International Journal for Research in Educational Studies
(ISSN: 2208-2115)
Volume 12, Issue 03, October 2026
DOI: 10.65327/es.v12i3.2546

THE RELATIONSHIP BETWEEN LEARNING MOTIVATION, CLASSROOM PSYCHOLOGICAL FLOW, AND ACADEMIC ACHIEVEMENT AMONG UNIVERSITY STUDENTS

Blessing Omojo Enyime

Medical Doctor, University Of Abuja Teaching Hospital Gwagwalada Abuja, E-mail: blessingenyime47@gmail.com

***Corresponding Author:** *Blessing Omojo Enyime, Email:blessingenyime47@gmail.com*

Received: 10/04/2026 **Revised:** 04/08/2026 **Acceptance:** 16/09/2026 **Published:** 26/10/2026

ABSTRACT

Psychological factors that have been found to be related to academic achievement in higher education include learning motivation and psychological flow. The study employed a quantitative approach with a cross-sectional correlational research design to examine the relationships among learning motivation, psychological flow and academic achievement of university students. Descriptive statistics, reliability assessment, Pearson correlation, multiple linear regression and group comparisons were used to analyze the Love of Learning Survey dataset consisting of 112 university students. The dataset was used to assess learning motivation, a 10-item composite index was used to assess psychological flow and grade point average (GPA) was used to assess academic achievement. The results showed that the mean score on learning motivation was 7.93, psychological flow was 3.35 and the mean score on GPA was 3.43. The Cronbach's α for the psychological flow scale was 0.787, which is acceptable. The positive correlation between psychological flow and learning motivation was 0.589; the positive correlation between psychological flow and GPA was 0.273; the positive correlation between learning motivation and GPA was 0.345, which were significant. Multiple regression analysis accounted for 12.7% variance in GPA and had a significant independent association with learning motivation, but psychological flow did not. Motivation and academic achievement were also found to be different in the context of academic discipline. The results underlined the need to encourage students' motivation to learn and also the limitation of the study due to cross-sectional and measurement issues.

Keywords – Learning Motivation; Psychological Flow; Academic Achievement; University Students; Educational Psychology

International Journal for Research in Educational Studies
(ISSN: 2208-2115)
Volume 12, Issue 03, October 2026
DOI:10.65327/es.v12i3.2546

1. Introduction

Academic achievement is one of the most basic measures of student success in higher education, which involves the interlaced interplay of cognitive, motivational, and psychological components. Student college life faces various challenges in academic learning, which require students to have enough patience, learn effectively and adapt their psychology. Recent educational research has focused on the social, emotional and motivational factors that can influence learning outcomes, as well as measuring academic success and understanding that it is not solely dependent upon intellectual ability. Psychological and behavioural traits have an impact on school adjustment and educational outcomes, thus highlighting that individual school experiences should be explored in more detail (Raza et al., 2021). Moreover, cognitive resources and adaptability contribute to academic motivation and engagement in tough learning contexts (Martin et al., 2023). It is crucial to understand these relationships and design effective educational programs that can lead to student achievement.

Learning motivation is a psychological process that triggers, guides and maintains student learning activities. Self-determination theory identifies autonomous motivation (personal interest, perceived value) and controlled motivation (external pressures). Research evidence shows that motivational orientations are linked to significant educational indicators, such as engagement and academic achievement (Howard et al., 2021). Furthermore, autonomy-supportive educational contexts foster adaptive motivational processes (Bureau et al., 2022). In addition to supporting students' motivational needs, educational interventions based on SDT also highlight the significance of supporting students' motivational needs (Wang et al., 2024). University students also exhibit active learning behaviours and academic confidence as a result of achievement motivation (J.-C. Chang et al., 2022).

Psychological flow is the state of being so absorbed in an activity, enjoying it so much and being so involved that one feels a sense of happiness and pleasure. In the context of education, flow can occur when the difficulty of learning tasks matches the students' perceptions of their own capabilities, allowing them to focus their attention and engage in meaningful learning experiences. Based on existing studies that investigated online learning, students' purposes of online learning are correlated with their experiences of flow and self-efficacy (Huang & Wang, 2022). In the context of interactive learning environments, flow and motivation, as well as academic achievement, are also emphasized as relevant aspects of challenge-based gamification research (Kaya & Ercag, 2023). These findings suggest that psychological flow is a dimension that could be important in students' learning experiences.

Academic achievement might be driven by the combination of learning motivation and psychological flow by maintaining focus, involvement and persistence in learning. Empirical evidence reveals that learning flow is related to meaningful learning outcomes (Jinmin & Qi,

2023). The relations between motivation factors and students' academic achievement at the university level have also been linked to students' academic results (Bano & Riaz, 2023). The studies that explore the connection between emotional intelligence, learning motivation and self-efficacy also illustrate the importance of these psychological factors in academic performance (Y.-C. Chang & Tsai, 2022). Furthermore, the effect of achievement motivation on educational and developmental outcomes can be realized through academic performance and self-efficacy (Li et al., 2022).

