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EFFECTIVENESS OF ONLINE LEARNING PLATFORMS IN ENHANCING STUDENT ENGAGEMENT AND ACADEMIC PERFORMANCE: A STUDY OF PUNJAB REGION

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ABSTRACT

This paper explores the prospects of online learning platforms in enhancing student engagement and learning performance for higher education students in Punjab, India. Applying a quantitative, cross-sectional study design on 302 learners, the paper uses correlation, regression and mediation to investigate the relationships between platform use with engagement and performance. Findings also reveal positive platform-use relationships with engagement and engagement with academic performance. Mediation analysis supports the mediating role of student engagement in online platform usage and academic performance. These results highlight the importance of engagement as a means through which digital platforms enhance learning. The findings provide regional perspectives with potential relevance for educators and policymakers to help improve online education practices in areas such as digital literacy and infrastructure.

Keywords: Online learning platforms; Student engagement; Academic performance; Mediation analysis; Punjab

1. INTRODUCTION

The rapid development of information and communication technologies (ICT) has changed the face of education around the world, with a shift from traditional classroom-based teaching to a technology-enhanced learning environment (Anderson, 2008). E-learning systems or online learning platforms are increasingly becoming ubiquitous in higher education to support the distribution of educational resources, promote interaction and increase access (Means et al., 2013). Integration of platforms, including Google Classroom, Zoom, Microsoft Teams, and Moodle, has particularly taken root in universities and colleges for a flexible and interactive learning experience (Kebritchi et al., 2017).

Student engagement, the degree to which students are attentive, interested, and participate in their learning process, has been identified as one of the primary contributors to academic achievement (Fredricks et al., 2004). As the use of online applications has become more widespread, understanding their impact on engagement has become of increased importance. It is believed that well-constructed online learning environments increase active involvement, peer-to-peer interaction, and self-directed learning, which in turn leads to higher levels of engagement when compared with traditional forms of instruction (Dixson, 2015; Martin & Bolliger, 2018). In higher education, the extent to which learners engage with their studies has important implications, not just for students' learning achievement but also for the sustainability of what they have learned and used in practice (Trowler, 2010).

In addition, academic performance as reflected by grades, examination performances and overall learning outcomes has been positively correlated with efficient use of digital learning platforms (Al-rahmi et al., 2015). Students are provided with various learning resources, instant feedback and team-based learning that have been proven to increase understanding and improve students' performance (Broadbent & Poon, 2015). Online learning provides

students with a sense of flexibility and satisfaction, as they can balance academic responsibilities alongside personal and professional obligations (Bower, 2019). However, it is not without challenges, most notably technological obstacles, a lack of digital skills and a lack of knowledge to use such platforms effectively (Hung et al., 2010; Sun & Chen, 2016).

In India, the significance of e-learning has increased considerably in the last few years owing to better digital infrastructure and ICT-driven educational reforms (Kumar Basak et al., 2018). Punjab, as a province, has witnessed an upsurge in student enrolment and digital media usage in higher education, making it an interesting geographical location to examine the effects of online learning platforms on students' learning attitudes and academic achievement. Although there is a rich body of international literature on the benefits of online learning, empirical studies within this regional context in India remain scarce. Closing this gap is important in designing context-appropriate policies for uplifting online education in higher educational institutions.

Thus, there is some study that needs to be done on the effect of online learning platforms on student engagement and academic performance in the context of Punjab. Through correlation and regression analysis of 302 student records from a survey, the paper aims to offer empirical knowledge on how platform usage predicts student engagement as well as academic performance, with guidelines suggesting this may help enhancing the strategies in online learning in Asia.

2. REVIEW OF LITERATURE

The theoretical basis of the effectiveness of online learning is grounded in numerous learning and behavioural theories around how digital spaces can improve educational results. According to constructivist learning theory, learners create knowledge through active involvement with the content being learned and through dialogue, both of which can occur by interacting with online instructional materials and other students in discussion forums using multimedia tools and real-time collaboration (Vygotsky, 1978; Anderson, 2008). According to Self-Determination Theory, student motivation is enhanced when learners feel autonomous (i.e., having a sense of control), competent, and connected to others—characteristics that may be developed within well-designed online learning facilities (Deci & Ryan, 2000). The TAM model (Technology Acceptance Model) can also be applied in this research to explain that the degree of public college administrators' acceptance and use of the system, considering their beliefs about whether using a particular online platform will increase his/her job performance, has an impact on intention to adopt it (Davis, 1989). Both these theoretical frameworks combine to emphasize that the design and take-up of online learning platforms impact not only engagement, but also student learning outcomes and academic achievement.

