

A MULTIVARIATE ANALYSIS OF ACADEMIC, BEHAVIORAL, AND PSYCHOLOGICAL PREDICTORS OF STUDENT PERFORMANCE

Saeed Al-Ketbi¹, Oliver Schmidt², Noor Al-Harthy³, Liu Fang⁴, Martina Novak⁵

¹ College of Education, United Arab Emirates University, Al Ain, United Arab Emirates

² Faculty of Education and Psychology, University of Munich (LMU), Munich, Germany

³ College of Education, Sultan Qaboos University, Muscat, Oman

⁴ Institute of Educational Sciences, East China Normal University, Shanghai, China

⁵ Department of Education, University of Vienna, Vienna, Austria

Corresponding Author

Email: saeed.alketbi@uaeu.ac.ae

Abstract

This paper explores how academic, behavioral and psychological variables relate to student performance through a multivariate analytical approach. The approach used to examine 1,000 student observations was quantitative and explanatory research. The independent variables considered were academic score, course participation, attendance rate, emotional engagement, physical activity, device usage, and feedback score. According to descriptive statistics, there were considerable variations in all variables, and academic scores were normally distributed and hence could be subjected to parametric statistics. From the Pearson correlation, there were notable correlations between academic score and student performance ($r = 0.926$). However, other variables correlated weakly or insignificantly with student performance. Multiple regression results indicated that academic score was the only statistically significant predictor of student performance ($\beta = 0.926$, $p < 0.001$), explaining a high proportion of the variation in the performance of students ($R^2 = 0.858$). In addition, behavioral and psychological variables did not have any significant effect on the dependent variable in the model. The study highlights the importance of adopting comprehensive analytical approaches to better understand the complex interplay of factors affecting student outcomes and provides valuable insights for educators and policymakers aiming to improve educational effectiveness.

Keywords: Student Performance; Academic Achievement; Multivariate Analysis; Student Engagement; Educational Factors

1. Introduction

The performance of students is believed to be a significant indicator of the efficiency and quality of education in an institution. The study of the variables which are capable of determining the student outcomes is essential to increase the teaching practice, the learning experience and the development of evidence-based educational policies. Although academic success has long been considered the main predictor of student success, the modern world recognizes the role of a wider set of driving influences such as behavioral and psychological aspects. Learning theories emphasize that student participation and engagement is a key factor in academic growth and learning outcomes (Astin, 2014; Kuh and O'Donnell, 2013).

Academic performance is an indication of how students understand the subject matter and their cognitive skills and is commonly regarded as the main indicator of academic achievement. It is the core of evaluation systems and is closely interconnected with progression and achievement outcomes. Simultaneously, learning conditions also have a strong impact on the level of students motivation and their success since various teaching methods may either promote or impair learning efficiency (Baeten et al., 2013). These views indicate that cognitive ability does not uniquely determine academic performance but rather contextual and environmental factors do.

Student engagement and participation are behavioral factors that have been given a lot of focus on the studies of education. Engagement is a multidimensional concept that involves behavioral, emotional, and cognitive engagement in the learning process (Finn and Zimmer, 2012; Fredricks et al., 2016). Active learners are more prone to exhibit better comprehension and academic performance. In addition, variations in the engagement levels with time can also have a strong impact on the student performance as students may be more engaged or disengaged based on their learning experiences and motivational processes (Jang et al., 2016). These results point to the dynamism of engagement and how it could influence academic achievement.

Another factor that leads to the student learning experiences is psychological factors. Motivation, beliefs and emotional processes are some of the main factors that influence the manner in which students approach learning tasks and how they react to challenges. Theoretical approaches stress the idea that the beliefs students have about their skills and the importance they place on learning activities can impact their academic behavior and performance (Eccles and Wigfield, 2020). On the same note, motivation and emotional processes have been extensively recognized as being instrumental in comprehending learning behavior and academic performance (Reeve, 2024). These are psychological aspects that make students persistent, work hard and generally participate in the learning processes.