Although motivation and educational engagement are receiving more attention, the combined effects of learning motivation, psychological flow and academic achievement in university students need to be further explored. Reciprocal relationships between achievement and autonomous motivation have been discussed and interpersonal motivation, engagement, and academic performance have been explored (Gareau et al., 2019; Ito & Umemoto, 2022). Additional connections between motivation and learning outcomes (LOs) may also be affected by learning experiences (Zhang et al., 2022). The results, however, should be further explored with integrated quantitative analyses that integrate psychological flow and measurable academic achievement.

The first purpose of this study is to examine the correlation between learning motivation, psychological flow and academic achievement of university students. In particular, this study aims to analyze the relationship between learning motivation and academic achievement, evaluate the relationship between psychological flow and academic performance, examine the association between learning motivation and psychological flow, and determine the combined statistical relationship between learning motivation and psychological flow with students' grades. The results will be used to advance the body of knowledge in educational psychology and guide evidence-based practices to enhance university students' learning experiences and achievement.

2. Materials and Methods

2.1. Research Design and Approach

The research design used in this study is a quantitative, cross-sectional, correlational study to examine the interactions between learning motivation, psychological flow and academic performance among students in universities. The data used in the secondary survey are used to test out the relationships between motivational attributes, psychological engagement and academic performance. The study uses descriptive statistics, correlation, and multiple linear regression to assess such relationships without causal impact.

2.2. Dataset Description and Study Participants

The dataset used in the study is the Love of Learning Survey, which consists of 112 observations

of university students and 18 variables (Burke, 2024). The dataset comprises academic year, discipline, geographical origin, travel-related data, learning motivation, psychological flow responses, and grade point average (GPA). The sample is a reflection of four academic years and three discipline groups: Business and Economics, Liberal Arts and Science, and Undeclared. There is no available documentation to set the initial sampling procedure or period of survey administration.

2.3. Research Variables and Measurement

The Love of Learning variable is used as a measure of learning motivation, with an observed range of 2-10. The psychological flow is quantified by 10 questionnaire items designed to capture concentration, involvement, perceived control and engagement in the learning activities. Flow items are measured on five-point numerical scales, with Flow_Index being a composite mean score. GPA is used to measure academic achievement with recorded GPA of 2.50 to 4.00. Additional variables that help characterize students are academic year and discipline.

2.4. Data Preparation and Missing Value Handling

The data set is analyzed on the basis of missing values, redundant values, inconsistent data and numerical validity. Out of 112 observations, 18 GPA values are missing (16.1%), which leaves 94 observations for complete-case analysis that can be conducted on academic achievement. Each of the Switched_On and Nothing_Else_Matters flow items has one item response missing. The flow index is checked against an average of the available responses to flow items. The GPA values that are not observed are not included in regression and correlation analysis using academic achievement and those records that are valid are used in descriptive analysis.

2.5. Statistical Analysis Techniques

The dataset is summarized using descriptive statistics, such as frequencies, percentages, means, and standard deviations. It is suggested that Pearson correlation analysis is used to test the linear relationships between Love of Learning, Flow Index and GPA, with appropriate assumptions. Multiple linear regression will be used to test the joint relationships between learning motivation and psychological flow and academic achievement. Regression coefficients, coefficient of determination (R2), confidence intervals, and statistical significance are analyzed. The level of significance of p =.05 is taken as two-sided

2.6. Reliability and Validity Assessment

The internal consistency of the 10 psychological flow items is determined by Cronbach's alpha, and 0.70 is a traditional exploratory standard. Total item correlations are analyzed to determine the consistency of measurements. Flow Index composite is checked against the items of the

International Journal for Research in Educational Studies
(ISSN: 2208-2115)
Volume 12, Issue 03, October 2026
DOI:10.65327/es.v12i3.2546

questionnaire. Since learning motivation is a single variable, the internal consistency cannot be determined with the help of Cronbach's alpha. The lack of original validation documentation of the questionnaire and unambiguous validation of classroom-specific measurement limits the interpretation of construct validity.

3. Results

3.1. Demographic and Academic Characteristics of University Students

highest percentage (35.7) consisted of first-year students, followed by second-year students (25.9). The percentage of participants who were in Liberal Arts and Science was 51.8, whereas Business and Economics was 31.3. In terms of geographical origin, half of the students (50.9) belonged to the USA. GPA data were provided for 94 students (83.9%), and 18 files (16.1%) had incomplete GPA records. Table 1 indicates that the sample was representative of various academic years, disciplines and geographical backgrounds. The missing GPA records minimized the sample to use in analyses about academic achievement.

