THE EXAMINING THE IMPACT OF LEARNING ENGAGEMENT ON STUDENT'S ACADEMIC OUTCOMES: THE MODERATING ROLE OF THE FLIPPED CLASSROOM MODEL

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Abstract: This study aims to explore the relationship between graduate students' Learning Engagement (LE), Academic Achievement (AO), and Flipped Classroom Model (FCM) at N University. Through one-way ANOVA, linear regression analysis, and independent sample T-test, the study found that learning engagement significantly positively influences academic achievement, and there are significant differences in learning engagement among students of different grades. Gender and major show no significant differences in academic achievement and learning engagement, but the flipped classroom model yields significant differences among students of different genders. The results emphasize the crucial role of learning engagement in improving academic achievement and suggest that the flipped classroom model may need adjustments based on students' gender characteristics. Future research should expand the sample size, explore more influencing factors, utilize causal research designs, and delve deeper into analyzing the specific implementation of the flipped classroom model to enhance educational practices and improve students' academic achievement.

Keywords: Learning Engagement, Academic Achievement, Flipped Classroom Model, Graduate Education, Quality Improvement in Education

Introduction

With the popularization of higher education, the scale of graduate education has rapidly expanded. In 2021, the enrollment reached 1.1765 million, with master's students accounting for 1.0507 million. However, the expansion of scale has raised concerns about educational quality, especially regarding the research capabilities and academic achievements of master's students. Studies indicate that Chinese master's students lack research abilities, innovative exploration capabilities, and practical research skills. Many master's students do not produce research outcomes during their master's studies, lack an understanding of cutting-edge knowledge in their disciplines, and lack comprehensive, innovative abilities. Furthermore, the arrival of the information age requires individuals, organizations, and society to enhance their comprehensive qualities and engage in lifelong learning continuously. The

19th National Congress of the Communist Party of China emphasized the importance of constructing a learning society, providing a backdrop for innovative educational models. As a new teaching model, the flipped classroom has been spreading globally since 2007. By reversing the traditional teaching sequence, it shifts the focus of teaching from "teaching" to "learning," facilitating the internalization of knowledge and the enhancement of learners' comprehensive qualities. Currently, there has been extensive discussion and practical exploration of the flipped classroom in the field of higher education in China. However, overall, it is still in the early stages of development. Therefore, this study focuses on the academic achievements of master's students, explores how the flipped classroom model influences academic achievement and seeks strategies to enhance educational quality, which holds significant theoretical and practical significance.

Research Objective (s)

Under the current background of educational reform, the quality and effectiveness of graduate education have attracted widespread attention. As an emerging teaching model, the flipped classroom's influence on students' learning engagement and academic achievement has become a hot topic in educational research. In order to better understand the actual application and effects of this model among graduate students at University N, this study has set a series of research objectives:

Objective 1: Investigate the overall perception of learning engagement among graduate students at University N.

Objective 2: Investigate the overall perception of academic achievement among graduate students at University N.

Objective 3: Investigate the overall perception of the flipped classroom model among graduate students at University N.

Objective 4: Explore the impact of different individual characteristics (such as gender, significant, and year of study) on learning engagement among graduate students at University N.

Objective 5: Explore the impact of different individual characteristics (such as gender, significant, and year of study) on academic achievement among graduate students at University N.

Objective 6: Examine the influence of different individual characteristics (such as gender, central, and year of study) on the flipped classroom model among graduate students at University N.

Objective 7: Investigate the relationships between learning engagement, academic achievement, and the flipped classroom model among graduate students at University N.

Literature Review

Learning Engagement

Learning engagement has been widely researched and interpreted since it was proposed over

70 years ago. In recent years, scholars such as Fredricks et al. (2004) have viewed learning engagement as a comprehensive construct involving behavioral, emotional, and cognitive aspects. Chinese scholars like Yang, L., & Han, X. (2014) have analyzed the impact of three-dimensional learning engagement factors, environmental factors, and five-dimensional learning engagement indicators on educational outcomes. They found that cognitive engagement is most strongly correlated with behavioral engagement, highlighting the multidimensional nature of learning engagement and its positive effects on students' academic achievement.

Flipped Classroom Model

The flipped classroom model, introduced in 2000, has rapidly evolved, with its core focus being on reversing the sequence of students' acceptance and internalization of learning content. Qin, W. (2013) considers the flipped classroom as a new learning approach, emphasizing student-led learning outside the classroom through teaching videos and materials and completing assignments and in-depth discussions in class under the teacher's guidance. Li, B., Hou, Y., & Wei, L. (2017) understand the flipped classroom as a teaching model that addresses specific practical problems and completes learning tasks, highlighting its importance in promoting students' critical thinking and independent learning abilities.

Academic Achievement

Research on academic achievement has broadened in recent years from solely focusing on academic grades to more comprehensive evaluations. Gao, W. (2021) defines academic achievement for graduate students as the sense of achievement in knowledge, abilities, and moral cultivation obtained through course learning and research training. Liu, Y. (2021) found that academic achievement for master's students includes not only course grades but also research output and the development of comprehensive abilities, reflecting the diversification and deepening of academic achievement assessment.

