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Numeracy, Multilingualism, and Supportive Leadership for Well-Being on Academic Achievement

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ABSTRACT

This This mixed-methods study explores how numeracy literacy, multilingual literacy, and supportive leadership for well-being influence students' academic achievement in Indonesian higher education. Motivated by low national performance in literacy and mathematics, the study used a sequential explanatory design to integrate quantitative surveys and qualitative interviews. Findings show that numeracy literacy has the most substantial effect, enhancing students' analytical capabilities; multilingual literacy improves comprehension of diverse academic sources; and supportive leadership fosters psychological well-being and motivation. Regression analysis revealed a strong predictive model (Adjusted R^2 = 0.906), with all three variables showing significant impacts. Qualitative insights confirmed students' perceptions of these factors as critical for academic success. The study emphasizes the need for holistic strategies combining literacy development and emotionally supportive leadership. It concludes that empowering students with numeracy, multilingual proficiency, and psychosocially responsive leadership is vital for advancing educational outcomes in higher education

Keywords: Numeracy, Multilingualism, Supportive Leadership, Academic Achievemet

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PENDAHULUAN

Academic achievement is the main indicator of the success of the educational process, reflecting the achievement of student competencies in various aspects of learning. One of the essential skills that plays a significant role in supporting academic achievement is numeracy literacy, which includes the ability to understand, analyze, and use quantitative information in a variety of daily life contexts.

In Indonesia, students' numeracy literacy skills are still a serious challenge. The results of the Programme for International Student Assessment (PISA) in 2018 show that the average mathematics score of Indonesian students is 379, far below the international average of 487 (PISA, 2018). In addition, around 70% of Indonesian students are categorized as having low ability in reading literacy, and 72% in mathematical literacy (PISA, 2018). This data indicates that the majority of Indonesian students have not reached the minimum proficiency level in numeracy literacy, which can negatively impact their overall academic performance (Wawan & Retnawati, 2022).

Considering this alarming situation, it becomes essential to explore how numeracy literacy influences students' academic development and learning outcomes. Research shows that students with limited numeracy and literacy skills may struggle to understand key concepts (Nityasanti et al., 2025), have weak problem-solving strategies (Mahmud & Pratiwi, 2019), have limited mathematical connections (Kusumadewi et al., 2024), and make errors across problem-solving stages (Logistica & Awalludin, 2024). Additionally, it will affect academic performance by reducing confidence (Iswara et al., 2022), increasing anxiety (Faiqotusshabrina et al., 2023), struggling with Higher-Order Thinking Skills (HOTS)

(Kusumadewi et al., 2024), and leading to lower achievement in math and science (Sari et al., 2024).

Due to the keywords of this study, some studies found that numeracy literacy has an effect on the academic performance of students academic performance (Prijowuntato et al., 2022), Numeracy literacy is also an important aspect of learning that students must master (Singh et al., 2023). These findings confirm that good numeracy literacy can improve students' academic achievement, especially in mathematics subjects.

However, some studies show the reality in the field is that not all students have an adequate level of numeracy literacy (e.g., research by (Hazimah & Sutisna, 2023; Rakhmawati & Mustadi, 2022). Factors such as teaching quality, learning environment, and lack of habituation in contextual problem-solving are often obstacles to students' numeracy literacy development. As a result, gaps in numeracy skills can affect gaps in academic achievement.

In addition to mathematical literacy, multilingual literacy is also a significant factor in higher education. The ability to understand and use more than one language not only opens access to a wide range of information sources but also improves students' cognitive abilities and social adaptation. Cummins states that bilingualism can improve cognitive flexibility, metalinguistic awareness, and communicative sensitivity (Cummins, 2000). In this era of globalization, multilingual literacy is becoming increasingly important because much of the academic literature is written in various foreign languages, especially English. Students who are able to access and understand this literature have a greater opportunity to develop student knowledge more broadly. In addition, multilingual literacy also helps students in communicating and participating in academic discussions at the global level (Zuniati et al., 2024), which can ultimately improve students' academic achievement (Calafato, 2025; Calafato & Simmonds, 2023; Gronlund, 1998). Some studies have also shown that multilingual skills can improve academic performance (Calafato, 2025). Multilingualism is linked to enhanced cognitive flexibility, intercultural competence, and academic confidence, particularly among students who must access scholarly materials in second or third languages. While multilingual students are often better equipped to participate in global academic dialogue, disparities in language access and proficiency can impact learning outcomes.