Besides this, self-regulated learning has become a significant variable of academic achievement especially in modern and technology mediated learning contexts. Students that can successfully control their learning processes, formulate goals and keep track of their progress have a higher likelihood of better results. It is especially applicable to online and distance learning, where self-regulation is a key component in ensuring academic performance (Carter Jr et al., 2020). Other theories such as academic resilience and academic buoyancy also underline the ability of students to persevere despite their hardships and continue to perform at the same level despite the challenges (Martin, 2012).

Learning environments have also been changed by the growing assistance of technology in education. The use of digital technologies, gamification, and novel pedagogical practices has proven to have an effect on student motivation and engagement. Although these approaches have the potential to positively impact learning experiences, their use and implementation among students are subject to their effectiveness (Hanus & Fox, 2015). Similarly, their level of engagement and risk of academic burnout, which, in turn, can affect their performance, have been associated with the socio-emotional abilities and health of students (Salmela-Aro and Upadaya, 2020).

With a more generalized view, economic and behavioral theories reveal that the beliefs and perceptions of individuals can possibly influence the performance outcomes of decision-making. These findings reveal that while examining student achievement, it is imperative to go past just the overt behaviors and examine the cognitive and motivational processes behind them (Beneabou and Tirole, 2016). The above views underscore the multi-variable and multi-dimensional nature of the predictors of student achievement.

While there is a lot of information about single predictor variables of academic success, very few attempts have been made to evaluate their combined impact. Majority of the earlier research has been done on singular variable and thus far from being able to capture their interaction effects. To bridge the knowledge gap, one must adopt a multivariate framework which would effectively determine the combined impact of these variables. This paper seeks to bridge this gap by conducting an analysis that will focus on the relative importance of academic, behavioral, and psychological factors that predict student success. This study will include various components of the student's traits that will offer a broader perspective of the factors that influence student success, and help develop effective teaching methods.

2. Methodology

2.1 Research Design

The research design adopted in this study is quantitative and explanatory to explore how academic, behavioral and psychological factors affect student performance. The aim is to establish important predictors and analyse the intensity of relationship between them and student outcomes with the help of statistical methods. Quantitative approach is deemed to be fitting because it provides an opportunity to measure and analyze relationships between variables systematically and draw conclusions which can be objectively interpreted and generalized. It is a cross-sectional research, which examines a point of observation to determine the patterns and relationships between the variables.

2.2 Data Source and Sample

The data adopted in this paper was obtained through an open-access learning dataset that is accessible on Kaggle (Ziya, n.d.). The study is founded on a systematized body of information related to students and 1,000 observations. The sample comprises various indicators connected with academic success, conduct in the classroom, psychological involvement, and the use of technologies. The sample is large enough to be statistically reliable and to give a strong inferential analysis. The observations include students at different levels of performance and allow a thorough analysis of other factors that affect academic performance.

2.3 Variables and Measurement

The research involves a dependent variable and a number of independent variables that reflect various aspects of student behavior and performance. Student performance is considered the dependent variable and it is measured as a categorical variable with three levels of performance namely low, medium and high. These independent variables are classified as academic, behavioral and psychological variables. Academic score is the essence of academic success of students. Behavioral variables comprise participation and attendance rate in course which measures the interest of the students concerning classroom activities. The psychological aspect of student involvement in learning is illustrated with the help of emotional engagement. Other variables like physical activity, use of devices and feedback score are added to give a bigger picture on what could affect the performance of students. Any independent variables are considered as continuous measures and can be analyzed in detail.

2.4 Analytical Techniques

To attain the study objectives, a number of statistical methods were used. First, the central tendencies of variables and dispersion were summarized by descriptive analysis, which gives an idea of the overall characteristics of the sample. Pearson correlation analysis was done to analyze the strength and direction of relationships between independent variables and performance of the students. The correlation analysis aided in the identification of variables with potential predictive value and gave an initial idea about the association among variables. A multiple regression analysis was then done to determine the overall impact of academic, behavioral and psychological factors on performance of students. Regression model approximates the correlation between the dependent variable and a collection of predictors, permitting the measurement of individual and group impacts of the independent variables. Unstandardized and standardized coefficients were considered to ascertain the relative strengths as well as the importance of each predictor. This will allow a thorough insight into what is affecting the performance of the students.