Table 1. Demographic and academic characteristics of university students (N = 112)

Characteristics	Category	Frequency (n)	Percentage (%)
Academic year	First year	40	35.7
	Second year	29	25.9
	Third year	21	18.8
	Fourth year	22	19.6
Discipline	Business and Economics	35	31.3
	Liberal Arts and Science	58	51.8
	Undeclared	19	17.0
Geographical origin	USA	57	50.9
	European Union	36	32.1
	Rest of World	19	17.0
GPA availability	Available	94	83.9
	Missing	18	16.1

Note. Percentages are based on 112 participants and may not sum exactly to 100% because of rounding.

3.2. Descriptive Statistics of Learning Motivation, Psychological Flow, and Academic Achievement

Descriptive analysis showed that the learning motivation of the university students was relatively

International Journal for Research in Educational Studies
(ISSN: 2208-2115)
Volume 12, Issue 03, October 2026
DOI:10.65327/es.v12i3.2546

high with a mean of 7.93 (SD = 1.66). Psychological flow exhibited a mean score of 3.35 (SD = 0.44), which means that participants tended to record a moderate to high flow experience. The mean academic performance in the form of GPA was 3.43 (SD = 0.37) with a sample of 94 students who had their GPA data available. The distributions of the three variables are shown in Figure 1.

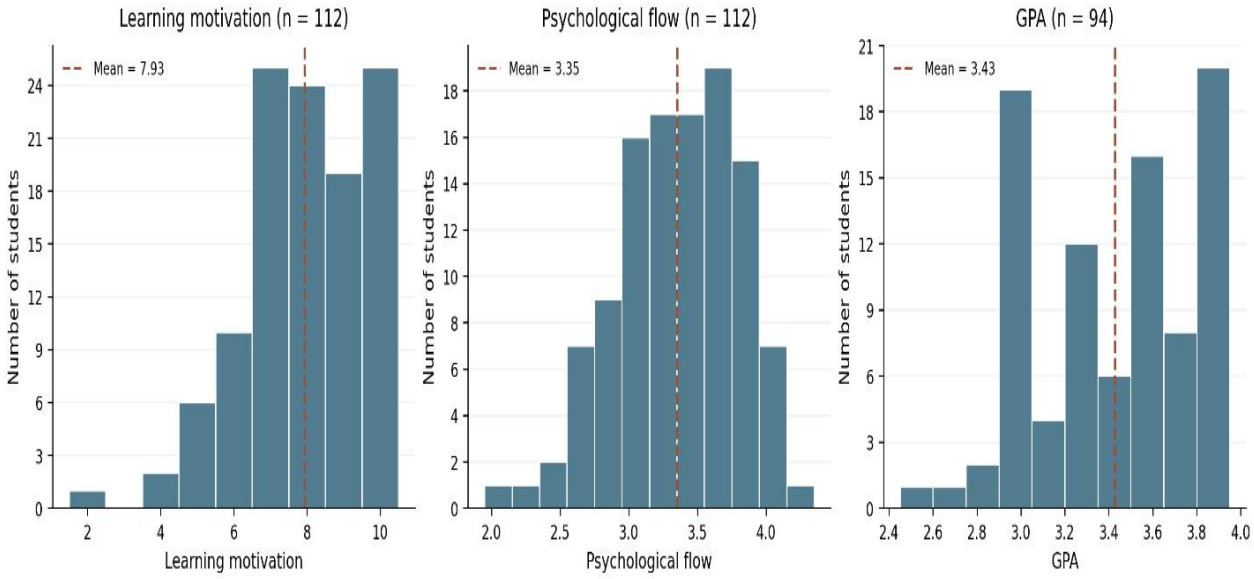

Figure 1. Distribution of learning motivation, psychological flow, and academic achievement

As shown in Table 2, overall students' learning motivation and psychological flow scores were favourable. These values should be interpreted in view of the difference in the measurement scales and variability. The smaller sample size for GPA is because of missing academic achievement data.

Table 2. Descriptive statistics of the principal research variables

Variable	N	Mean	SD	Median	Minimum	Maximum
Learning motivation	112	7.93	1.66	8.00	2.00	10.00
Psychological flow	112	3.35	0.44	3.40	2.00	4.30
Academic achievement (GPA)	94	3.43	0.37	3.50	2.50	4.00

Note. SD = standard deviation. Learning motivation is represented by Love_Of_Learning, and psychological flow by Flow_Index.

