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Learner Perception on Blended Learning: Moderating Role of Technology

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Abstract

This study explores the impact of blended learning (BL) on academic performance and literacy skills among university students in Nepal, emphasizing the moderating role of technology access and digital proficiency. Anchored in the Community of Inquiry (COI) framework, the research examines how cognitive, social, and teaching presences enhance learning outcomes in digitally enabled environments. A pre-post quantitative design was employed over a 15-week semester involving 54 students from various academic years and disciplines. Data were collected via structured surveys and institutional grade records, measuring reading comprehension, writing fluency, and BL perceptions. Statistical analyses -- including paired t-tests, ANOVA, correlation, and regression -- showed that BL significantly improved literacy skills and academic achievement ($p < 0.001$). Strong positive correlations were found between students' perceptions of BL and both academic performance and literacy development ($r > 0.99$). Technology access and digital readiness were significant predictors of favorable BL experiences. Third-year students demonstrated the greatest improvements, highlighting the role of cumulative digital exposure. Despite promising results, limitations such as a small sample size, self-reported data, and context specificity constrain generalizability. The study underscores the need for robust digital infrastructure, inclusive policies, and capacity-building initiatives in higher education. It advocates for the strategic implementation of blended learning to bridge educational inequities and improve learning outcomes in resource-constrained settings.

Keywords: blended learning; academic performance; literacy skills; digital proficiency; technology access, community of inquiry

Introduction

Over the past decade, blended learning has gained increasing prominence both globally and in Nepal, driven by a range of institutional, technological, and policy advancements. Internationally the key organizations such as the Organization for Economic Co-operation and Development (OECD), World Bank, Asian Development Bank (ADB) and UNESCO have taken parts in setting the education plan. In the year 2015, UNESCO pointed out the value of learning and bringing together of information and communication technologies (ICT) to help the access to quality education. Since that time UNESCO has helped with the efforts. UNESCO pushes resources (OERs) and supports the inclusion. UNESCO offers the teacher training programs that match the goals of Sustainable Development Goal 4 (UNESCO, 2021).

World Bank emphasizes evidence-based reforms to raise learning results. The World Bank uses the Systems Approach for Better Education Results (SABER) and the Education Strategy 2020 as tools for those reforms (World Bank, 2011). Similarly, the Asian Development Bank supports digital learning projects such as MathCloud initiative, in Bhutan a project that uses technology to improve teaching methods (ADB, 2017).

Blended learning grows in Nepal after the Ministry of Education Science and Technology (MoEST) introduced the ICT in Education Master Plan (2013-2017). The Digital Nepal Framework (Government of Nepal, 2019) further pushed learning and aimed to bring people into Massive Open Online Courses (MOOCs), archived educational content into classrooms, and e-learning platforms into use. School Education Sector Plan 2022-2032 moves toward technology-based education by adding literacy and mixed teaching methods (MoEST, 2022). In the education sector the University Grants Commission runs major projects such as Higher Education Reforms Project (HERP) and the Nepal Higher Education Equity Project (NHEEP), both the projects get support from the World Bank. These projects improve facilities and school quality. UGC introduced official Blended Learning Guidelines (UGC Nepal, 2021) that guidelines set up the push instructional approaches. The COVID-19 pandemic caused a growth of digital learning environments. This pandemic made educational institutions across Nepal increase their use of Learning Management Systems (LMS) and other e-learning tools to keep teaching and ongoing learning at that time. Rural communities now have access to technology due to community-based innovations such as OLE Nepals E-Paath and E-Pustakalaya and the National Innovation Centers smart classroom programs bring technology to communities (OLE Nepal, 2023; National Innovation Center, 2025). The growth in technology reflects ten years of planned investment in learning. The blended learning program aims to close gaps and to update Nepal's system.