2.5 Model Evaluation

The regression model was tested based on a number of statistical indicators. The proportion of variance in student performance that the model explained was determined using the coefficient of determination (R^2). Adjusted R^2 was also taken into consideration to give the number of predictors used in the analysis, which gives the model performance estimate more accurately. The overall significance of the regression model was determined through a F-statistic and t-values and p-values to determine the significance of individual predictors. The level of significance of $p < 0.05$ was considered to establish whether the effects of variables were statistically significant.

3. Results

3.1 Descriptive Analysis of Study Variables

Table 1 shows the descriptive statistics of the study variables, and it provides an overview of the central tendencies and variability of the data. The findings show that the average academic performance of students is 74.83 (SD = 14.35) which shows a moderate range of academic performance among the sample. Academic scores are fairly distributed and the quartile values (Q1 = 63.00; Median = 75.00; Q3 = 86.00) indicate that no extreme scores are highly skewed or concentrated in the extremes.

There is also a great deal of variability in the behavioral variables. The mean of the course participation is 49.96 (SD = 28.87), which means that students have a great diversity in their levels of engagement in classroom activities. Equally, the attendance rate has a mean of 74.76 (SD = 14.39), indicating that there are overall similar attendance patterns among the students, although there are differences among individuals. Diversity in student lifestyle behaviors is further indicated by the level of physical activity where the mean of 60.09 (SD = 23.08).

The psychological variables as manifested by emotional engagement show wide distribution (Mean = 49.75; SD = 28.71) meaning that the students vary greatly in terms of their emotional engagement in the learning processes. The average time spent on the device is 5.01 hours a day (SD = 2.87), which indicates the moderate use of digital tools and technology. Also, feedback score (Mean = 2.95; SD = 1.18) indicates moderate perceived feedback levels amongst students.

The mean of the dependent variable, student performance is 1.21 (SD = 0.74) which means that the majority of students occupy the average performance range. The values of this variable (Q1 = 1.00; Q3 = 2.00) indicate that even though a large percentage of the students perform with moderate levels of achievement, there is a group of students with high performance.

Table 1. Descriptive Statistics of Study Variables

Variable	Mean	Std. Deviation	Minimum	Q1	Median	Q3	Maximum
Academic Score	74.83	14.35	50.00	63.00	75.00	86.00	99.00

Course Participation	49.96	28.87	1.00	25.00	50.00	75.00	100.00
Attendance Rate	74.76	14.39	50.01	62.28	74.89	87.24	99.98
Physical Activity	60.09	23.08	20.02	40.56	59.63	79.61	99.96
Emotional Engagement	49.75	28.71	1.00	25.00	50.00	74.00	100.00
Device Usage (hours/day)	5.01	2.87	0.01	2.58	5.01	7.44	9.99
Feedback Score	2.95	1.18	1.00	1.88	2.95	3.95	5.00
Student Performance	1.21	0.74	0.00	1.00	1.00	2.00	2.00

To supplement the descriptive statistics, Figure 1 depicts the distribution of academic scores among students. The histogram shows that the distribution is somewhat normal and most of the values are clustered around the mean. There is no extreme skewness or outliers, which means that the data is well-behaved to use parametric statistics. Such an even distribution also facilitates consistency of future correlation and regression analysis.