International Journal for Research in Educational Studies
(ISSN: 2208-2115)
Volume 12, Issue 03, October 2026
DOI:10.65327/es.v12i3.2546

3.3. Reliability Analysis of Psychological Flow Measurements

Cronbach's alpha was used to determine the internal consistency of the 10 psychological flow items. There were 110 students for whom all responses could be obtained; Cronbach's alpha was 0.787, which is acceptable. Corrected ITCs varied between 0.208 and 0.661, indicating some differences in the contribution of individual items to the composite. Totally_Involved (M = 3.75), Tuned_In (M = 3.61) and In_The_Flow (M = 3.56) gave the highest means. The lowest mean was for the group Nothing_Else_Matters (M = 2.39). As shown in Figure 2, students indicated that they were more engaged and that they paid attention to the stimulus than that they ignored distracting stimuli. The reliability coefficient indicates that the composite Flow_Index can be used in future analyses, however, individual item correlation suggests that the flow items are not equally consistent with the overall measure.

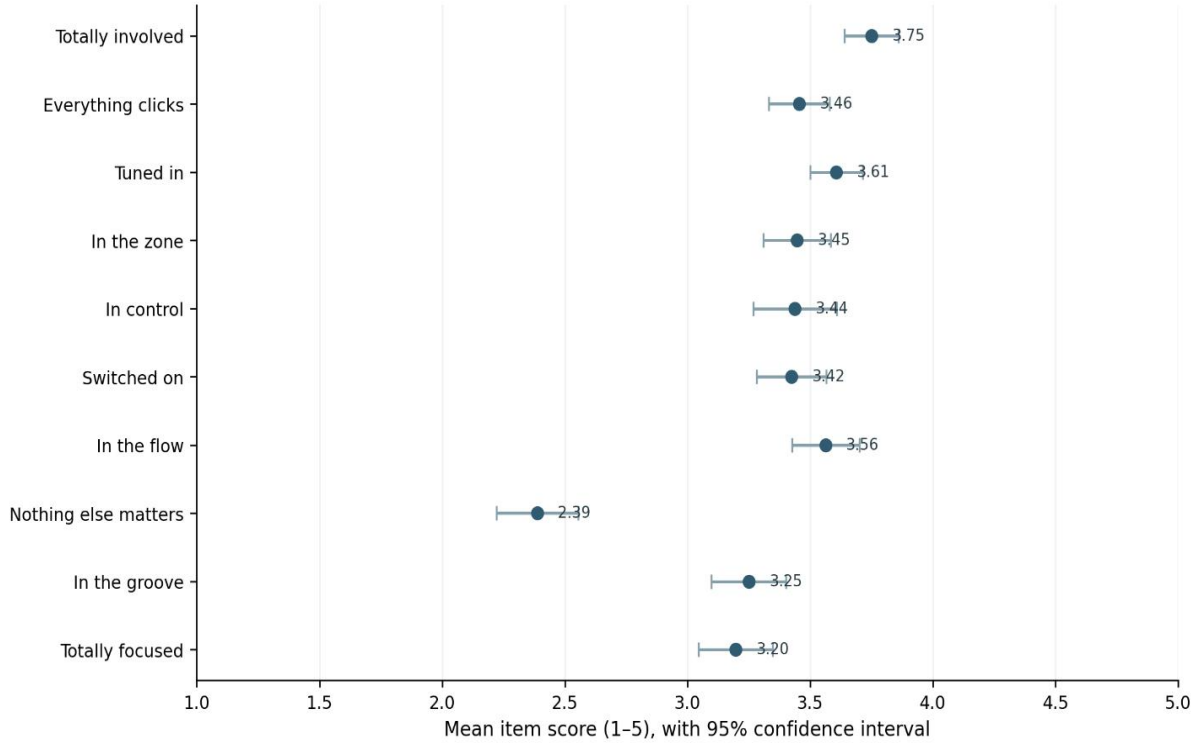

Figure 2. Mean scores of the 10 psychological flow questionnaire items

3.4. Correlation Between Learning Motivation, Psychological Flow, and Academic Achievement

Statistically significant positive associations between the three main research variables were found using Pearson correlation analysis. The results showed that there was a moderate positive correlation between learning motivation and psychological flow ($r = 0.589$, $p < .001$). Academic achievement positively correlated with learning motivation ($r = 0.345$, $p < .001$) and

International Journal for Research in Educational Studies
(ISSN: 2208-2115)
Volume 12, Issue 03, October 2026
DOI:10.65327/es.v12i3.2546

psychological flow (r = 0.273, p = .008). These results suggest that students who reported higher levels of motivation and psychological flow were more likely to be high achievers in the academic arena, however the relationships with GPA were weaker as indicated in Table 3.

Table 3. Pearson correlation analysis of learning motivation, psychological flow, and academic achievement

Variable relationship	N	Pearson r	p-value
Learning motivation – Psychological flow	112	0.589	< .001
Learning motivation – Academic achievement	94	0.345	< .001
Psychological flow – Academic achievement	94	0.273	.008

Note. Correlations were calculated using available observations for each variable pair. All three associations were statistically significant at p < .05.