Beyond cognitive factors, recent research highlights the importance of the psychosocial environment in supporting academic achievement. Leadership styles within academic programs and institutions—particularly those that support students' psychological well-being—can play a decisive role in shaping motivation, emotional resilience, and academic persistence. Supportive-transformational leadership for well-being involves practices that promote emotional safety, empathy, encouragement, and a sense of belonging. Such leadership aligns with models like the Job Demands–Resources (JD–R) framework and Psychological Capital theory, which suggest that emotionally supportive environments enable students to engage more deeply with their studies, reduce burnout, and develop higher self-efficacy. According to Bass & Avolio, Supportive-transformational leadership inspires and motivates a person to achieve more than what he or she would normally expect (Bass & Avolio, 1994; C. Tan, 2018; Jianping Shen et al., 2020). Responsive and participatory leadership not only encourages student involvement in academic activities but also gives students a sense of ownership and responsibility for the student's own learning process. Conversely, an authoritarian or less supportive leadership style can create obstacles in the learning process, reduce motivation, and even cause academic stress (Littlewood, 1984). Several studies have shown the influence of leadership style on academic achievement ((Howard & Knight, 2022; Jama, 2023; Kythreotis et al., 2010; Zhong, 2024).

Some studies in Indonesia have also shown that university students who feel emotionally supported by their institutions and academic leaders tend to experience better psychological well-being and perform better academically. For example, a study found that perceived social support contributes positively to academic success, especially through the strengthening of Psychological Capital (PsyCap)—which includes self-efficacy, optimism, and academic resilience (Hassan et al., 2023).

Similarly, Chaudhry, Rasheed, Shabbir, and Iftikhar highlighted that institutional support and a positive internal academic team environment play an essential role in enhancing students' psychological well-being, which in turn boosts their academic engagement (Chaudhry et al., 2024). Drawing from Self-Determination Theory, Haw and King emphasized that when students perceive their leaders as meeting their basic psychological needs—such as autonomy, competence, and relatedness—it significantly increases their intrinsic motivation and learning engagement, ultimately improving academic performance (Haw & King, 2023).

In another study, Yusof, Arifain, Aziz, Suhaini, Malek, and Abidin confirmed that social support from academic leaders, family, and peers is positively correlated with students' psychological well-being, and indirectly helps reduce anxiety and strengthen academic resilience (Yusof et al., 2022). Likewise, Yu, Shek, and Zhu found that students' personal well-being is a long-term predictor of academic growth (Yu et al., 2018). This effect becomes even more significant when students are actively involved in a supportive university environment, especially when they experience positive relationships with faculty and academic leaders. These three factors, mathematical literacy, multilingual literacy, and leadership style (supportive leadership for psychological well-being) are interrelated and affect students' academic achievement. Strong mathematical literacy can strengthen students' analytical abilities, while multilingual literacy allows students to access information from a wider range of sources. On the other hand, a supportive study program leadership can create an environment conducive to the development of literacy, as well as facilitate positive interactions between students and lecturers. By combining these three factors in a single study, a more holistic picture of how distinct aspects of higher education contribute to students' academic success.

This study aims to explore and analyze in depth the influence of mathematical literacy, multilingual literacy, and supportive leadership (study program) for psychological well-being on student academic achievement. As stated by Creswell that The mixed-methods approach provides a comprehensive understanding by integrating quantitative and qualitative data to explore complex phenomena (Creswell, 2015). By using a mixed method approach, this research is expected to make a significant contribution to the development of theory and practice in higher education. This approach makes it possible to explore various variables comprehensively, by combining quantitative data and qualitative insights.