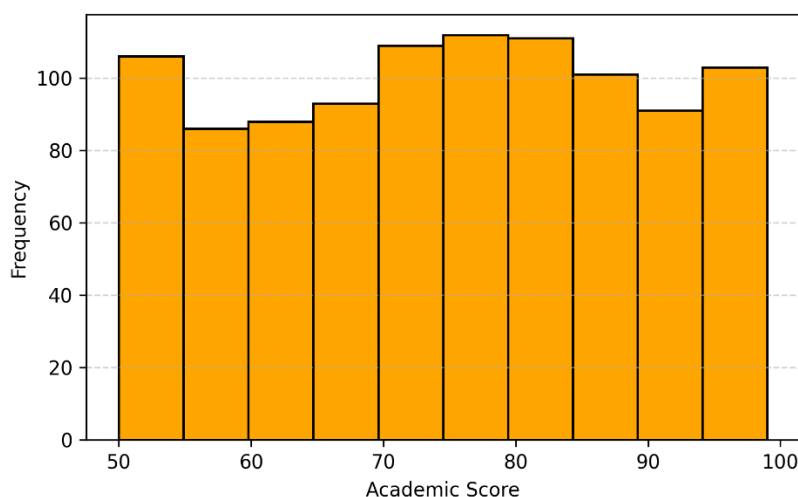


Figure 1. Distribution of Academic Scores

3.2 Bivariate Relationships among Study Variables

Pearson correlation analysis was used to study the correlation between variables and the results are provided in Table 2. The analysis shows that academic score and student performance have very high degree of association with each other as they are strongly positively correlated ($r = 0.926$). This implies that students who have academic scores higher are far much more likely to perform better.

Other independent variables on the other hand show weak or non significant correlations with student performance. Course attendance ($r = -0.011$) and course participation ($r = -0.004$) have almost zero correlations, which means that there are weak linear relationships. Equally, emotional engagement ($r = 0.017$) and physical activity ($r = 0.017$) have only weak correlations with performance. There is a weak positive relationship between device usage ($r = 0.050$) and feedback score ($r = -0.070$) has a weak negative correlation.

The findings suggest that theoretical meaningfulness of behavioral and psychological variables is not directly related with student performance in the current data set. The fact that academic score is dominant in the correlation analysis demonstrates its key point in the determination of student outcomes.

Table 2. Pearson Correlation Matrix of Study Variables

Variable	Academic Score	Course Participati on	Attendance Rate	Physical Activity	Emotional Engagement	Device Usage	Feedback Score	Student Performa nce
Academic Score	1.000	-0.009	-0.009	0.027	0.016	0.050	-0.070	0.926
Course Participation	-0.009	1.000	0.015	0.020	0.017	-0.012	0.019	-0.004
Attendance Rate	-0.009	0.015	1.000	0.010	0.003	0.010	0.020	-0.011
Physical Activity	0.027	0.020	0.010	1.000	0.015	0.012	-0.005	0.017
Emotional Engagement	0.016	0.017	0.003	0.015	1.000	0.010	0.002	0.017
Device Usage	0.050	-0.012	0.010	0.012	0.010	1.000	0.018	0.050
Feedback Score	-0.070	0.019	0.020	-0.005	0.002	0.018	1.000	-0.070

Student Performance	0.926	-0.004	-0.011	0.017	0.017	0.050	-0.070	1.000
---------------------	-------	--------	--------	-------	-------	-------	--------	-------

To give a more detailed graphical representation of the relationship between academic score and student performance, Figure 2 gives a boxplot of the distribution of academic scores in the various performance categories. The figure makes it clear that the students who belong to the higher performance categories are more likely to have higher academic scores. The positive correlation found in the correlation analysis is supported by the upwards movement in the median values of performance groups. This is yet another piece of visual evidence that academic achievement is a key element that helps distinguish the level of performance of students.

