

Impact of Collaborative Learning on Student's Academic Performance in Teacher's Education Program

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Abstract

Creating a classroom environment for learners to participate actively and engage is an integral element of a comprehensive educational initiative for actively learning students in higher education institutions. Students collaborate to attain goals through collaborative learning. The idea behind collaborative learning is that students may help each other learn and build a deeper comprehension of the subject matter by working together. The study examines the influence of collaborative learning on the academic performance of students at B.Ed. Levels focusing on social factors such as interaction with peers, interaction with teachers, and social media usage influence CL and collaborative learning to improve the student's academic performance. Social constructivism theory was used to observe student performance. Data have been collected through questionnaires from four private universities. Findings were evaluated through SPSS version 22; the composite reliability of the instrument was measured as $\alpha=0.954$. The results of the regression analysis confirmed and accepted all three hypotheses. It can be concluded that all three independent variables - student interaction with peers, interaction with teachers, and social media use- positively impact collaborative learning and help students improve their academic performance and achieve their goals. The results of this study suggest that collaborative learning is an effective approach to enhancing academic Performance in higher education (B.Ed. Honors) and that social factors play an important role in promoting collaboration among students. The findings have implications for teaching and learning practices in higher education, where collaborative learning may be especially beneficial. Overall, this research highlights the importance of collaborative learning in promoting academic development in students.

Keywords: Collaborative Learning, Performance, Social Interaction, Usage of Social Media.

Introduction

The transmission of knowledge from instructor to student in today's classrooms has developed into its distinct art form. Teaching in the twenty-first century is an endeavor in a collaborative dilemma that seeks to cultivate in students the ability to think critically, communicate properly, and work with others to find solutions to complex issues (Fayaz et al., 2023). Various studies have shown that collaborative learning leads to students working as a group to solve a problem, perform tasks, or produce work (Laal & Ghodsi, 2012; Khan et al., 2022). Educational institutions are always

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developing new ways to use technology in the classroom and making new information systems to help with teaching and learning. In recent years, many studies have demonstrated how important collaborative learning is and how well it works as a way of learning (Laal & Ghodsi, 2012) because it can help people feel more confident in their abilities, increase the desire to learn and lead to increased achievements from learning (Supena et al., 2021; Buriro et al., 2023) learning via collaboration in tertiary education to increase overall academic performance (Nakata et al, 2022).

This research examines students' opinions on how collaborative learning affects their academic achievement in the B.Ed. Honors program. This study aims to clarify the effectiveness and importance of collaborative learning in higher education by investigating learners' experiences, perspectives, and ideas.

Collaborative learning (CL) is viewed as an effective method to promote teamwork, share ideas, and enhance leadership. However, the outcome often does not match the stated objectives (Samad & Lashari, 2022). Students who are disruptive, overly authoritarian, or excessively reliant on others can slow down the group's progress and demoralize other team members. As a result, students may become averse to collaborative learning due to a lack of trust and reduced social networking.

This study addresses these issues by identifying the factors that should be considered in CL and the variables that affect student academic Performance toward collaborative learning. Collaborative learning has been shown to have several positive outcomes. The only way to make good use of this method of education is to appreciate its advantages (Raza, 2021). Collaboration is called group work, community learning, team learning, and others. These characters' attributes all work together. Collaboration goes beyond successful teamwork (Mandusic & Blaskovic, 2015). This research will not only enhance the learning of students but also improve their caliber and academic Performance. It will also show the impact of collaborative learning in higher education.

Research Objectives

- To investigate the impact of collaborative learning on the academic performance of prospective students.
- To examine the relationship between collaborative learning and students' academic performance.