Nepal's higher education system supports a broad population, ranging from bachelor's degree to doctoral levels; however, severe problems impede quality learning. Limited infrastructure, rural-urban inequities, and resource constraints frequently block access to quality education, particularly in distant places (Joshi & Khatiwada, 2024).The government's National Education Policy (2019) and the Digital Nepal Framework (2019) emphasize digitalization and blended learning (BL) as strategic responses to these barriers (Government of Nepal, 2019; Ministry of Education, 2019). The technology gap still affects how students learn. Some struggle with slow internet, not enough devices, or just not knowing how to use digital tools well (UNESCO, 2021; World Health Organization, 2020). Blended learning -- a combination of online and in-person instruction --attempts to address that. Things become more structured and interactive with platforms like Moodle or MS Teams. They lump everything in one spot: the readings, videos, quizzes, lecture slides. Students have access to these resources at any time, and also get multiple opportunities to participate. Discussion boards, assignment portals and instant feedback keep students involved and push them to think more deeply about what they're learning. With regular use, these tools enable students to improve their writing skills, comprehend the text they read and increase comfort with digital academic work (Mid-West University, 2020). But let's be real, if participants don't have the right tech or the skills, those benefits can be elusive at best and in that scenario the digital divide continues to loom large (UGC Nepal, 2021).

However, blended learning in Nepal is juddering to a halt, despite the investment in digital tools. A lot of students in rural areas simply don't have reliable internet or digital devices (Asian Development Bank, 2020; The World Bank, 2021). In addition, a huge number of teachers and learners continue to grapple with the challenges of digital literacy (UNDP, 2021; UGC Nepal, 2021). Old-school teaching methods also dominate, so tech-savvy, interactive lessons have yet to gain a firm foothold (European Union, 2022). No

one knows for sure exactly how this new technology is altering things on the ground for students - there just isn't much research into its real effects in Nepal (Pokhrel & Chhetri, 2021). This investigation intends to find out if and how blended learning heightens college students' academic performance and literacy abilities, particularly as weighted by their availability to, and comfort with, technology. Indeed, the advantages of blended learning may not extrapolate easily owing to resistance to changing how teachers teach and continued digital divides. That begs the question as to whether it can work in practice for everybody in such a diverse education system as Nepal's (OECD, 2020; Pokhrel & Chhetri, 2021). Looking at the academic outcomes that blended learning produces, the question is how much difference it makes, to reading, writing scores and overall success in general. Well-known is the fact that students' experiences with blended learning can be highly positive. Coming from the students themselves, there is a lot of sentiment about the impact that blended learning has had on their literacy and educational success. It is also a factor of how much access and capability with technology they have. Therefore, with these considerations, the objectives of the present study were to --

a) Measure improvements in students' reading comprehension and writing fluency resulting from the implementation of a blended teaching-learning method,
b) Assess academic performance through the analysis of course-based assessments, and
c) explore students' perceptions regarding the impact of blended learning on their literacy skills, academic performance, and access to technology.

In consideration of these objectives, the present study was accomplished being guided by a set of assumptions that include as follows:

d) **H_1:** Blended learning significantly improves students' literacy skills and academic performance.
e) **H_2:** Technology and access have a significant effect on students' perceptions of blended learning.

Conceptual and Theoretical Framework: A theoretical approach to learning that incorporates cognitive, social, and teaching presence, when analyzing the impact of blended learning on literacy and academic performance in Nepal, drew upon the Community of Inquiry framework. This framework is well-suited to this investigation, given the stark technology constraints in Nepal, as described by Baral (2022) and is directed by its ability to unite these three presences with postulated results, in a country where a digital divide, described by Pokhrel and Chhetri (2021), is a reality.