Recent literature is capturing the importance of online learning platforms for influencing student engagement and achievement, particularly considering the heightened dependence on digital education that resulted from the global COVID-19 pandemic. Almaiah, Al-Khasawneh and Althunibat (2020) investigated certain barriers with respect to e-learning adoption in higher education, the results of which showed that institutional readiness, system quality and user satisfaction are the vital factors that affected engagement as well as learning performance. Recently, Adedoyin and Soykan (2020) maintained that although online platforms were able to achieve access, they have been limited by issues such as digital divide, lack of technical skills and less interactivity in improving the academic performance of students during the pandemic. Previously, Martin, Sun and Westine (2019) studied online engagement strategies and found that producing prompt feedback from instructors along with interactive course designs increased participation and academic performance. Bower (2019)

also highlighted that technology-supported learning increases cooperation and students' satisfaction, which in turn translates into greater academic performance when compared with traditional teaching strategies. Consistently, Broadbent and Poon (2015) observed improved grade performance for learners with the use of self-regulated learning in online contexts, as engagement significantly predicts success in digital education.

Other empirical research also confirms these results. The Online Student Engagement Scale (OSE) was designed by Dixson (2015), who found that the perception of interacting with instructors and peers in an online classroom positively connected to students' engagement and academic performance. Al-Rahmi, Othman and Yusuf (2015) found a positive relationship between the computer-mediated collaboration of students in Malaysian universities with cooperative learning, knowledge attainment, and academic integration. In terms of learners' preparedness, students' competence and self-efficacy in using digital technology significantly determine their involvement as well as motivation and performance (Hung et al., 2010).

In their investigation, Kumar Basak, Wotto, and Bélanger (2018) revealed that in an Indian context, e-learning and m-learning offer students the flexibility of time, access to material, emphasized by high-stakes assessments, resulting in improved performance. This is consistent also with international studies, such as Means et al. (2013), who performed a meta-analysis on online learning studies and found that students who are engaged in both online and blended learning environments fared slightly better than students in the face-to-face traditional setting. In sum, these studies suggest that when online learning systems are well-designed, they can positively affect student engagement and academic performance, though issues concerning digital literacy, bandwidth availability and instructional design quality still need to be addressed.

3. RESEARCH GAP AND OBJECTIVES OF THE STUDY

Although online learning platforms are being quickly embraced in higher education globally, particularly post-COVID-19 pandemic, there exists limited empirical evidence on how these learning platforms shape student engagement and academic performance in the developing world context like Punjab, India. The earlier research has tended to address technology adoption and access (Hung et al., 2010; Broadbent & Poon, 2015) or the immediate transition to online teaching for crisis adaptation (Adedoyin & Soykan, 2020; Almaiah et al., 2020), but few have systematically examined how platform usage relates to engagement and performance outcomes.

Also, most of the literature is heavily focused on Western organizational settings (Martin et al., 2019; Bower, 2019) and Indian studies that have been conducted (Kumar Basak et al., 2018) stress ease of use and flexibility as opposed to a demonstration of actual learning gains. There is also a methodological void, owing to the sparse use of statistical models (correlation, regression and mediation analysis) to estimate the strength and predictive level of these relationships.

Therefore, we aim with this study to fill these gaps by empirically testing whether the use of online learning platforms increases student engagement and subsequently academic performance in Punjab, as well as testing for the mediation of engagement. The main objectives of the study are:

- To examine the relationship between the use of online learning platforms and student engagement among higher education students in the Punjab region.

- To analyze the relationship between student engagement and academic performance of students using online learning platforms in the Punjab region.
- To assess the impact of online learning platform usage on students' academic performance, with student engagement as a mediating variable.