Research Questions

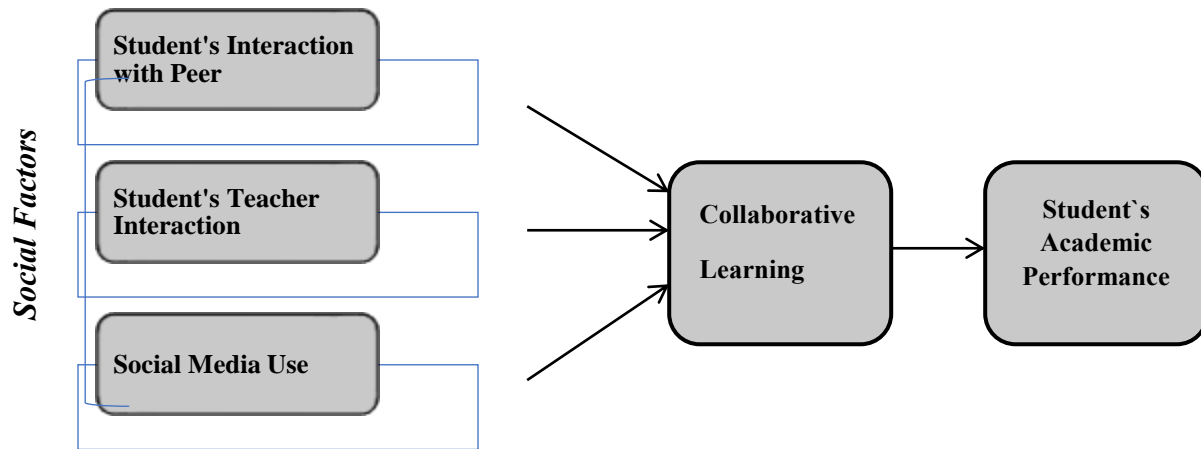
Q1: Is collaborative learning impacting the academic performance of prospective students?

Q2: What is the relationship between collaborative learning and students' academic performance?

Literature Review

Conceptual Framework

The conceptual framework chart has been constructed based on the above literature. The model is intended to demonstrate that collaborative learning has an impact on students' academic Performance. It is hypothesized that collaborative learning has a significant relationship with students' academic achievement after reviewing the literature (Buriro et al., 2023). The model also decorates the relationship between social factors, collaborative learning, and students' achievement, which was also significantly hypothesized from the literature. The research will check each factor's impact on students' academic learning. The conceptual model is as follows:

Figure 1: Conceptual Framework

Theoretical Perspectives

This study uses Vygotsky's (1978) theory of social constructivism as the theoretical framework to further the researchers' knowledge of developing views and issues that teaching faculty and learners confront in higher education organizations. This study was conducted to advance the investigator's comprehension of developing perspectives and challenges (Amineh, 2015, p.5). Social constructivism is a theory of communication and knowledge that focuses on how people build their understanding of their surroundings via interaction (Mooman et al., 2023).

Social constructivism is a way of learning in which students work together to learn by interacting, conversing, and sharing what they know (Fayaz et al., 2023). In other words, the theory of social constructivism is based on the idea that people learn best when they talk to each other, work together, and do projects as a group (Lashari & Umrani, 2023). According to Akpan et al. (2020), it focuses on interaction, collaboration, and group work for effective learning. Students, teachers, and fellow students all work together to create a shared understanding of the world (Fayaz et al., 2023b; Imran et al., 2022). Facilitators lead groups of students in activities, encouraging them to learn from one another (Fayaz et al., 2023b). Because of these principles, including the idea that learning involves a group effort, this theory was chosen with the explicit goal of encouraging students to work together to solve problems, expand upon existing knowledge, and increase their understanding of a topic (Akpan et al., 2020; Lashari et al., 2023).

In addition to using the mentioned principles, the current research was situated within the context of Collaborative Learning as it is implemented at the University of higher education of preference.

Methods and Procedures

This paper covers all the aspects of the research process, starting with the research philosophy, its ontological and epistemological stances, providing details about the research design, what approach and strategy has been applied to carry out the proposed research, and details about the population and the sample size and sampling technique.