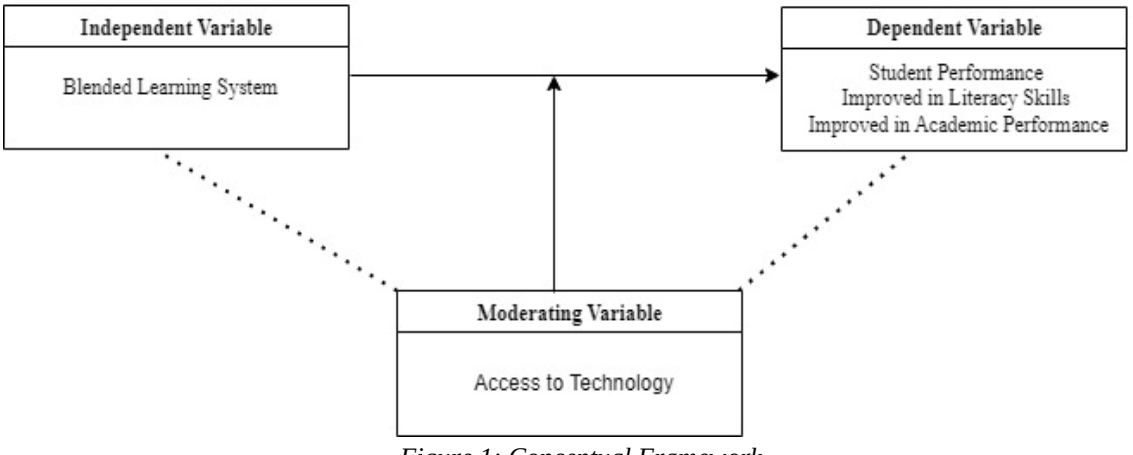

Figure 1: Conceptual Framework

As for learning in blended environments, the Community of Inquiry framework is a guiding principle. According to this framework, three interrelated presences come together to maximize the learning experience: teaching, social and cognitive. Zhang (2020) has been at the forefront in describing these three components. In simplified terms, Researcher has broken down each of these presences and its ideal operation, and presents conditions that are supportive of the Community of Inquiry in the blended environments which, as the name would suggest, are part online and part face-to-face. Literacy learning in particular can flourish in three main conditions that promote learning.

Examining the impact of digital tools in Nepal, this study acknowledges the country's limitations, erratic internet and restricted device access. Despite this, by using a blended learning approach, it is shown that these e-presences improve the students' literacy skills, grades and general outlook on education, according to the research findings of Baral (2022) and Pokhrel et al. (2023). This study's conceptual structure maps out the interplay of these online interventions with the desired outcomes in the Nepalese higher education system, which informed the design of the research.

Research Methods and Procedures

The study adopted a post-positivist paradigm, using a pre-post design to evaluate the impact of a blended learning (BL) course on literacy skills and academic performance over a 15-week semester without a control group. The population included students aged 18 or older, enrolled in a BL course at multiple colleges and universities, with access to smartphones or computers and consent to participate, excluding those under 18, without devices, or unwilling to participate. Stratified random sampling ensured balanced representation across academic years and majors, with recruitment via email and in-person outreach. Data were collected at three points: a Week 1 pre-test survey (Likert scale) assessing reading and writing skills, a Week 7 Google Forms survey (piloted for clarity) evaluating BL perceptions (flexibility, engagement, technology access, technical issues), and a Week 15 post-test survey reassessing literacy skills, with course grades obtained from institutional records. Data analysis ensured quality through reliability tests (Cronbach's α), normality checks (Shapiro-Wilk), variance homogeneity (Levene's test), and outlier detection (z-scores), with missing data imputed using mean replacement. Analyses in SPSS included paired t-tests with Cohen's d for effect sizes, descriptive statistics, one-way ANOVA with Tukey post-hoc tests, Pearson correlations, and linear regressions, using a significance level of $\alpha = 0.05$. Ethical considerations ensured voluntary participation, informed consent, and anonymity, with confidential data handling and institutional permission for grade access. Limitations included the lack of a control group, potential bias from self-reported surveys, variable internet reliability affecting BL engagement, and limited generalizability due to the focus on a single BL course.

Results and Discussions

The section interprets the findings, compares them to past research, and discusses the significance. It examines similarities and contrasts between previous studies, discusses limitations, and suggests areas for further research.

Statistical Analysis

Profile of Respondents: Gender, year of study and subject area, when conducting the study, the researchers made sure to randomly distribute the participants by age. Coming from a wide age range, the same number of males and females took part, all of them from different years at university and studying different subjects including business, engineering, humanities and social sciences, basically got a very representative mix of

students. The survey itself was very concise, but managed to draw a sample that was incredibly diverse, and since the majority of the people who took the survey were 18 to 22 years old, our sample consisted mainly of younger college students. Well-known as being slightly more interested in research, the second-year students dominated our survey, and also, because our respondents came from a huge array of majors, the results were not skewed in favor of any particular one. These institutions' student bodies present more even demographic mixes across key census areas than do many of the institutions themselves. This matters a great deal because it means that the perspective we capture in this study reflects a far wider variety of student experiences than just the sorts of things that might tend to bubble up and get noticed at one or two campuses.