4. RESEARCH METHODOLOGY

The current research was conducted using a quantitative, cross-sectional research design to investigate the association of the use of a learning management system and student engagement with academic achievement in higher education students from Punjab. The sample comprised 302 participants, statistically appropriate for correlation, regression and mediation analysis; dimensioned by an approach like Cochran's formula with a confidence level of 95% and satisfied the rule of thumb in regression for having at least 10–15 observations per predictor, hence allowing enough statistical power and reliability. The study had strata based on type of institution -public/private, level of course offered undergraduate/postgraduate and location–urban/rural, covering major education hubs, i.e. Ludhiana, Amritsar, Jalandhar, Patiala, Mohali, Bathinda and other districts in Punjab. The data was collected using a questionnaire, which was distributed both offline and online; however, only students who were currently studying in the recognized higher education institutions and had experience with online learning platforms were included. Questions were asked about the use of the platform, and engagement and performance were examined through reliability using Cronbach's alpha. Descriptive statistics were performed first to present the descriptive information of demographics. Pearson correlations were used to analyze associations, simple and multiple regression were implemented as methods of testing predictive relationships, and mediation regression was utilized to assess the mediating effect of engagement in the link between platform use and academic achievement. Observing professional and institutional ethical standards respecting informed consent, anonymity, and voluntary participation promoted the academic and institutional integrity for which this survey was intended.

5. DATA ANALYSIS & INTERPRETATION

The demographics profile shows that it is only with an equal proportion of males (49.0%) and females (51.0%), more students aged 18-20 years old made up most of the sampled population (47.4%) and consisted of more undergraduates than postgraduates (Undergraduates=61.6%; Postgraduates=38.4%). Further diversity and representativity among students are ensured, as public (43.7 %) and private schools (56.3%), urban 57.6%) and rural 42.4%) settings are represented in the sample. This spread also contributes to the generalizability of the research proposal across different groups of learners and has important implications for the customization of online learning strategies in diverse gender, academic, institutional and geographical environments.

Table 1: Demographic Profile of Respondents (N = 302)

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	148	49.0
	Female	154	51.0

Demographic Variable	Category	Frequency (n)	Percentage (%)
Age Group	18–20 years	143	47.4
	21–23 years	85	28.1
	24–26 years	57	18.9
	26 years & above	17	5.6
Course Level	Undergraduate	186	61.6
	Postgraduate	116	38.4
Institution Type	Public Institution	132	43.7
	Private Institution	170	56.3
Location	Urban	174	57.6
	Rural	128	42.4

For Objective 1 (Table 1), the results reveal a robust, significant correlation between digital platforms use and student engagement ($r = .62$, $p < .001$). This indicates that the students present in the Punjab provinces are more motivated when they are engaged on online learning platforms on a regular basis, and teachers should use these technologies meaningfully to add stimuli for their learning. In a practical sense, what this means is that when students are actively engaging with digital tools to access learning resources/discussions and collaborate, not only do their attention, curiosity and engagement in academic activities increase. Such findings emphasize the importance of well-organized online platforms in enhancing engagement that can enhance the effectiveness of digital education in promoting students' involvement.

Table 2: Correlation between Online Platform Usage and Student Engagement

Variables	Mean	SD	r	p
Online Platform Usage	3.72	0.68	.62**	<.001
Student Engagement	3.85	0.71	—	—

Note. $p < .01$ (two-tailed).

Results of Objective 2, as shown in Table 2, indicate that student engagement is a robust and significant predictor of the academic performance of the students who use online learning platforms. The regression results reveal that engagement has a positive effect on performance ($\beta = .64$, $t = 13.40$, $p < .001$), accounting for 41% of the variance in school results ($R^2 = .41$).

That is, students with a higher level of attention and participation in online activities tend to receive better grades. These results highlight the importance of engagement as a primary mechanism for predicting learning success in digital courseware.