In this research, the deductive quantitative study is intended to respond to research questions that are abstracted as the base of this research and will be tested through hypothesis testing. This study adopted a correlational research design. The participants in this study were private university students (B.Ed.) in Karachi. The sample size is N=290 students. This quantitative research study

uses the deductive approach, which uses a survey method to collect data from the respondents of a set context. As a quantitative study, the five-point Likert scale questionnaire comprising 35 close-ended questions with options ranging from Strongly Disagree (SD) to Strongly Agree (SA) was used to get the information from three private universities B.Ed. Department.

The paper establishes the research philosophy, which sets the foundation for the study's ontological and epistemological stances. By clearly defining these philosophical underpinnings, the researchers provide a framework for their investigation, guiding their approach to knowledge and understanding.

Adopting a deductive approach in quantitative research implies a structured methodology where hypotheses are formulated based on existing theories or principles and then tested through empirical observation. The choice of a deductive approach suggests a desire to generalize findings based on specific hypotheses, which aligns with the objective of many quantitative studies.

A correlational research design is appropriate for exploring the relationship between variables without necessarily inferring causality. This design enables the researchers to examine the degree and direction of associations among variables, offering valuable insights into potential patterns or connections within the data.

Targeting private university students specializing in B.Ed. in Karachi as participants enhances the relevance and specificity of the study to the context under investigation. The sample size of 290 students seems robust for quantitative research, allowing for sufficient statistical power to detect meaningful relationships.

Utilizing a five-point Likert scale questionnaire comprising 35 close-ended questions demonstrates a structured approach to gathering data. By employing a standardized instrument, the researchers ensure consistency in measurement across respondents, facilitating comparability and analysis of results.

Employing a survey method for data collection is well-suited for capturing quantitative data from a large sample within a relatively short timeframe. This method offers efficiency and practicality, enabling the researchers to collect a breadth of data from multiple respondents across different private universities.

While not explicitly mentioned in the provided excerpt, it can be inferred that the data collected through the survey will undergo quantitative analysis, likely involving statistical techniques such as correlation analysis or regression modeling to test hypotheses and examine relationships among variables.

Overall, the methodology outlined in the paper demonstrates a structured and rigorous approach to conducting quantitative research within the field of education. By clearly delineating the research design, participant selection, data collection instrument, and analysis approach, the researchers lay a solid foundation for generating meaningful insights and contributing to the body of knowledge in the field.

Demographic Profile

Students using CL in their B.ED Honors degree programs were given the questionnaire. The students of B.ED (Honors) participants individually answered questions on their self-perceptions toward collaborative learning. The data were collected using a non-probability sampling technique.

The questionnaire provided demographic data of respondents as well. Gender, age, and in which semester students are studying, etc.

Table 1: Gender: (Demographic Profile)

Gender	Frequency	Percentage
Male	31	11%
Female	259	89%
Total	290	100%

Table 1 shows the gender distribution of participants in a sample of 290 participants. Male and female individuals are included in the sample. There are 31 male participants, representing 11% of the overall sample. There are 259 female participants, accounting for 89% of the overall sample size. The sample size is 290 individuals, which represents 100% of the population. The gender sample distribution is shown in table 4.3 that shows 11 % were male students and 89 % were female students.

Table 2: Age

Age	Frequency	Percent
Below 21	68	23.4%
21 to 30	179	61.7%
31 to 35	33	11.4%
More than 35	10	3.4%
Total	290	100%

Table 2 provides information about the distribution of individuals across different age groups. There are 68 individuals in this age group, accounting for 23.4% of the total sample size of 290. 21 to 30, this age group has the highest frequency with 179 individuals, making up 61.7% of the total sample—33 students between the ages of 31 and 35, or 11.4% of the total population. Table 4 shows over 35, 10 people with 3.4% of the total sample. Overall, the table reveals that most respondents are between the ages of 21 and 30, constituting the highest proportion.