The results of this study are expected to provide a clearer picture of the interaction between literacy, leadership, and academic achievement of students. In addition, this study can also identify other factors that may have an effect, which have not been widely researched before. Thus, this research is not only relevant in the academic context but also has practical implications that can be applied in the development of study programs and educational policies in higher education. The results of this research are expected to be a reference for policymakers and education practitioners in designing effective strategies to improve student academic achievement through strengthening literacy and leadership.

METHODS

This study employed a mixed-method approach with a Sequential Explanatory design, where the quantitative method was conducted first, followed by the qualitative method (Creswell, 2015). This design was selected to thoroughly examine the connection between mathematical literacy, multilingual literacy, and leadership style in study programs on students' academic achievement. The quantitative phase offered an initial overview through statistical analysis based on data collected from questionnaires and tests. In contrast, the qualitative phase enriched the findings through in-depth interviews and observations to explore the underlying context and meanings behind the numerical data. The research population comprised all active undergraduate students at Universitas Ma'arif Lampung in 2024, distributed among three faculties: FTIK, FSHEBI, and FUD. The quantitative sample was selected through stratified random sampling to ensure diverse representation across various study programs. In contrast, the qualitative sample consisted of 12 informants chosen purposively from the same programs for in-depth interviews.

There were two types of data, namely quantitative and qualitative data. Quantitative data were gathered using tests and questionnaires that employed Likert scales to assess numerical literacy, multilingual literacy, perceptions of leadership style, and academic achievement as reflected in students' GPAs. Numerical literacy was evaluated using instruments designed to measure basic and advanced mathematical skills, while multilingual literacy was assessed using relevant foreign language tests. Perceptions of leadership style were captured through a questionnaire that examined various aspects of program leadership. For qualitative data collection, semi-structured interviews and direct observations of classrooms and academic environments were utilized to explore how these factors impact students' everyday educational experiences.

The research procedure commenced with the development and validation of instruments, followed by the collection of both quantitative and qualitative data, and concluded with an analysis of the data. Quantitative data were analyzed using statistical techniques, while qualitative data were explored through thematic analysis to identify key themes and emerging patterns. This integrated approach provided the researcher with more profound and comprehensive insights. The data analysis techniques in this study are presented in the following table.

Table 1. Data Analysis Techniques

Approach	Data Analysis Techniques
Quantitative	The validity and reliability of the instruments were analyzed using content validity and Cronbach's Alpha. The collected data was then analyzed using multiple linear regression to evaluate the simultaneous influence of mathematical literacy, multi-language literacy, and study program leadership style on achievement Academic Students
Qualitative	Data were analyzed using thematic analysis to identify key themes that emerged from the interviews and FGDs. The data validity techniques used include: credibility test with triagulation method and member check, confirmability test with trail audit, transferability test Using peer review and dependability tests with in-depth descriptions.
Mix Method	Integration of data validity using cross-validation and convergent validity • **Cross-validation between quantitative and qualitative results:** using data from both methods to complement and verify findings. In this study, the results of the interviews were used as an additional interpretation of quantitative data. • **Convergent Validity:** measure the extent to which the results of the two methods (quantitative and qualitative) support each other and produce consistent conclusions.

RESULTS AND DISCUSSIONS

1. Quantitative Research Result

a. Instrument Validity and Reliability

The results of the instrument validation and reliability estimation indicate that all instruments utilized in this study demonstrate acceptable psychometric properties. Content validity was established through expert review, ensuring that each item appropriately represented the underlying constructs being measured—namely, numeracy literacy, multilingual literacy, leadership perception, and academic achievement. Furthermore, statistical validation procedures, including item-total correlation analysis, confirmed the internal consistency of the instruments. Reliability testing, conducted using Cronbach's Alpha, yielded coefficients above the commonly

accepted threshold of 0.70 for all scales, indicating high internal consistency. These results affirm that the instruments used are both valid and reliable, providing a robust foundation for the subsequent data analysis and interpretation. The following are details of the results of proving the validity and reliability of the instrument.