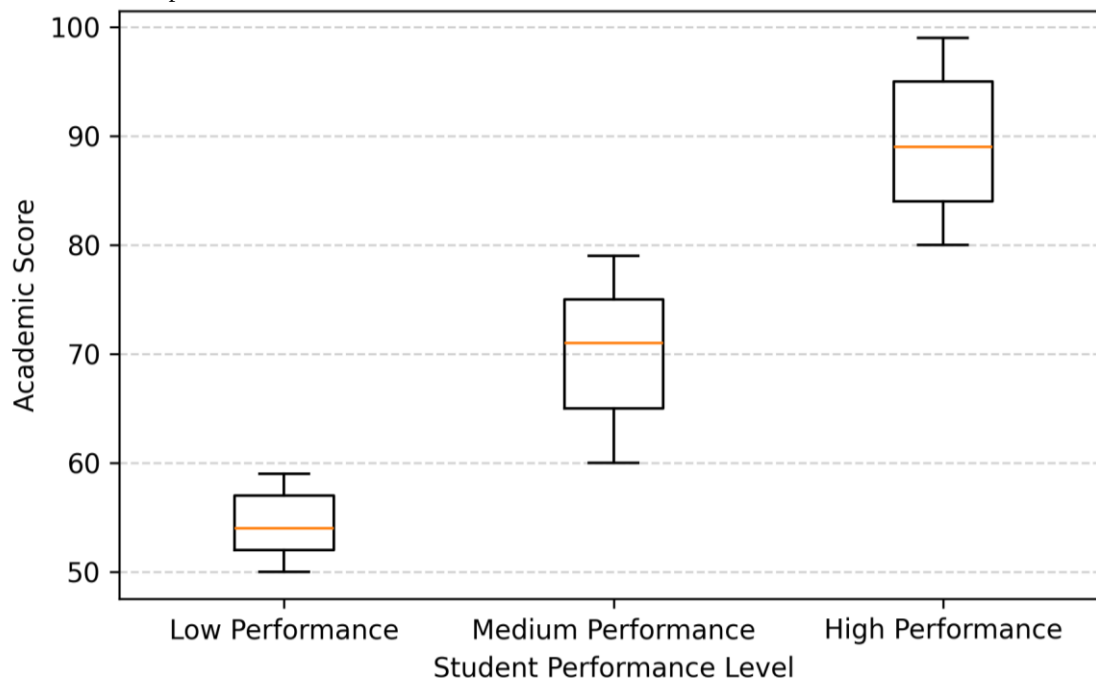


Figure 2. Academic Scores across Student Performance Levels

3.3 Multivariate Analysis of Predictors of Student Performance

A multiple regression analysis was performed to determine the overall effect of the academic, behavioral, and psychological variables and the findings are shown in Table 3. The regression model is found to be significant ($F = 855.5$, $p < 0.001$) which means that the combination of independent variables explains the variation in student performance. The model has a high explanatory power with an R^2 value of 0.858 and adjusted R^2 value of 0.857 which indicates that about 85.8 percent of the variance in student performance can be attributed to the predictors used in the model.

Academic score stands out as the only statistically significant predictor ($\beta = 0.926$, $p < 0.001$) and has a strong positive impact on student performance. This finding suggests that the higher the academic score, the greater the performance outcomes. The strength of the standardized coefficient further underscores the preeminence of academic achievement as a predictor of student achievement.

In contrast, neither of the behavioral variables (course participation: $p = 0.593$ and attendance: $p = 0.490$) shows any statistically significant effect. Furthermore, the psychological variables (emotional engagement: $p = 0.293$) show no significant effect either. Moreover, all the other factors (physical activity: $p = 0.193$, device use: $p = 0.639$, and feedback score: $p = 0.805$) do not show any statistically significant effect on student performance either.

These results suggest that behavioral and psychological variables do not have a direct effect on the performance of students in the framework of this dataset, although they are theoretically relevant. The findings indicate academic performance is the biggest predictor of student performance.

Table 3. Multiple Regression Analysis of Predictors of Student Performance

Predictor	B	Std. Error	β	t-value	p-value	Significance
Intercept	-2.38	0.12	—	-19.83	<0.001	Significant
Academic Score	0.0480	0.0006	0.926	77.01	<0.001	Significant
Course Participation	0.0003	0.0005	0.002	0.54	0.593	Not Significant
Attendance Rate	-0.0435	0.0630	-0.003	-0.69	0.490	Not Significant
Physical Activity	0.000008	0.000006	0.006	1.30	0.193	Not Significant
Emotional Engagement	0.0328	0.0312	0.005	1.05	0.293	Not Significant
Device Usage	0.0005	0.0011	0.002	0.47	0.639	Not Significant
Feedback Score	-0.0019	0.0076	-0.004	-0.25	0.805	Not Significant

The correlation between all the study variables in a visual representation is presented in figure 3. The heatmap shows that

academic score and student performance have a strong positive relationship, and other variables have weak relationships. This visualization supports the results of the correlation and regression analysis, and again proves the prevailing position of academic achievement.

