Furthermore, students' age and residential location may also be examined because they are influential determinants of satisfaction with digital platform-mediated learning. Consequently, the facts and findings of our study contribute to the literature about students' learning satisfaction with technology-aided teaching and effective commitment in a few important ways.

Firstly, our findings support the results of existing literature focusing on the effects of digital platform-mediated learning on students' satisfaction during the COVID-19 pandemic (Caldevilla-Domínguez, Barrientos-Báez, & Padilla-Castillo, 2021). Our findings also reaffirm research on the massive open online course (MOOC), and sustainable lifelong learning (Gao, Luo, & Zhang 2012; Tadeusiewicz & Dobrowolski, 2011). In the event of difficulties and absence of classroom learning, digital platform-mediated learning will be a substitute for classroom learning because 'it is closer than everybody thought' (Qandil & Abdel-Halim, 2020, p. 301). Students' interest and satisfaction will be increased by prompt feedback on assignments, direction of making assignment, asynchronous academic online discussion, timely assessment, and meeting other academic requirements perfectly under the provision of digital platform-mediated learning. These findings are also consistent with previous researches. Our proposed attributes of the extended model confirm that the sign, magnitude, and significance levels are robust. Our estimated result also confirms the findings of previous empirical studies (Gray & DiLoreto 2016, Bolliger, 2004; AlJeraisy et al. 2015; Stewart & Suldo, 2011; Best & Conceicao, 2017). Collectively, the abovementioned attributes in digital platform-mediated learning ensure an effective plan for digital-mediated teaching and learning practices.

Secondly, students' age and residential location are found to be important components of digital platform-mediated learning. Both of these are negatively related to satisfaction with digital mediated learning. Older students at the graduate level always prefer to engage themselves with the job-related books rather than participate in any mode of academic discussion in Bangladesh. Similarly, students in rural and remote areas benefit less from digital platform-mediated learning during this pandemic situation due to insufficient internet coverage, poverty, and a scarcity of high-quality internet service. This result confirms the findings of previous studies (Rahiem, 2021; Sarrett, 2018) and is consistent with the self-reported reasons described by the respondents.

CONCLUSION

The current practice of online-based teaching does not bring about a new learning culture in a pedagogical setting during the COVID-19 period (Thomas & Bryson, 2021). Students' satisfaction is essential to establishing a new pedagogical setting during this period. It can be established by considering empirically tasted attributes and students' characteristics. Students' satisfaction with proper digital platform-mediated learning can develop students' motivation and, therefore, students' success and completion rates (Bolliger & Wasilik, 2009). Students' age and residential location are the influential factors of digital platform-mediated learning. Likewise, teachers' prompt feedback on assignments, direction of making assignments, asynchronous online academic discussion, timely assessment, and academic support are the significant contributors to popularizing learning through digital platforms during the COVID-19 pandemic. This study provides some further steps into the relationship of learning preferences to performance for students' satisfaction with digital platform-mediated learning. This

feature is rather rare in existing literature, which brings a unique insight into the literature.

Despite the proper and careful design and investigation, our study is not free of certain lacunas that further demand for further research in this field. Students' satisfaction is a psychological matter, but the quantitative issues of our study are not perfectly captured related to students' satisfaction with digital platform-mediated learning. The small number of respondents from a particular institution is another shortcoming of our study. Thus, our study recommends further study to avoid such limitations and get a better empirical assessment-based digital platform-mediated teaching and learning atmosphere.

Disclosure statements

The Author declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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