Literacy Skills and Academic Performance: When looking at the effects of blended learning, a researcher studied the progress of students in relation to academic performance and literacy skills. This involved analyzing overall literacy scores, reading and writing abilities, grades, and self-assessment of the students. Coming from the results, we can see how students rate their progress.

Table 2: ***Descriptive Statistics for Literacy Skills and Academic Performance***

	Statistics				
	Literacy_ Skills	Q7_Reading Comp	Q8_WritingSkills	Academic_Performance	Q13_Grades
Mean	21.22	4.35	4.31	17.06	4.15
Std. Deviation	2.320	.482	.507	2.193	.787

Source: Survey 2025 *N=54*

The mean scores of all the indicators are high. The students felt there was a considerable improvement in their overall literacy as seen in the literacy skills mean score (M =21.22). The sub components that support this perception are writing abilities (M = 4.31) and reading comprehension (M = 4.35). The reactions of the students are similar as indicated by the insignificant standard deviations of these items. The confidence level of students concerning their academic achievement in the blended learning setting was also seen through the results of their grades who scored an average of 4.15/5 and academic performance recorded a positive mean of 17.06.

The findings indicate that students believed that blended learning made a significant contribution to their academic performance and they improved their reading and writing skills. The vast majority of them experienced it well - the scores were great and very close to each other. It seems that this strategy was successful, however. Students improved their courses and literacy level.

Table 3: ***Descriptive Statistics, Test of Homogeneity of Variances, ANOVA, and Post-Hoc Test for Literacy Skills Following Academic Year***

Measure	1st Year (M, SD)	2nd Year (M, SD)	3rd Year (M, SD)	F(2, 51)	p-value	η^2	Significant Differences
Literacy Skills	18.83, 0.577	20.08, 0.408	24.33, 0.485	607.196	< 0.001	0.51	1st vs 2nd: $p < 0.05$ 1st vs 3rd: $p < 0.05$ 2nd vs 3rd: $p < 0.05$
Academic Performance	18.83, 0.577	20.08, 0.408	20.08, 0.408	28.47	< 0.001	0.53	1st vs 2nd: $p < 0.05$ 1st vs 3rd: $p < 0.05$ 2nd vs 3rd: $p < 0.05$

Source: Survey 2025

The findings of the ANOVA indicate the statistically significant differences in academic performance and literacy skills across academic years. The mean score in literacy was also the highest in the third-year students (M = 24.33), second-year students (M = 20.08) and first-year students (M = 18.83). The analysis of post-hoc revealed that each academic year had significant differences with others ($p < 0.05$) which showed a gradual improvement in literacy skills. Academic performance was also the same, and the second and third-year students performed better than the first-year students, portraying the long-term implications of the use of blended learning.

Such results indicate that the academic performance and literacy levels of the students increase significantly during school years. The effect sizes ($\eta^2 = 0.51$ and 0.53) demonstrate that academic year makes significant impact on the results. This goes in favor of the benefits of this type of pedagogies in the long term by suggesting that prolonged exposure to blended learning contexts have a positive effect on the development of students.

Perceptions of Blended Learning: Researcher examined the satisfaction levels of students with learning blending by getting a small number of statistics on the opinions of students such as how flexible blended learning is, how engaged students are, whether they have access to the appropriate technology, and whether they have encountered any issues with the technology. It will paint us a better understanding of what it really feels like to be a student who learns in this manner, and whether technological difficulties come into play.