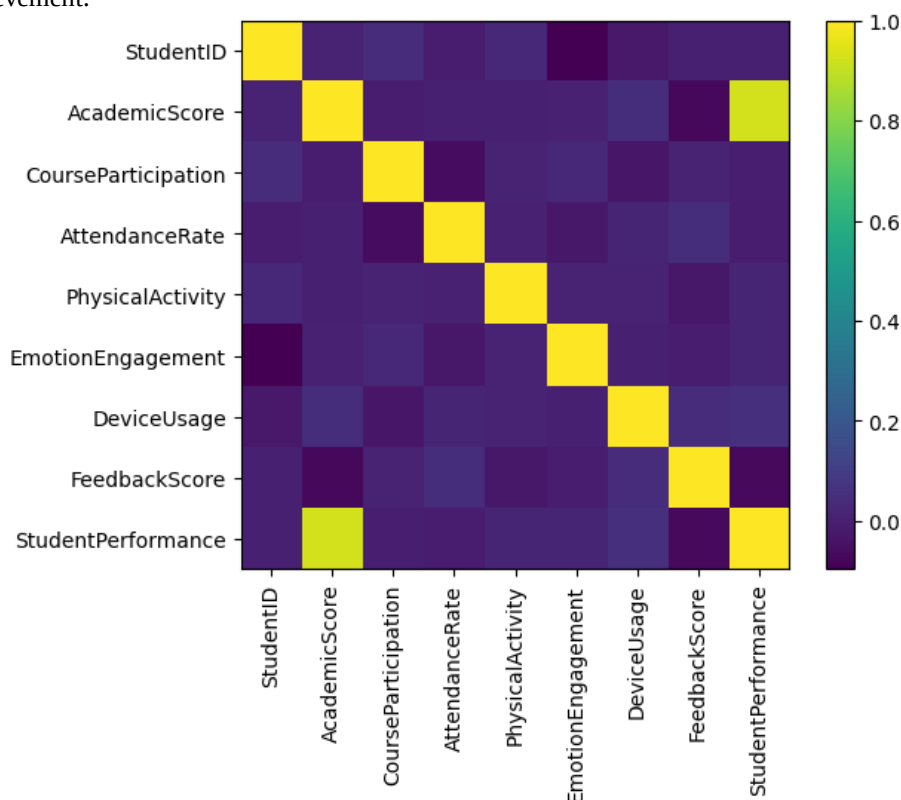


Figure 3. Correlation Matrix of Study Variables

The findings of this research all prove that the most significant predictor of student outcomes is academic performance. Descriptive analysis is used to ensure there is sufficient variability in all variables; hence, statistical analysis is robust. The outcome of correlation shows that academic score is strongly correlated with student performance with other variables showing weak correlations. The Multivariate regression analysis also proves that academic score is the sole statistically significant predictor that explains a significant percentage of variance in performance of students.

Behavioral and psychological variables, in turn, do not have significant direct effects, which may indicate that they can influence indirectly or be context-specific. Generally, the results emphasize the predominant position of academic achievement in defining student performance, but also show that additional research has to be conducted to understand how non-academic factors may impact performance indirectly.

4. Discussion

The objective of the current research was to investigate the impact of academic, behavioral, and psychological variables on the performance of students through a multivariate analysis. These findings offer valuable information on the relative weight of these factors and add to the overall body of knowledge on determinants of student achievement. The findings show that academic score is the highest predictor of student performance and its relationship with student performance is strong. Both correlation and regression analysis always show the preeminence of academic achievement, with high correlation and significant regression coefficient. This result is consistent with the existing studies that put a key or prominent emphasis on academic achievement in forecasting student outcomes (Schneider and Preckel, 2017; Richardson et al., 2012). Through these studies, cognitive and academic factors have been noted to be the best predictors of performance in educational settings. A further argument that supports the statement of academic performance being the primary factor that explains a significant amount of variance in student achievement is the strong explanatory power of the model.

On the other hand, behavioral variables like course attendance and course participation did not indicate statistically significant differences in the multivariate analysis. Although these variables are commonly known to be the predictors of student engagement, their statistical insignificance in this study indicates that their effect might not be linear and swift. Past studies revealed that behaviors associated with engagement tend to be indirectly linked to academic achievement due to better learning approaches and motivation (Kahu, 2013; Trolan, 2023). Likewise, meta-analytic data indicate that student engagement correlates with academic performance in a positive way, but the degree to which it is significant can differ depending on situational and methodological circumstances (Lei et al., 2018). Thus, the results of this research do not deny the significance of the behavioral engagement but, on the contrary, indicate that its effects can be mediated by variables.