Table 2. Instrument Validity and Reliability

Instrument	Indeks Aiken's	Cronbach Alpha	Conclusion
Test of Numeracy Literacy	0,92	0,78	Valid and Reliable
Test of Multilingual Literacy	0,93	0,74	Valid and Reliable
Questionnaire of Leadership Perception	**0,95**	**0,81**	Valid and Reliable

The numeracy literacy test instrument has an Aiken's Index of 0.92, which indicates that this instrument is very valid. In addition, the Cronbach Alpha value of 0.78 indicates that this instrument has good reliability, as it is above the minimum limit of 0.7. Therefore, this test can be considered valid and reliable. The multilingual literacy test instrument has an Aiken's Index of 0.93, which also indicates an excellent level of validity. A Cronbach Alpha value of 0.74 indicates good reliability, as it is higher than 0.70. Thus, this test can be declared valid and reliable. Furthermore, the Perception of Leadership Style Questionnaire instrument showed a very high Aiken's Index, which was 0.95, which indicates that this instrument is very valid. In addition, the Cronbach Alpha value of 0.81 also indicates excellent reliability, which indicates that this questionnaire is stable and consistent in its measurements. Therefore, this questionnaire can be categorized as a valid and reliable instrument. Overall, the three instruments used in this study (numeracy literacy test, multilingual literacy test, and student perception questionnaire on the study program's leadership style) were proven to have good validity and reliability, so that they can be used confidently in collecting research data.

b. Data description

The following is a description of the data from the measurement of the three variables.

Table 3. Description of Variable Measurement Data

Statistics	Numeracy	Multilingual	Kepemimpinan	GPA
Mean	63,66	71,46	118,28	**3,31**
Median	63,00	73,00	123,00	**3,28**
Variance	205,37	199,79	250,94	**0,05**
Std. Deviation	14,33	14,14	15,84	**0,23**
Minimum	37,00	47,00	94,00	**2,98**
Maximum	97,00	97,00	148.00	**3,86**
Range	**60,00**	**50,00**	**54,00**	**0,88**

Based on the results of descriptive statistics, the mean score for numeracy literacy, multilingual literacy, and leadership style was 63.66, 71,46, and 118.28, respectively, while the average score of the student's Cumulative Grade Point Average (GPA) is 3.31. Variance and standard deviation indicate the rate of data spread, where

the leadership style has the highest variation (250.94) with a standard deviation of 15.84, while the GPA has the smallest data spread with a variance of 0.05 and a standard deviation of 0.23.

c. Basic Assumption Test

1) Linierity Test

The linearity test was conducted to determine whether there was a linear relationship between the three independent variables (numeracy, literacy and leadership style) and the dependent variable (GPA). The following is a summary of the Linearity test for the three variables.

Tabel 4. Hasil Uji Linieritas

Variabel	*Linearity*		*Deviation from Linearity*		Conclusion
	F	*p-value*	F	*P-Value*	
GPA*Numeracy	1222,621	0.000	5.939	0.007	Assumed Linear
GPA*Multilingual	732.072	0.000	2.906	0.012	Assumed Linear
GPA*Leadership	738.329	0.000	6.200	0.028	Assumed Linear

Based on the table of F test results above, the p-value is known. For the linearity test of the three variables, the number is 0.000, which means it is less than 0.05. This shows that there is a significant linear relationship between GPA and the three independent variables. The enormous F-statistics further corroborates the evidence for strong linear relationships. Furthermore, based on the Sig. Value for Deviation from Linearity, a value smaller than 0.05 is obtained. This indicates that there is a significant deviation from linearity. Nevertheless, the linear relationship between the three independent variables and the GPA is assumed to be linear based on the results of the linearity test above.