The highest correlation appeared between learning motivation and psychological flow as shown in Figure 3. Motivational orientation and psychological engagement were positively correlated with GPA, indicating that these variables may be important correlates of academic achievement.

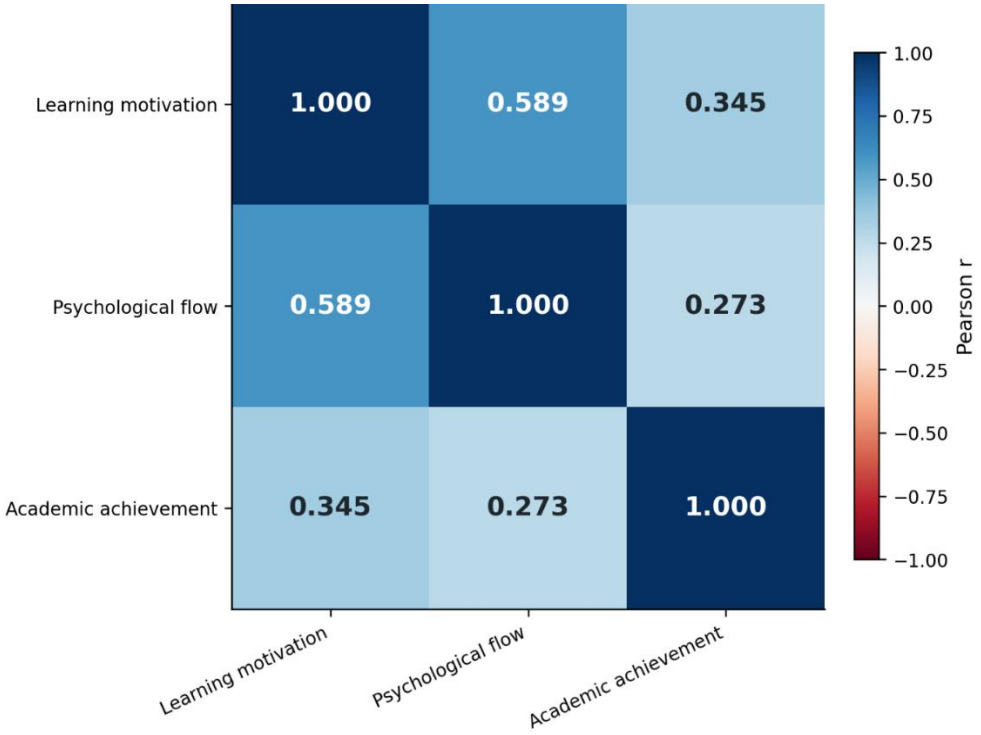

Figure 3. Correlation heatmap of learning motivation, psychological flow, and academic achievement

International Journal for Research in Educational Studies
(ISSN: 2208-2115)
Volume 12, Issue 03, October 2026
DOI:10.65327/es.v12i3.2546

3.5. Regression Analysis of Academic Achievement

The study analyzed the simultaneous relationships between learning motivation and psychological flow and academic achievement by using multiple linear regression with 94 complete data points. The overall regression model was statistically significant, $F(2, 91) = 6.59$, $p = .002$, explaining 12.7% of the variance in GPA ($R^2 = 0.127$; adjusted $R^2 = 0.107$). The regression coefficients for learning motivation and psychological flow were statistically significant ($B = 0.064$; $p = .022$) and ($B = 0.093$; $p = .376$), respectively, but learning motivation was the only one that was statistically significant after controlling for psychological flow. When psychological flow was added into the model, learning motivation was still positively correlated with academic achievement as seen in Table 4. The results on the other hand did not support an independently significant relationship between psychological flow and GPA. The overall model was significant, but modest, indicating that there are other factors that can explain some of the variation in students' academic achievement.

Table 4. Multiple linear regression analysis predicting academic achievement (GPA)

Predictor	B	SE	β	t	p-value	95% CI for B
Constant	2.601	0.289	—	9.013	< .001	[2.028, 3.175]
Learning motivation	0.064	0.027	0.282	2.329	.022	[0.009, 0.118]
Psychological flow	0.093	0.104	0.108	0.890	.376	[-0.114, 0.300]

Note. $N = 94$; $R^2 = 0.127$; adjusted $R^2 = 0.107$; $F(2, 91) = 6.59$, $p = .002$. B = unstandardized regression coefficient; SE = standard error; β = standardized coefficient; CI = confidence interval.