Table 3: B.Ed. Honors Program

S.no.	B.Ed. Honors Program	Frequency	Percentage
1	Semester 1	25	8.6 %
2	Semester 2	69	23.8 %
3	Semester 3	42	14.5 %
4	Semester 4	106	36.6 %
	Beyond Semester 4	48	16.6 %
	Total	290	100 %

Table 3 provides information regarding the distribution of B.Ed. Honors Program. Twenty-five students in the first semester were responses, accounting for 8.6% of the total sample size of 290. In semester 2, 69 (23.8%) students were represented. In the third semester, 42 students' responses were in the B.Ed. Honors Program, representing 14.5% of the total. In semester 4, the greatest number of students, 106 (36.6%) individuals, responded to the questionnaire; over the 4 semesters, 48 (16.6%) students responded.

Reliability Analysis Using Cronbach's Alpha

"Reliability relates to the consistency of findings, whereas validity refers to the authenticity of findings" (Altheide & Johnson, 1994). The phrase "reliability" relates to the measurement that produces consistent findings with equivalent values (Mohajan, 2017). It evaluates a study's accuracy, reproducibility, consistency, and reliability (Chakrabartty, 2013). The instrument tool's reliability is applied to reveal how unbiased (error-free) the instrument is, so it guarantees that measurements are consistent throughout time and across the variety of things present in the instrument. Hence, a reliability test was conducted to determine the adaptable instrument's consistency.

Table 4: Cronbach's Alpha (N=290)

Variable	Items	Cronbach's Alpha
Students Interaction with Peer (SIP)	08	.866
Students Interaction with Teacher (SIT)	08	.864
Social Media Use (SMU)	05	.812
Collaborative Learning (CL)	05	.814
Student's Academic Performance(SAP)	09	.868
All Variables	35	.954

It can be observed from table 6 that values of Cronbach's Alpha for the influence of collaborative learning on student's academic performance in higher education (B.ED. Honors). The value is greater than 0.7. (Hair et al., 2010) recommended 0.7 as the minimum value for Cronbach's Alpha to establish internal consistency. The Cronbach's Alpha values are 0.866 for students' interaction with peers, 0.864 for students' interaction with teachers, 0.812 for social media, 0.814 for collaborative learning, and 0.868 for students' academic performance. The composite reliability value was checked and resulted in 0.954, which meets the threshold level for reliability statistics.

Regression Analysis

Regression analysis is a statistical method to establish the relationship between a dependent variable and one or more independent variables. Regression analysis aims to identify the functional form of the relationship between the variables and estimate the model parameters that best describe this relationship.

The Influence of collaborative learning on students' academic performance can be investigated using regression analysis. Using regression analysis, quantitatively examine the Influence of collaborative learning on students' academic performance and better understand the nature of this relationship.

The table below shows multiple linear regression calculations based on collaborative learning to

Table 5: Multiple linear Regression (Model Summary)

Variables	R	R Square	Adjusted R Square	Std. Error of the Estimate
SIP> SIT>SMU	.663 ^a	.440	.434	16.40991

a. Predictors: (Constant), SIP, SIT, SMU

predict interaction with peers, teacher interactions, and social media use. The results have been presented below:

Table 6: ANOVA^a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	60481.433	3	20160.478	74.867	.000 ^b
	Residual	77015.550	286	269.285		
	Total	137496.983	289			

a. *Dependent Variable: CL*

b. *Predictors: (Constant), SIP , SIT, SMU*

In the above model summary, which is multiple regression. Table 5 shows that the value of R is 0.663, R square = 0 .440 with a total variation of 44% in the dependent variable. The value of adjusted R2 is .434, which shows the goodness of fit for the regression model. The value of R shows multiple correlations of SIP, SIT, and SMU based on CL.