2) Normality Test of Residual Data

Based on the results of the Kolmogorov-Smirnov test, the Kolmogorov-Smirnov Z value was 1,712 with a significance value (p-value) of 0.076. Since the significance value of 0.076 is greater than the significance level of $\alpha = 0.05$, the residual data does not differ significantly from the normal distribution. Thus, it can be concluded that the assumption of residual normality in the regression model is met.

3) Autocorrelation Test

The Durbin-Watson test was used in this study to detect the presence of autocorrelation in the residuals in the regression model. Based on the results of the analysis, the Durbin-Watson value obtained was 2.015. With the number of observations (n) as many as 116 and the number of independent variables (k) as many as 3, the critical values of DL (Lower Bound) and DU (Upper Bound) at a significance level of 5% were 1,619 and 1,739, respectively. The Durbin-Watson value of 2.015 is in the range of $1.739 \leq DW \leq 2.261$. This shows that there is no autocorrelation in the residual regression model. Thus, the residual independence assumption in the regression analysis is met, so that the resulting model can be relied upon for further interpretation.

4) Multicollinearity Test

The multicollinearity test was performed to ensure the absence of strong linear relationships between independent variables in the regression model. Based on the results of the analysis, the values of Tolerance and VIF (Variance Inflation Factor) for each variable are as follows. All variables have a Tolerance value > 0.1, which indicates that each independent variable has a good tolerance level. The VIF score for all variables was below the critical threshold of 10, which was 7,602 for Numeracy, 7,453 for Multilingualism, and 3,434 for Leadership. This indicates the absence of high multicollinearity among independent variables. With a Tolerance value of > 0.1 and a VIF of < 10 for all variables, it can be concluded that there is no problem of multicollinearity in the regression model. The assumption of multicollinearity is met, so that the regression model can be used for further analysis.

5) Heteroscedasticity Test

The heteroscedasticity test is performed to ensure that the residual regression model has a constant variance (homoscedasticity). In this study, the Glejser test was used by regressing the residual absolute value (abstract) to an independent variable. The results of Glejser's regression analysis showed the significance value (p-value) for each independent variable as follows: (1) Numeracy: p = 0.894, (2) Multilingual: p = 0.226, and (3) Leadership Style: p = 0.059. All independent variables have a significance value (p-value) greater than the significance level of α = 0.05. This shows that there is no significant relationship between the residual absolute value and the independent variable. Based on the results of the Glejser test, it can be concluded that there is no heteroscedasticity problem in the regression model. Thus, the assumption of homocedasticity is met, and the model can be used for further analysis.

d. Coefficient of Determination

The results of regression analysis showed that the adjusted R Square value was 0.906. This value indicates that about 90.6% of the variation in dependent variables (GPAs) can be explained by the independent variables in the model, namely Leadership, Multilingualism, and Numeracy. The Adjusted R Square value is used to assess the extent to which the regression model can explain the variation in the data, considering the number of predictors in the model. This high value shows that the regression model used is very good at explaining the variations in the existing data. In addition, the R Square Change value of 0.908 indicates that this model makes a significant contribution in explaining the variation in the data, with an F Change of 370.566 and a significance value of p = 0.000, indicating that the regression model is overall significant. Based on these results, it can be concluded that the regression model used has excellent predictive power, with a high Adjusted R Square, which indicates the model's ability to explain significant variations in data.

e. Research Hypothesis Test

To see the simultaneous influence, the F test is used. Simultaneous influence tests are carried out to test whether independent variables together have a significant influence on the dependent variable, namely GPA. Based on the results of the ANOVA test, an F value of 370,566 was obtained with a significance value of p = 0.000. A very large F-value and a very small p-value (less than 0.05) indicate that simultaneously, the independent variables of Leadership Style, Multilingual Literacy, and Numeracy

Literacy have a significant influence on the dependent variables of GPA. The Sum of Squares for regression is 5.413 with a Mean Square of 1.804, while the Sum of Squares for residual is 0.545, which suggests that this regression model can explain most of the variation in the data. Based on the results of the ANOVA test, it can be concluded that the regression model involving leadership style variables, multilingual literacy, and numeracy literacy simultaneously has a significant influence on GPA.