3.6. Comparative Analysis of Learning Motivation and Psychological Flow Across Student Groups

To compare the differences in academic achievements, learning motivations, and psychological flow across academic years and disciplinary groups, comparative analysis was conducted. The one-way analysis of variance showed no statistically significant differences between academic years for learning motivation, $F(3, 108) = 1.99$, $p = .120$, or psychological flow, $F(3, 108) = 2.00$, $p = .119$. Learning motivation, however, varied significantly between disciplines, $F(2, 109) = 4.41$, $p = .014$, with the Liberal Arts and Science students having the highest mean ($M = 8.36$) followed by Business and Economics ($M = 7.51$) and Undeclared students ($M = 7.37$). There were no significant differences between disciplines ($p = .875$) in psychological flow. Relatively similar scores of psychological flow and learning motivation between the disciplines are shown in Figure 4, while there are disciplinary differences in GPA scores.

International Journal for Research in Educational Studies
(ISSN: 2208-2115)
Volume 12, Issue 03, October 2026
DOI:10.65327/es.v12i3.2546

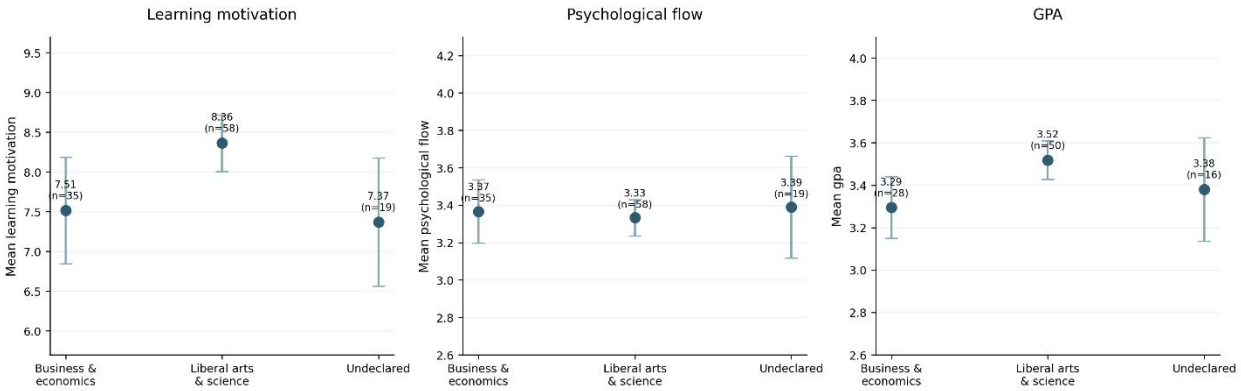

Figure 4. Comparison of learning motivation, psychological flow, and academic achievement across academic disciplines

GPA differed significantly across disciplines, $F(2, 91) = 3.58$, $p = .032$. Based on Tukey post hoc comparisons, learning motivation ($p = .041$) and GPA ($p = .028$) were significantly higher for Liberal Arts and Science students compared to those in Business and Economics. None of the other pairwise differences were statistically significant. The results indicate that the differences among the disciplines were more prominent in learning motivation and academic performance than in psychological flow.

4. Discussion

This study explored the relationship among Learning Motivation, Psychological Flow, and Academic Achievement among University Students. Results showed there were significant positive correlations between learning motivation and psychological flow ($r = 0.589$), learning motivation and GPA ($r = 0.345$), and psychological flow and GPA ($r = 0.273$). The regression analysis showed that learning motivation significantly influenced academic achievement, while psychological flow was not statistically significant when learning motivation was controlled. The results indicate that motivational engagement might have a more direct statistical relationship with academic achievement than psychological immersion. In the context of college learning, a connection between learning motivation, emotion, psychological resources, and academic outcomes has also been explored (Liu et al., 2024).

Learning motivation was found to have a significant positive correlation with academic achievement, suggesting that the more motivated learners are in learning, the higher their GPA score is. The results of regression analysis also showed that, when psychological flow was held constant, the level of motivation remained statistically significant. This connection underscores the potential significance of maintaining learning interest, academic motivation, and commitment for educational achievement. The reciprocal relationship between academic motivation and achievement has also been stressed in the past, in which academic motivation and performance

may affect each other across time (Santana-Monagas et al., 2025). Furthermore, studies on university exam preparation have revealed the importance of motivational processes and timing for academic involvement(Janson et al., 2024).

Psychological flow showed a strong positive bivariate correlation with academic achievement and was not a significant predictor of GPA in the multiple regression model, although it was a significant predictor of academic achievement in this model. This result indicates that flow might explain some of the variance in learning motivation but not be the only factor that explains the relationship to academic performance on its own. They are connected because, as revealed by the relatively strong correlation between motivation and flow, they are intertwined. The relationships between flow, self-efficacy, motivation, and learning outcomes have been studied in previous research, which examined multidimensional relationships among the factors (Su et al., 2024). In addition, flow is highlighted as a psychological experience that is related to academic engagement in theoretical discussions (Mazid et al., 2024). It is also highlighted by the meta-analytic evidence that flow experiences are relevant in an educational context.