Table 4: ***Descriptive Statistics for Perceptions and Technology Access***

Statistics	Perception_of_ Blended_Learning	Q5_Flexibility	Q4_Engagement	Q17_TechAccess	Q19_TechIssues
Mean	25.52	4.35	4.31	3.89	4.31
Std. Deviation	2.813	.482	.507	.572	.507

Source: Survey 2025 *N=54*

The students had a positive attitude towards blended learning, and the mean score was 25.52 which implies high approval of the learning method. The scores of flexibilities (M = 4.35) and engagement (M = 4.31) were high, which means that students appreciated the flexibility and the interactive character of blended courses. The access to technology was moderate (M = 3.89) with a fair access to digital tools. Interestingly enough, technical problems scored remarkably high (M = 4.31), thus, suggesting that despite the fact that technical issues were involved, they could be viewed as such that were manageable or that the extent of the problem was minimal.

Blended learning appears to be really preferred by students, and this is probably explained by the fact that it is flexible and makes them engaged. Technology was accessible to most of them and they did not spend much time worrying about technical issues hence the tech side was performing well. Overall, all these findings support the fact that blended learning is effective in higher education.

Correlation Analysis: Conducted Pearson correlation to determine the relationships between the perception of students towards blended learning and their grades and literacy skills. In essence, Researcher examined academic performance, literacy abilities as well as what students believe about blended learning. This method can be used to determine whether the students who are happy with blended learning really achieve better in school, and have better literacy capabilities.

Table 5: ***Correlation Analysis***

Perception_of_Blended_
Learning and Literacy_Skills/Academic_Performance.

		Perception_of_ Blended_Learning	Literacy _Skills	Academic _Performance
Perception_of_Blended_Learning	Pearson Correlation	1	.997**	.992**
	Sig. (2-tailed)		.000	.000
	N	54	54	54
Literacy_Skills	Pearson Correlation	.997**	1	.984**
	Sig. (2-tailed)	.000		.000
	N	54	54	54
Academic_Performance	Pearson Correlation	.992**	.984**	1
	Sig. (2-tailed)	.000	.000	
	N	54	54	54

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Survey 2025

The correlation analysis shows that all the three variables are highly related and have a statistically significant relationship. The perception of blended learning is strongly related to academic performance ($r = 0.992$, $p < 0.001$) and literacy skills ($r = 0.997$, $p < 0.001$). On the same note, academic performance is strongly associated with literacy skills ($r = 0.984$, $p < 0.001$). These strong positive relations suggest that students who gave positive responses related to blended learning also recorded improved academic and literacy outcomes.

These findings indicate that there is an evident correlation between the student attitude towards blended learning and their academic performance in school particularly in the field of literacy. The students who enjoy blended learning have higher grades and are more confident in their reading and writing abilities. In such a way, when students are satisfied and interested in blended learning, their academic achievements increase.

Linear Regression for Literacy_Skills: Linear regression analysis was conducted to determine whether the opinion of students towards blended learning would be able to forecast their literacy skills. The model measured the extent of accountability of the perceptions in explaining the variance in literacy outcomes and extent to which the two variables relate.

Table 6: ***Linear Regression for Literacy_Skills***

Statistic	Value
R^2	0.993
Standard Error	0.194
F-value	7535.143
p-value	< 0.001
B (Perception)	0.822
Beta	0.997
t-value	86.805

Source: Survey 2025

According to regression model, the Perception of Blended Learning is a very strong predictor of Literacy Skills, as it explains 99.3% of variance ($R 2 = 0.993$). The model is very statistically significant ($F = 7535.143$, $p < 0.001$) which indicates that there is a reliable prediction relationship. The unstandardized coefficient ($B = 0.822$) demonstrates that with each one-unit change in the increase of perception; the

change in literacy skills is 0.822 units. The strength and significance of this predictor is proved by the standardized coefficient (Beta = 0.997) and the high t-value (86.805).

The analysis shows that the way students feel about blended learning really shapes their literacy skills. Attitude matters - a lot. In fact, perception alone explains almost all the differences in how well students do with literacy. If students to grow academically, need to help them see blended learning in a positive light.

Linear Regression for Academic_Performance: Linear regression analysis was carried out to ascertain how students' perceptions of blended learning affected their academic achievement. Academic performance was the dependent variable, and perception of blended learning was the independent variable.