Furthermore, the results of the partial test can be seen in the following thickness.

Table 8. Partial Test Result Using T-Test

Model		*Unstandardized Coefficients*		*Standardized Coefficients*	t	Sig.
		B	*Std. Error*	Beta		
1	(*Constant*)	2.101	0.053		39.515	0.000
	Numeracy	0.008	0.001	0.485	6.150	0.000
	Multilingual	0.004	0.001	0.279	3.579	0.001
	Leadership	0.003	0.001	0.231	4.362	0.000
Dependent variable: **GPA**						

A partial test was conducted to test the influence of each independent variable on the dependent variable of GPA individually. Based on the results of the regression test, t-values and p-values were obtained for each independent variable as follows.

1) **For the Multilingual Literacy Variable**, B = 0.004, Standardized Beta = 0.279, t = 3.579 and p-value = 0.001 were obtained. A p-value of 0.001 less than 0.05 indicates that Multilingual literacy also has a significant influence on GPA. With a Standardized Beta of 0.279, the contribution of this variable to GPA prediction is quite strong even though it is smaller compared to Numeracy.
2) **For the Multilingual Literacy Variable**, B = 0.004, Standardized Beta = 0.279, t = 3.579 and p-value = 0.001 were obtained. A p-value of 0.001 less than 0.05 indicates that Multilingual literacy also has a significant influence on GPA. With a Standardized Beta of 0.279, the contribution of this variable to GPA prediction is quite strong even though it is smaller compared to Numeracy.
3) **For the Leadership Variable**, B = 0.003, Standardized Beta = 0.231, t = 4.362 and p-value = 0.000 were obtained. A very small p-value (0.000) of less than 0.05 indicates that Leadership Style also has a significant influence on GPA. With a Standardized Beta of 0.231, the Leadership style variable makes a significant contribution to GPA prediction, although the contribution is smaller compared to Numeracy and Multilingual Literacy.

Based on the results of the partial test, it can be concluded that all independent variables in the model (numeracy, multilingualism, and study program leadership style) have a significant influence on GPA with very small p-values (all below 0.05). The Numeracy variable contributed the most to GPA, followed by Multilingual and Leadership Style.

2. Qualitative Research Results
   a. Students' Perceptions of Numeracy Literacy

      In general, despite different faculty backgrounds, numeracy literacy has proven to have an important role in supporting students' academic achievement. Both in the Faculty of Tarbiyah and Teacher Training, the Faculty of Sharia, Islamic Economic Law and Business, as well as the Faculty of Ushuluddin and Da'wah, students with good numeracy literacy feel Easier to do academic assignments, especially those that involve data analysis or numbers-based reports. Students feel that numeracy literacy is not only helpful

in solving math problems, but also in understanding and interpreting data used in students' fields of study. Based on the results of the interviews, students in all faculties also feel more confident in academic presentations and discussions, because students can support arguments with accurate and clear data.

b. Students' Perceptions of Multilingual Literacy

Work on academic assignments, especially those involving data analysis or numbers-based reports. Students feel that numeracy literacy is not only helpful in solving math problems, but also in understanding and interpreting data used in students' fields of study. Based on the results of the interviews, students in all faculties also feel more confident in academic presentations and discussions, because students can support arguments with accurate and clear data.

c. Students' Perceptions of Leadership Style in the Study Program

Overall, students perceived that the leadership style of the Head of the Study Program—characterized by effective communication, discipline, encouragement of critical thinking, and freedom to innovate—had a positive impact on their academic performance across all three faculties. Students from each faculty reported experiencing the benefits of leadership that provides clear direction, promotes active engagement, and fosters a supportive learning environment.