Table 6 shows that the R2 value is 0.440 with a total variation of 44 %, so the ANOVA table shows that the R square is significantly impacted because the p-value is less than 0.05. It shows it is significant. The p-value is 0.000 in table 7, which shows the goodness of fit for the regression model. In addition, the unstandardized coefficient shows B= .028, which represents the slope of the line between the dependent (CL) and the predictor variable (SIP).

Table 7: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	23.034	4.993		4.614	.000
	IP	.124	.028	.315	4.459	.000
	STI	.123	.029	.294	4.282	.000
	SMU	.098	.046	.128	2.124	.035

a. *Dependent Variable: CL*

Standardized coefficient, i.e., Beta $\beta = 0.315$, the t value is 4.459. Beta, which reveals that the effectiveness of the predictor variable (SIP) on the dependent variable (CL) is quite strong, and the level of significance is $P = .000$, which is also significant because it is < 0.05 . Hence, there is a significant relationship between SIP and CL. The second variable is student interaction with peers. The unstandardized coefficient, which shows B= .029, represents the slope of the line between the dependent (CL) and the predictor variable (SIT). Standardized coefficient, i.e., Beta $\beta = 0.294$, the t value is 4.282. Beta, which reveals that the effectiveness of the predictor variable (SIT) on the dependent variable (CL) is strong, and the level of significance is $P = .000$, which is also significant because it is < 0.05 . Hence, there is a significant relationship between SIT and CL. The third variable is social media use; the unstandardized coefficient shows B= .046. Standardized coefficient, i.e., Beta $\beta = 0.128$, the t value is 2.124. Beta, which reveals that the effectiveness of the predictor variable (SMU) on the dependent variable (CL) is strong, and the level of significance is $P = .035$, which is also significant because it is < 0.05 . Hence, there is a significant relationship between the use of social media (SMU) and collaborative learning (CL).

Table 8: Model Summary

Variable	R	R Square	Adjusted R Square	Std. Error of the Estimate
CL	.621 ^a	.385	.383	62.67131

a. Predictors: (Constant), CL

Table 9: ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	709463.274	1	709463.274	180.631	.000 ^b
	Residual	1131175.470	288	3927.693		
	Total	1840638.745	289			

a. Dependent Variable: SAP

b. Predictors: (Constant),

Table 10: Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	79.712	16.203		4.920	.000
	CL	2.272	.169	.621	13.440	.000

a. Dependent Variable: SAP

Table 10 shows the value of R is 0.621, R square = 0.385 with the total variation of 38% in the student academic performance (SAP). The value of adjusted R² is .383. The R² value which is 0.385 with the total variation of 38% so in ANOVA^a table 18 shows the R square is significantly impact because the p value is less than 0.05. It shows it is significant. The p value is 0.000 the above table 4.10 which shows the goodness of fit for regression model.

Furthermore, unstandardized coefficient shows B= 2.272, Standardized coefficient i.e. Beta β =0.621, the t value is 13.440. Beta which reveals that the effectiveness of the predictor variable (CL) on dependent variable (SAP) is quite strong, and the level of significance is P = .000 which is also significant because it is < 0.05. Hence there is significant relationship between CL and SAP; it can conclude that the use of collaborative learning (CL) accounts for 38% variation in (SAP). CL significantly impact on student's academic performance.

Table 11: Hypothesis testing summary

Hypothesis	Regression Weight	Beta coefficient	R ²	F	T value	P value	Hypothesis supported
H1	SIP > CL	.617	0.380	177.134	13.309	0.000	Supported
H2	SIT > CL	.608	.370	169.300	13.012	0.000	Supported
H3	SMU > CL	.516	.266	104.307	104.30	0.000	Supported
H3	CL > SAP	.621	.385	180.63	13.440	0.000	Supported

Note. * $p < 0.05$. SIP > CL, SIT > CL, SMU > CL and CL > SAP

Table 11 shows the summary of the findings. The first hypothesis H1 there is significant relationship between SIP and CL. SIP significantly predicted CL, F=177.134, $p < 0.000$, which indicates that the SIP can play a significant role in shaping CL (b=0.617, $p < 0.000$). Moreover, the

$R^2=0.380$ depicts that student interaction with peer (SIP) accounts for 38% variation in (CL). This supports the first hypothesis stating “students interaction with peer significantly impact on collaborative learning.