Table 7: ***Linear Regression for Academic_Performance***

	Statistic	Value
R^2		0.985
Standard Error		0.274
F-value		3350.585
	p-value	< 0.001
	B (Perception)	0.822
	Beta	0.997
	t-value	86.805

Source: Survey 2025

Academic performance and perceptions of blended learning were found to be strongly positively correlated by the regression model. According to the R2 value of 0.985, students' perceptions of blended learning account for 98.5% of the variation in academic performance. The model as a whole is statistically significant, according to the F-value (3350.585) at a significance level of $p < 0.001$. Additionally, the unstandardized coefficient (B = 0.822) and the standardized Beta coefficient (0.997) indicate a significant positive impact of perception on performance. The predictor's high significance is confirmed by the t-value (86.805).

Students who feel good about blended learning usually perform better in school. The data shows a strong link here, so when students enjoy and value blended learning, their grades go up. If schools want to help students succeed, they should focus on creating blended learning experiences that students actually like and find useful. Investing in this pays off.

Linear Regression Perception_of_Blended_Learning: This analysis examines the extent to which Technology_and_Access predicts students' Perception_of_Blended_Learning. The regression model evaluates the relationship between access to technology and students' overall perceptions of the blended learning environment.

Table 8: ***Linear Regression Perception_of_Blended_Learning***

Statistic	Value
R^2	0.637
Standard Error	1.711
F-value	91.235
p-value	< 0.001
B (Constant)	-14.785
B (Technology_and_Access)	3.186

Beta	0.798
t-value	9.552

Source: Survey 2025

According to the results of the regression analysis, students' opinions of blended learning are significantly predicted by technology and access. A significant amount of the variance in Perception_of_Blended_Learning (63.7%, R2 = 0.637) can be explained by the model. The overall statistical significance of the regression is confirmed by the F-test ($F = 91.235$, $p < 0.001$). Better access to technology is linked to higher perception scores, according to the positive unstandardized coefficient ($B = 3.186$). Furthermore, the t-value (9.552) validates that this predictor is highly significant, and the standardized beta coefficient of 0.798 indicates a strong positive relationship.

So, it seems students do really care about how good their tech set-up is for blended learning. If they're working with strong internet and good devices, they are more positive about the entire experience - more engaged, better educated." So if intuitions want blended learning to be successful, they have to concentrate on providing students robust tech support. That's where it all starts.

Conclusions and Recommendation

The study had evidence to support the alternative hypothesis (H_1): Blended learning really does raise literacy and academic achievement, the technology and access disparities were vital in influencing the way students considered blended learning. The latter two effects were the most significant among the students in the third year, who experienced high increases in the scores of their Academic Performance and Literacy Skills. It aligns with the faculty development research of Garrison and Vaughan (2008) and Dvisuban et al. (2018), who also found that academic achievement and involvement among students are two concepts that are closely tied in the context of blended learning. The overall lesson is quite simple: blended learning reaches the most successful outcomes when the students work with its interactive and flexible features. The students who were positive about such aspects as engagement and adaptability were more likely to excel in their studies. Nevertheless, the research had its dark sides. There were technical hiccups that occasionally intervened and most likely prevented blended learning to achieve its potential. The sample size was limited (only 54 students) and the data was provided by the self-reports, so it is difficult to argue that the cause and effect are proven and to say that the results would be similar in case more students are considered. Also, we cannot be certain about the causes of the particular changes as there were neither pre- nor post-intervention measures. The sample too was quite narrow, and thus it is difficult to determine whether these findings would be replicated in other groups or large groups. The next round should have a larger net -- bigger and more diverse samples across fields and schools to determine whether the findings will be permanent. Hard numbers such as actual course grades or the standardized tests would also make the findings more concrete.

The results, however, indicate the promise of blended learning as an effective teaching strategy in increasing the level of student achievement and literacy. Educational establishments should be keen on creating dynamic learning environments. Meanwhile, it is important to ensure proper and efficient delivery by repairing technical issues and making sure that the infrastructure is robust. In testing causality and enhancing blended learning strategies, the research also proposes that scholars should carry out more studies with bigger sample sizes and more objective measures. Future studies are needed to identify their distinct effects on student success by analyzing aspects of blended learning, including recorded lectures vs. forums of interactive discussions (Dvisuban et al., 2018; Garrison and Vaughan, 2008).

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