The results corroborate some previous research that established connections between motivational and psychological aspects and educational outcomes. Research with medical students has revealed a connection between academic motivation, metacognition, and academic achievement (Deshmukh et al., 2025). Likewise, undergraduate lecture studies have explored the correlations between dispositional flow, engagement in the classroom, comprehension, and performance/grades (Smith et al., 2023). Yet, the present results suggest that the relationship between flow and GPA is not obvious when learning motivation is taken into account. These variations could be due to differences in educational context, measures used, sample characteristics, and analysis methods.

The results indicate that learning interest, participation in a meaningful way, and extended academic interest needs to be stimulated in university teaching practice. Structured learning activities, constructive feedback and challenging task appropriately may assist with students' motivational experiences. Studies on SRL have shown that structured learning support is relevant to university education (Jaramillo et al., 2022; Xu et al., 2022). The effect of learning strategy interventions on students' study behaviours and academic outcomes has also been investigated (Biwer et al., 2023; Irvine et al., 2021). Incorporating motivational encouragement alongside appropriate learning approaches has the potential to reinforce academic progress.

The current study has several limitations. Firstly, the cross-sectional design precludes any causal claims. Secondly, the study sample is relatively small. Thirdly, the data on GPA were sparse, and fourthly, the data relied on secondary measures from the survey. As for learning motivation, there was only one indicator, and the psychological flow situation of the classroom was not measured independently. Longitudinal design, validated multidimensional instruments, and larger institutional samples are recommended for future studies. According to the research on self-

regulated learning in online learning contexts, it is important to take into account contextual learning strategies. Likewise, research on undergraduate transitions emphasizes the role of learner characteristics and self-regulation in academic success. Further research is needed to determine if these factors account for other variation in academic achievement.

5. Conclusion

The present study used a quantitative correlational method to investigate the relationship between learning motivation, psychological flow and academic achievement of university students. The results showed that learning motivation, psychological flow and academic achievement have significant positive relationships, which indicates that motivational and psychological factors play a very important role in higher education. Learning motivation was positively correlated with psychological flow at a moderate level ($r = 0.589$) and both learning motivation and psychological flow were positively correlated with academic achievement. In order to determine whether learning motivation has a significant independent relationship with GPA, multiple regression analysis was conducted, and it was found that learning motivation still had a statistically significant influence on GPA when the influence of psychological flow was eliminated. The regression model accounted for 12.7% of the variance in academic achievement, suggesting that other educational and individual factors may help explain students' academic achievement. Comparative analyses also revealed that there were great differences in discipline in learning motivation and achievement, and psychological flow was relatively stable in all groups of students. The results highlight the importance of fostering students' learning interest, academic involvement and learning strategies in campus settings. The cross-sectional design and the small sample size, however, limit the ability to draw causal inferences and generalizations, and the GPA was not measured for all students. Future studies should adopt a more longitudinal design, representative and larger samples and validated multidimensional instruments to better understand the links between motivation, psychological flow and academic success, and to guide evidence-based educational interventions.

References

1. Bano, S., & Riaz, M. N. (2023). Moderating role of academic motivation and entitlement between motives of students and academic achievement among university students. Journal of the Pakistan Medical Association, 73(4), 759–762.

2. Biwer, F., De Bruin, A., & Persky, A. (2023). Study smart – impact of a learning strategy training on students' study behavior and academic performance. Advances in Health Sciences Education, 28(1), 147–167. https://doi.org/10.1007/s10459-022-10149-z

3. Bureau, J. S., Howard, J. L., Chong, J. X. Y., & Guay, F. (2022). Pathways to Student Motivation: A Meta-Analysis of Antecedents of Autonomous and Controlled Motivations.

Review of Educational Research, 92(1), 46–72. https://doi.org/10.3102/00346543211042426

4. Burke, C. (2024). Love of Learning Survey. 1. https://doi.org/10.17632/xjsrpk5xv7.1

5. Chang, J.-C., Wu, Y.-T., & Ye, J.-N. (2022). A study of graduate students' achievement motivation, active learning, and active confidence based on relevant research. Frontiers in Psychology, 13, 915770.

6. Chang, Y.-C., & Tsai, Y.-T. (2022). The effect of university students' emotional intelligence, learning motivation and self-efficacy on their academic achievement—Online English courses. Frontiers in Psychology, 13, 818929.

7. Deshmukh, N., Borkar, A., Abbas, H. M., & Jalgaonkar, S. (2025). Role of metacognitive awareness and academic motivation in medical undergraduates' academic performance: An observational study. Journal of Advances in Medical Education & Professionalism, 13(3), 198.