Table 3: Regression Results Predicting Academic Performance from Student Engagement

Predictor	**B**	**SE**	**β**	**t**	**p**
Student Engagement	**0.67**	**0.05**	**.64**	**13.40**	**<.001**

Model Summary: $R^2 = .41$, $F (1, 300) = 179.6$, $p < .001$

The findings of Objective 3 show that student engagement is a significant mediator between the use of online platforms and academic performance. The overall degree to which use of the platform affected performance was large and positive (β =.59, p < .001). When engagement was included as a mediator, the direct effect of platform usage on performance became attenuated but still significant (β = 0.28, p <. 01) and the indirect effect of meaning in life through engagement was also significant (β = 0.31, 95% CI [0.21, 0.44]). Because the confidence intervals does not include 0, mediation is supported. This suggests that the direct use of web tools is positively related to academic achievement, and much of this impact takes place through increasing students' engagement level. Therefore, engagement is an important mediator between platform use and enhanced learning outcomes.

Table 4: Mediation Analysis of Student Engagement between Online Platform Usage and Academic Performance

Pathway	**Effect**	**SE**	**95% CI (LL, UL)**
Total Effect (Platform → Performance)	0.59	0.07	0.45, 0.73
Direct Effect (Platform → Performance)	0.28	0.08	0.12, 0.44
Indirect Effect (via Engagement)	0.31	0.06	0.21, 0.44

Note. **Bootstrapped 95% confidence intervals (CI) do not include zero, confirming significant mediation.**

6. DISCUSSION AND IMPLICATIONS

The findings of the study would provide strong theoretical and practical evidence regarding the role of online learning platforms in promoting students' engagement and academic performance at the higher education level in Punjab. Reflecting related studies (Lamarca et al. 2019), the data have implications for online designs when appropriately applied and employed, which enhance engagement and even learning outcomes.

Firstly, there is a strong positive relationship between the use of mediums such as moodle, google classroom and microsoft teams and student engagement. Students who participate in these platforms demonstrate higher levels of engagement and participation with their studies. This is in line with constructivist and self-determination theories that reiterate that interaction, autonomy, task relevance and cooperation are the moving mechanisms of one's engagement within digital learning environments.

Second, the regression results suggest that student engagement is a significant predictor of academic performance, explaining 41% of the variance. This contributes to the need to encourage attention, engagement and involvement by students, who are more attentive tend to be also more successful in their academic work. These results parallel international research on engagement as a key learning success factor (Trowler, 2010; Bower, 2019).

Mediation analysis shows that student engagement partly explains the relationship between using the platform and academic achievement. In other words, platforms that only provide the technical tools for learning without encouraging students to actively take responsibility and participate in their own learning are less effective. Student involvement is crucial for meaningful learning outcomes.

From educator and institutional perspectives, this result indicates the necessity to establish e-learning spaces in which students are not "stuck" with passive content but instead become actively involved. Techniques like active participation, instant feedback delivery, implementing game elements, and teamwork can contribute to improving engagement. At the policy level, regional interventions in Punjab should similarly strive to promote digital equity and invest a great deal in infrastructure and training teachers and students (particularly those based in rural areas) with access to digital literacy. That way, we can make better use of the capacity of online platforms and provide equitable access to learning for everyone.

7. CONCLUSION & SCOPE FOR FUTURE RESEARCH

In sum, the present study underscores how online teaching environments can facilitate active learning and increase academic performance, with student engagement playing a central role in such process. As it gets the views of a variety of students in Punjab, the study offers an important perspective on how digital education is influencing learning experiences in the region. But the role of technology in education is not just about having an online platform. Real learning is achieved by offering students relevant ways to get involved, learn from others, and explore on their own. Future studies could also investigate the endurance and decay of online learning's effects, compare blended learning with fully online courses, or examine how teachers' preparedness to support students in creating new understandings influences the outcome of digital learning at the university level. As with any study, the present research has limitations. A limitation of the cross-sectional approach is that it limits causality, and future research should investigate the development over time in online platform usage, engagement, and academic performance. While the sample is representative of a wide range of higher education institutions within Punjab, it may exclude smaller or specialized colleges and therefore limit generalizability. Moreover, self-reported information, particularly for academic achievement, can be subject to bias (and future work should consider the use of institutional records) and not only be extended to other areas, mixed methods could be used as a study method for a richer understanding in the future, and teaching readiness, quality of instruction design and structure, and technological infrastructure can also be approached as moderators. Comparisons of blended with full digital tuition will also help to better understand and inform policy for delivering effective digital education.

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