Policies implemented by the Head of the Study Program, whether related to academic discipline, curriculum development, or support for student activities, were considered successful in creating an atmosphere conducive to academic improvement. Students also noted that leadership that pays attention to both academic well-being and individual potential encouraged them to be more motivated in pursuing academic excellence and succeeding in their coursework.

d. Comparison of Quantitative and Qualitative Research Findings

This study aimed to explore the influence of numeracy literacy, multilingual literacy, and the leadership style of study programs on students' academic achievement across different faculties. The analysis of both quantitative and qualitative data revealed that all three variables had a significant impact on academic performance, both simultaneously and individually.

The results of the multiple regression analysis indicated that numeracy literacy, multilingual literacy, and leadership style collectively contributed significantly to students' academic success. This suggests that these three factors interact and support one another in enhancing overall student performance. Furthermore, partial analysis confirmed that each variable had a statistically significant effect, although with varying levels of influence.

Numeracy literacy showed the strongest positive impact, especially in quantitatively oriented courses such as statistics, accounting, and research methods. Students with strong numeracy skills were better able to complete academic tasks efficiently and accurately. In terms of multilingual literacy, proficiency in multiple languages, particularly in reading academic texts in English and Arabic, also positively affected academic achievement. Students with multilingual capabilities tend to comprehend course materials more easily, especially in subjects that rely on foreign language sources.

Regarding leadership style, it was found to significantly affect academic performance as well. Students who felt supported by a communicative and open leadership style that valued their academic initiatives tended to achieve better academic results. Clear academic direction and well-implemented policies by the Head of the Study Program were perceived to create a more conducive learning environment.

Qualitative interviews with students from three faculties offered deeper insight into how these variables influenced academic achievement. For instance, students from the Faculty of Sharia explained that numeracy skills assisted them in analyzing case studies in Islamic economics. In the Faculty of Tarbiyah, students found numeracy essential for understanding research methods and data analysis.

Similarly, students from the Faculty of Ushuluddin and Da'wah emphasized how Arabic language proficiency supported their comprehension of religious texts, particularly in courses like Tafsir and Hadith. Meanwhile, students in the Faculties of Sharia and Tarbiyah who were proficient in English reported that they found it easier to understand international academic literature commonly used in their assignments.

In terms of leadership style, students across all three faculties agreed that a supportive, communicative, and open approach from the Head of the Study Program had a positive impact on their academic experience. For example, students from the Faculty of Sharia felt more confident in engaging with theory-based and practical Islamic economics courses due to the participatory leadership style that encouraged discussion and research. Likewise, in the Faculty of Tarbiyah, leadership that welcomed student ideas and fostered academic innovation played a role in improving academic performance.

In conclusion, both quantitative and qualitative findings consistently showed that numeracy literacy, multilingual literacy, and leadership style significantly influenced students' academic achievement. When combined, these three factors have helped to form a strong foundation for academic success. Individually, numeracy literacy had the most substantial effect, followed by multilingual literacy and leadership style. This study underscores the importance of developing these three competencies to enhance academic quality across faculties.

DISCUSSIONS

This study aims to explore the influence of numeracy literacy, multilingual literacy, and study program leadership style on student academic achievement. Based on quantitative results using multiple regression and qualitative interviews, the findings show that these three variables have a significant effect on student academic achievement.

Numeracy literacy, which refers to an individual's ability to understand and use numbers and data in a variety of contexts, has been shown to have a significant influence on students' academic achievement. This is in line with research that shows that numeracy literacy ability is closely related to academic achievement (Prijowuntato et al., 2022; Singh et al., 2023). Numeracy literacy allows students to process data and information more efficiently, which contributes to logical problem-solving and better decision-making.

In interviews with students from various faculties, it was revealed that numeracy skills significantly contribute to completing academic tasks more quickly and accurately. This, in turn, has a positive impact on student achievement. These findings highlight that mastering numeracy is not only beneficial in everyday life but is also highly relevant in academic settings.