8. Gareau, A., Gaudreau, P., & Boileau, L. (2019). Past academic achievement contributes to university students' autonomous motivation (AM) which is later moderated by implicit motivation and working memory: A Bayesian replication of the explicit-implicit model of AM. Learning and Individual Differences, 73, 30–41.

9. Howard, J. L., Bureau, J., Guay, F., Chong, J. X. Y., & Ryan, R. M. (2021). Student Motivation and Associated Outcomes: A Meta-Analysis From Self-Determination Theory. Perspectives on Psychological Science, 16(6), 1300–1323. https://doi.org/10.1177/1745691620966789

10. Huang, H., & Wang, Y. (2022). How flow experience and self-efficacy define students' online learning intentions: View from task technology fit (Framework). Frontiers in Psychology, 13, 835328.

11. Irvine, S., Williams, B., Smallridge, A., Solomonides, I., Gong, Y. H., & Andrew, S. (2021). The self-regulated learner, entry characteristics and academic performance of undergraduate nursing students transitioning to University. Nurse Education Today, 105, 105041.

12. Ito, T., & Umemoto, T. (2022). Examining the causal relationships between interpersonal motivation, engagement, and academic performance among university students. PloS One, 17(9), e0274229.

13. Janson, M. P., Wenker, T., & Bäulke, L. (2024). Only a matter of time? Using logfile data to evaluate temporal motivation theory in university students' examination preparation. British Journal of Educational Psychology, 94(4), 1192–1207. https://doi.org/10.1111/bjep.12712

14. Jaramillo, A., Salinas-Cerda, J. P., & Fuentes, P. (2022). Self-regulated learning and academic performance in Chilean university students in virtual mode during the pandemic: Effect of the

4Planning app. Frontiers in Psychology, 13, 890395.

15. Jinmin, Z., & Qi, F. (2023). Relationship between learning flow and academic performance among students: A systematic evaluation and meta-analysis. Frontiers in Psychology, 14, 1270642.

16. Kaya, O. S., & Ercag, E. (2023). The impact of applying challenge-based gamification program on students' learning outcomes: Academic achievement, motivation and flow. Education and Information Technologies, 28(8), 10053–10078. https://doi.org/10.1007/s10639-023-11585-z

17. Li, X., Pu, R., & Phakdeephirot, N. (2022). The influence of achievement motivation on college students' employability: A chain mediation analysis of self-efficacy and academic performance. Frontiers in Psychology, 13, 972910.

18. Liu, Y., Ma, S., & Chen, Y. (2024). The impacts of learning motivation, emotional engagement and psychological capital on academic performance in a blended learning university course. Frontiers in Psychology, 15, 1357936.

19. Martin, A. J., Ginns, P., & Collie, R. J. (2023). University students in COVID-19 lockdown: The role of adaptability and fluid reasoning in supporting their academic motivation and engagement. Learning and Instruction, 83, 101712.

20. Mazid, A., Samantaray, N. N., & Chaudhury, S. (2024). Theoretical underpinnings of flow and its relation with academic engagement: A narrative review. Industrial Psychiatry Journal, 35(1), 25.

21. Raza, S. A., Qazi, W., & Yousufi, S. Q. (2021). The influence of psychological, motivational, and behavioral factors on university students' achievements: The mediating effect of academic adjustment. Journal of Applied Research in Higher Education, 13(3), 849–870.

22. Santana-Monagas, E., Núñez-Regueiro, F., & Núñez, J. L. (2025). Does motivation lead to academic success, or conversely? Reciprocal relations between autonomous and controlled motivation, and mathematics achievement. British Journal of Educational Psychology, 95(2), 513–529. https://doi.org/10.1111/bjep.12736

23. Smith, A. C., Ralph, B. C. W., Smilek, D., & Wammes, J. D. (2023). The relation between trait flow and engagement, understanding, and grades in undergraduate lectures. British Journal of Educational Psychology, 93(3), 742–757. https://doi.org/10.1111/bjep.12589

24. Su, P., Kong, J., Zhou, L., & Li, E. (2024). The interplay of flow, self-efficacy, learning motivation, and learning outcomes in music education: A comprehensive analysis of multidimensional interactions. Acta Psychologica, 250, 104515.

25. Wang, Y., Wang, H., Wang, S., Wind, S. A., & Gill, C. (2024). A systematic review and meta-

analysis of self-determination-theory-based interventions in the education context. Learning and Motivation, 87, 102015.

26. Xu, L., Duan, P., Padua, S. A., & Li, C. (2022). The impact of self-regulated learning strategies on academic performance for online learning during COVID-19. Frontiers in Psychology, 13, 1047680.

27. Zhang, J., Sun, G., Xu, L., Khan, I., Lv, W., & Philbin, S. P. (2022). The moderating effect of learning experience on learning motivation and learning outcomes of international students. Frontiers in Psychology, 13, 913982.