H2 there is significant relationship between student interaction with teacher (SIT) and collaborative learning (CL). SIT significantly predicted CL, $F=169.300$, $p<0.000$, which indicates that the SIT can play a significant role in shaping CL ($b=0.617$, $p<0.000$). Moreover, the $R^2=0.370$ depicts that the model explains 37% of the variation in CL).

This supports the second hypothesis stating “Students interaction with teacher significantly impact on collaborative learning.

H3 there is significant relationship between SMU and CL. Use of social media significantly predicted CL, $F=104.307$, $p<0.000$, which indicates that the SMU can play a significant role in shaping CL ($b=.516$, $p<0.000$). Moreover, the $R^2=0.266$ depicts that (SMU) accounts for 26% variation in (CL). This supports the third hypothesis stating “Social media use significantly impact on collaborative learning.

H4 there is significant relationship between CL and SAP. Collaborative Learning significantly predicted student’s academic performance (SAP), $F=180.631$, $p<0.000$ which indicates that the CL is playing significant role in shaping student’s academic performance (SAP) ($b=0.621$, $p<0.000$). Moreover, the $R^2=0.385$, it can conclude that the use of collaborative learning (CL) accounts for 38% variation in (SAP). This supports the fourth hypothesis stating “Collaborative learning significantly impact on student’s academic performance. The fourth hypotheses also accepted. Student’s interaction with peer(SIP), interaction with teacher (SIT) and the use of social media (SMU) influence on CL and CL significantly impact on SAP. The entire hypothesis accepted.

Results of Mediation Analyses

Table 12: Mediation Analyses

Hypotheses	Coefficient	P Value	LLCI	ULCI	Result	Conclusion
SIP >CL>SAP	.2170	.000	.0954	.3550	Supported	Partial mediation
SIT >CL>SAP	.3207	.000	.1979	.4634	Supported	Partial mediation
SMU>CL>SAP	.4865	.000	.3104	.7015	Supported	Partial mediation

*Note: SIP, student interaction with peers; SIT, student interaction with teachers; SMU, , social media use; CL, collaborative learning; SAP, student academic performance. SRW, ***denotes significance at 1%*

The study assessed the mediating role of CL. Table 12 shows the results revealed significant indirect effect of SIP on SAP through CL ($b= .2170$, $p = 0.000$) supported H1. LLCI is .0954 and ULCI is .3550. Since boots LLCI and ULCI value, there is no zero between the two values as CL is significantly mediate for independent variables SIP, SIT, and SMU and the dependent variable SAP. This mediation is partial. The effect of SIT on SAP through CL ($b=.3207$, $p = 0.000$) has a significant indirect effect. The effect of SMU on SAP through CL ($b=.4865$, $p = 0.000$) has a significant indirect effect. The summary of the mediation analyses is presented in table 12 above.

Discussions

The present research has focused on the "influence of collaborative learning on student's academic performance in higher education (B.ED. Honors). "For this reason, the impact of social factors, students' interaction with groups, teacher interaction, and social media use on collaborative learning was examined, and collaborative learning impacts students' academic performance. The data was collected from four private universities from the Department of Education (B.Ed. Honors). The findings revealed direct associations between students' interaction with groups, teachers, and social media use on collaborative learning and collaborative learning's impact on students' academic performance. The collaborative learning variable plays the role of mediator. Collaborative learning is important because it encourages students to participate and work together. Collaborative learning impacts students' academic performance, and they work efficiently in groups, improve their critical thinking, boost their confidence, improve their communication skills, gain more knowledge and good grades through collaborative learning, and achieve their goals.