The psychological factors and especially the emotional involvement seem to be inconsequential in the current analysis as well. This result is opposed to the theoretical approaches that put a strong emphasis on motivation, self-efficacy, and involvement with emotions in learning (Talsma et al., 2021; Snyder et al., 2014). An example is that self-efficacy has been demonstrated to be key when it comes to academic performance, especially with first-year students who are adjusting to new academic settings (Talsma et al., 2021). Likewise, implicit attitudes towards skill and reactions to failure may also affect academic attitudes and performance (Snyder et al., 2014). The lack of important effects in this study could suggest that psychological variables have an indirect or situation-specific effects that cannot be fully modeled in a direct regression model.

The results connected with the use of technology also confirm this interpretation. The usage of the devices did not significantly affect the performance of the students, which is in line with mixed results in the literature. On the one hand, it is claimed that overuse of digital technologies can have bad consequences on academic performance, whereas on the other, it can be said that it has the potential to positively influence it based on the use of technology (Junco, 2015; Lepp et al., 2014). The non-significant relationship between the two variables in this study could be because of the dual nature of technology where its effects are determined by the way it is used and not through the exposure to it.

These findings can be further explained by the broader literature on self-regulated learning. One of the aspects that affect academic success has been determined to be self-regulation, goal setting, monitoring, and strategic learning behaviors (Broadbent and Poon, 2015; Panadero, 2017; Zimmerman, 2015). Such processes tend to work with behavioral and psychological variables, implying that the lack of direct effects in this study can be attributed to the fact that the mediating processes, such as self-regulation, have not been included in the study. As a result, the results indicate the necessity to take more complex models into consideration that can represent the interdependence between cognitive, behavioral, and psychological factors.

The other significant implication of the study is that traditional academic performance measures remain relevant in determining the performance of students. The academic score dominance in this analysis is in line with the concept of visible learning, which highlights academic success in terms of quantifiable academic performance as a significant measure of learning success (Hattie, 2015). This implies that despite the growing emphasis on the importance of holistic education, academic achievement remains an integral component of evaluation procedures.

At the same time, it also raises certain concerns regarding the measurement of variables unrelated to learning outcomes. While engagement and psychological aspects have already gained recognition as important factors, they may not necessarily manifest in the form of quantifiable indicators. This is consistent with the current body of literature emphasizing that student engagement is a complex construct and thus necessitates more sophisticated means of measurement (Kahu, 2013; Trolan, 2023). Future studies must thus incorporate new approaches, such as longitudinal methodology and/or advanced analysis techniques, to capture the relationship between the variables appropriately.

The current research contributes to the existing body of knowledge by providing empirical evidence of the significance of academic, behavioral, and psychological predictors of the student performance among other factors. The findings indicate the dominant role of academic success and the complexity of non-academic factors. The insights have been very pertinent especially to educators and policy makers who are interested in coming up with evidence-based strategies to enhance student outcomes. Even though academic support remains a very critical factor, indirect and contextual influence of behavioral and psychological factors should be further perceived to be able to have a more holistic approach to education.

5. Conclusion

This paper has examined the influence of academic, behavioral, and psychological determinants on student performance using multivariate analysis. From the findings, it is evident that academic performance is the key determinant of student performance. Correlation analysis and regression analyses found that there was a high correlation between academic performance and performance results, which implies that students who perform academically tend to perform better than other students. However, neither behavioral nor psychological determinants were associated with student performance. While behavioral and psychological factors are recognized as critical determinants of the learning process, their association with student performance in this study seems to be contextual rather than direct and measurable via statistical associations. These findings indicate the complexity of the process under investigation and introduce an assumption about the existence of other variables which would impact on the academic performance, mediating the connection. Additionally, this research is valuable due to the fact that it considers different predictors within one conceptual framework. On the one hand, this research emphasizes the significance of academic performance in evaluating education processes; on the other hand, it shows the need for further research in order to explore the influence of other factors on student performance and interaction of variables. Further research can benefit from using more complicated approaches for analysis.