Multilingual literacy, or the ability to use more than one language, was also found to have a significant influence on students' academic achievement. In line with Cummins' opinion, which confirms that mastery of more than one language can improve students' cognitive abilities, which in turn supports students' academic success (Cummins, 2000). In this context, students who master foreign languages, especially English and Arabic, tend to be better able to understand lecture materials that use international references. From the results of the interviews, students from the Faculty of Ushuluddin and Da'wah who master Arabic find it easier to understand religious texts and other lecture materials, which strengthens students' understanding of language-based courses. Meanwhile, students from the Faculty of Tarbiyah and the Faculty of Sharia who master English feel more confident in taking courses that use

foreign literature. The results of this study are in harmony with previous research, which revealed a positive relationship between multilingual skills and academic achievement (Calafato, 2025; Calafato & Simmonds, 2023; Filippi et al., 2025).

The leadership style of the head of the study program also plays an important role in shaping an academic environment that supports student achievement. The results of this study show that students who feel supported by leadership that is open, communicative, and respectful of student aspirations tend to have better academic achievement. According to Bass, a transformational leadership style that emphasizes empowerment and participation can increase student motivation, which in turn contributes to student academic achievement (Bass & Avolio, 1994; Jianping Shen et al., 2020). From the interviews, students from the three faculties revealed that the leadership style that supports and provides space to innovate and participate in academic activities influences students to be more active in the learning process. A democratic leadership style, as applied by the Head of the Study Program, contributes to increased student confidence and motivation in facing academic challenges. These results support previous studies that have revealed the influence of leadership style on academic achievement (Howard & Knight, 2022; Jama, 2023; Kythreotis et al., 2010) including several studies in Indonesia (Nurjannah et al., 2022).

The integration between quantitative and qualitative results shows that numeracy literacy, multilingual literacy, and study program leadership style simultaneously or partially have a positive impact on students' academic achievement. These findings have been shown to be consistent with relevant previous research. Overall, the results of this study provide evidence that the development of these three variables can improve students' academic achievement. Therefore, study programs in higher education should pay more attention to the development of students' numeracy and multilingualism, as well as apply a supportive leadership style to create an academic environment that is conducive to learning.

The study has several limitations, one of which is that the sample coverage is limited to three faculties, so the results may not be generalizable to all students or other universities. The mixed method approach used has not explored other external factors that can affect academic achievement, such as socioeconomic conditions or motivation. Variable measurements are carried out through tests, questionnaires, and interviews that may not be in-depth enough, with achievement assessments based only on GPAs without considering non-academic aspects. The short research time limits the analysis of the long-term impact on student achievement. Subjectivity in interviews and measurement of the study program's leadership style through student perception can affect the accuracy of research results. In addition, the study only examined three main variables, while academic achievement was influenced by many other factors that were not measured in the study.

CONCLUSIONS

The results of the study show a significant relationship between numeracy literacy, multilingual literacy, and study program leadership style on student academic achievement, with numeracy literacy providing the most dominant influence. Students consider numeracy and multilingual literacy as basic skills that support academic success, especially in analytical and communication-based assignments. The leadership style of the study program is seen as an important factor that creates a conducive academic environment and motivates student achievement. Quantitative analysis reveals strong statistical relationships, while qualitative analysis reinforces these findings by explaining how those factors impact the student experience. These findings confirm the compatibility between quantitative and qualitative data, providing in-depth insights into the determinants of academic success.

This research emphasizes the importance of numeracy and multilingual literacy in the development of higher education curriculum to strengthen students' ability to analyze data and understand international literature. In addition, the supportive and communicative leadership style of the head of the study program is considered crucial in creating a productive academic atmosphere. Colleges are advised to integrate numeracy literacy more deeply into the curriculum, provide multilingual training programs, and improve the quality of leadership

through specialized training. For advanced research, longitudinal studies and exploration of other factors that affect academic achievement, such as learning motivation and technology are proposed to be carried out more comprehensively.

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