Quantitative research and well-established theories support the findings that show a direct correlation between student use of social media, teachers, and peers and collaborative learning. They also show that collaborative learning improves academic achievement. Like the benefits that have been seen, collaborative learning theories highlight the value of social interactions in creating knowledge and meaningful learning experiences. Furthermore, the advantages of collaborative learning, such as raised engagement, deeper comprehension, and enhanced academic results, are continuously supported by empirical research. Collaboration works as a medium via which social interactions impact academic achievement, according to the recognized remediating role of collaborative learning. To improve student engagement, critical thinking, and overall success, these studies highlight the significance of creating collaborative learning environments in the classroom.

The results of the research provide strong support for all offered hypotheses, providing light on the multiple interactions between factors:

1. It emphasizes the beneficial relationship between student contact with peers and learning, emphasizing the importance of information sharing and cooperation in generating engagement.
2. The study demonstrates a strong connection between teacher-student contact and collaborative learning, underlining the necessity of clear communication and educator support in improving student participation and educational outcomes.
3. The use of social media networks is shown to favor collaborative learning, consistent with previous studies emphasizing the function of digital platforms in encouraging student contact and cooperation.
4. The study indicates that collaborative learning greatly improves student academic performance by giving better access to resources and information.
5. Additionally, the study confirms that collaborative learning significantly influences student academic performance by providing enhanced access to resources and information, thus underscoring its crucial role in educational success. Overall, the findings offer valuable insights into the interplay of these factors in promoting effective learning environments and student achievement.
6. This study examined the role of a variable called CL as a mediator. The results presented a significant indirect effect of SIP, SIT, and SMU on SAP through CL, with all the hypotheses supporting. CL significantly mediates the relationship between the independent variables SIP, SIT, SMU, and the dependent variable SAP. This mediation is considered partial mediation.

Conclusion

Learning through collaboration is essential because it encourages students to get involved and communicate with one another during their studies. Collaborative learning has positive impact on students' academic performance because it improves their ability to think critically, increases their confidence, improves interpersonal abilities, gives them greater understanding, and helps them achieve their objectives. The purpose of the present research was to evaluate the influence that students' connections with one another, students' relationships with teachers, and students' use of social media have on the extent to which collaborative learning ultimately leads to improved academic performance. The study provides evidence that the results are accurate. The outcomes of this study give insight into the academic achievement of university students and their utilization of social networks in collaborative learning. The findings of the study suggest that learning in a group setting with classmates has several benefits for students, as it can lead to positive outcomes in terms of their learning experiences and achievements. When students engage in collaborative learning, they can exchange ideas and perspectives with their peers, which can result in the development of more robust concepts and ideas. Group discussions allow students to explore different viewpoints, challenge their own thinking, and gain a deeper understanding of the subject matter.

Recommendations

This research helps higher education (B.ED) in Pakistan understand the CL and encourage student collaboration, which can boost academic achievement.

This study has some recommendations for future researchers. For future researchers, the following recommendations are more beneficial.

- a) First, responses were acquired via a questionnaire; future research should collect data from longitudinal studies (such as survey responses, interviews, and observations) to further validate the model.
- b) This research focused on social factors that influence collaborative learning but did not consider other factors that may also be important, such as individual differences in learning styles or cognitive abilities. Future studies could include these variables to gain a more comprehensive understanding of collaborative learning and academic performance.
- c) The study relied on self-reported measures of social factors, collaborative learning, and academic performance, which may be subject to bias or errors. Future studies could use objective measures like observations or assessments to validate the self-reported data.
- d) This study only examined the influence of social factors on students' academic performance. However, it did not consider the impact of other contextual factors, such as institutional policies or classroom structures. Future studies could examine how these contextual factors influence collaborative learning and academic performance in higher education institutions.
- e) This study only focused on using social media to influence collaborative learning. Future studies could explore other forms of technology, such as online learning platforms or virtual reality, and how they impact collaborative learning and academic performance.

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