References

1. Astin, A. W. (2014). Student involvement: A developmental theory for higher education. In *College student development and academic life* (pp. 251-262). Routledge.
2. Baeten, M., Dochy, F., & Struyven, K. (2013). The effects of different learning environments on students' motivation for learning and their achievement. *British journal of educational Psychology*, 83(3), 484-501.
3. Bénabou, R., & Tirole, J. (2016). Mindful economics: The production, consumption, and value of beliefs. *Journal of Economic Perspectives*, 30(3), 141-164.
4. Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The internet and higher education*, 27, 1-13.

5. Carter Jr, R. A., Rice, M., Yang, S., & Jackson, H. A. (2020). Self-regulated learning in online learning environments: strategies for remote learning. *Information and Learning Sciences*, 121(5-6), 321-329.
6. Eccles, J. S., & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. *Contemporary educational psychology*, 61, 101859.
7. Finn, J. D., & Zimmer, K. S. (2012). Student engagement: What is it? Why does it matter?. In *Handbook of research on student engagement* (pp. 97-131). Boston, MA: Springer US.
8. Fredricks, J. A., Filsecker, M., & Lawson, M. A. (2016). Student engagement, context, and adjustment: Addressing definitional, measurement, and methodological issues. *Learning and instruction*, 43, 1-4.
9. Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & education*, 80, 152-161.
10. Hattie, J. (2015). The applicability of visible learning to higher education. *Scholarship of teaching and learning in psychology*, 1(1), 79.
11. Jang, H., Kim, E. J., & Reeve, J. (2016). Why students become more engaged or more disengaged during the semester: A self-determination theory dual-process model. *Learning and instruction*, 43, 27-38.
12. Junco, R. (2015). Student class standing, Facebook use, and academic performance. *Journal of Applied Developmental Psychology*, 36, 18-29.
13. Kahu, E. R. (2013). Framing student engagement in higher education. *Studies in higher education*, 38(5), 758-773.
14. Kuh, G. D., & O'Donnell, K. (2013). Ensuring quality and taking high-impact practices to scale. *Peer Review*, 15(2), 32-33.
15. Lei, H., Cui, Y., & Zhou, W. (2018). Relationships between student engagement and academic achievement: A meta-analysis. *Social Behavior and Personality: an international journal*, 46(3), 517-528.
16. Lepp, A., Barkley, J. E., & Karpinski, A. C. (2014). The relationship between cell phone use, academic performance, anxiety, and satisfaction with life in college students. *Computers in human behavior*, 31, 343-350.
17. Martin, A. J. (2012). Academic Buoyancy and Academic Resilience.
18. Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in psychology*, 8, 422.
19. Reeve, J. (2024). *Understanding motivation and emotion*. John Wiley & Sons.
20. Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: a systematic review and meta-analysis. *Psychological bulletin*, 138(2), 353.
21. Salmela-Aro, K., & Upadaya, K. (2020). School engagement and school burnout profiles during high school–The role of socio-emotional skills. *European Journal of Developmental Psychology*, 17(6), 943-964.
22. Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analyses. *Psychological bulletin*, 143(6), 565.
23. Snyder, K. E., Malin, J. L., Dent, A. L., & Linnenbrink-Garcia, L. (2014). The message matters: The role of implicit beliefs about giftedness and failure experiences in academic self-handicapping. *Journal of Educational Psychology*, 106(1), 230.
24. Talsma, K., Robertson, K., Thomas, C., & Norris, K. (2021). COVID-19 beliefs, self-efficacy and academic performance in first-year university students: cohort comparison and mediation analysis. *Frontiers in Psychology*, 12, 643408.
25. Trolan, T. L. (2023). Student engagement in higher education: Conceptualizations, measurement, and research. In *Higher Education: Handbook of Theory and Research: Volume 39* (pp. 1-60). Cham: Springer Nature Switzerland.
26. Zimmerman, B. J. (2015). Self-regulated learning: Theories, measures, and outcomes.
27. Ziya. (n.d.). *Personalized educational dataset* [Data set]. Kaggle.
<https://www.kaggle.com/datasets/ziya07/personalized-educational-dataset>