Theories used in This Study

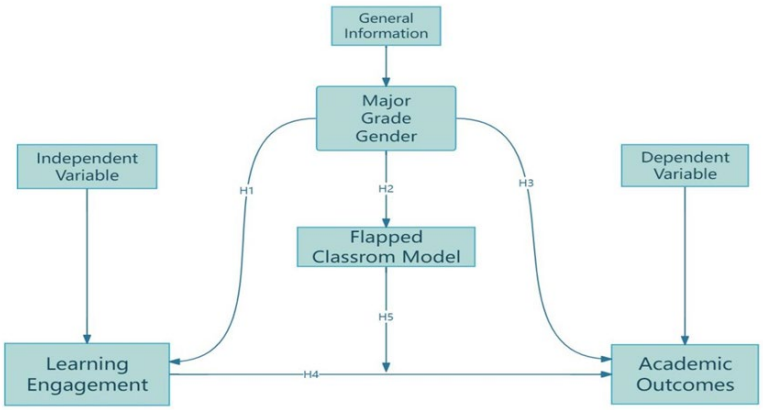
This study delves into constructivist theory, self-efficacy theory, effort quality theory, and Biggs' 3P theory, providing critical perspectives for understanding students' learning processes, enhancing learning efficiency, and achieving academic success. The constructivist theory emphasizes learners actively constructing knowledge through interaction with the environment; self-efficacy theory indicates that individuals' assessment of their ability to complete tasks influences learning motivation and behavior; effort quality theory suggests that learning outcomes are closely related to the time and effort individuals invest in learning; Biggs' 3P theory breaks down the learning process into premises, processes, and outcomes, providing a systematic model for analyzing the learning process. These theories support a deeper analysis of the relationship between learning engagement and academic achievement and offer theoretical guidance for educational practices.

Relationship between Learning Engagement and Academic Achievement

Research indicates that learning engagement positively predicts academic achievement, meaning that students' active participation and investment can enhance their academic performance. Researchers have found a positive correlation between learning engagement and academic achievement through different methods and samples Maamin, M. (2021) and Xie, T. (2018). Furthermore, learning engagement is also seen as a mediating variable that affects the relationship between individual psychological characteristics and academic achievement. Studies by Erdoğdu, M. Y. (2019) and Liao, Y. G. (2014) suggest that learning engagement mediates the relationship between students' attitudes, commitment, self-efficacy, and academic performance. These research findings collectively demonstrate that learning engagement is not only a direct predictor of academic achievement but may also mediate between other psychological variables and academic achievement, emphasizing the importance of learning engagement in the educational process.

The Conceptual Framework

(Pic. 1) provides a clear theoretical framework for this study, integrating key concepts such as learning engagement, flipped classroom model, and academic achievement into a unified analytical framework. This framework helps us systematically organize and understand the various variables and their potential connections in existing literature, guiding the design of research methods to ensure the focus and relevance of the study. Through this framework, we can more clearly identify the main variables, understand their interactions, and predict the possible impact of these variables on academic achievement.



Picture 1: Research Conceptual Framework

Methodology

Research Design

This study uses a survey questionnaire to construct a linear regression model to analyze the impact of graduate students' learning engagement on academic achievement at University N, providing a basis for theoretical development and practical operations. The research first employs confirmatory

factor analysis (CFA) to validate the measurement model fit of the three constructs: learning engagement, flipped classroom model, and academic achievement. The results of CFA support a significant positive correlation between learning engagement and academic achievement.

Scales Measurement

The Learning Engagement Scale: The "Graduate Students' Learning Engagement Scale" developed by Fu Yujie (2018) consists of 17 items and is rated using a Likert five-point scale. The scale demonstrates good reliability. The Likert five-point scale ranges from "Strongly Disagree" to "Strongly Agree". The Flipped Classroom Model Scale: Based on the scale developed by Qi (2022), this scale includes 21 items and measures students' satisfaction with the flipped classroom model. It also utilizes a Likert five-point scale, with response options ranging from "Strongly Disagree" to "Strongly Agree."

The Academic Achievement Scale: The "Master's Graduate Academic Achievement Scale" developed by Yang (2023) contains 13 items covering theoretical knowledge, research innovation ability, and other aspects. It also employs a Likert five-point scale, with response options ranging from "Strongly Disagree" to "Strongly Agree."

Sample Selection

This study utilizes cluster sampling in probability sampling, selecting graduate students from University N as the population. According to Taro Yamane's sample size table, along with a 95% confidence level and 5% sampling error, the minimum required sample size is calculated to be 353 individuals. To enhance the accuracy of the research results and generalizability of conclusions, 430 questionnaires were distributed and collected. After removing invalid questionnaires, 423 valid questionnaires were obtained, resulting in an effective response rate of 98.37%.

Data Analysis Methods

Data analysis includes frequency analysis, independent samples t-test, one-way analysis of variance, one-sample t-test, two-tailed test, factor analysis, and linear regression analysis. These methods aim to comprehensively evaluate the relationships between individual characteristic variables, innovation orientation, academic achievement, and the flipped classroom model.

Reliability and Validity Analysis of Scales

Reliability Analysis: Cronbach's alpha coefficient is used for reliability analysis, with results indicating alpha coefficients of 0.984 for the Learning Engagement Scale, 0.986 for the Academic Achievement Scale, and 0.956 for the Flipped Classroom Model Scale, all exceeding 0.8, demonstrating high internal consistency of the scales.

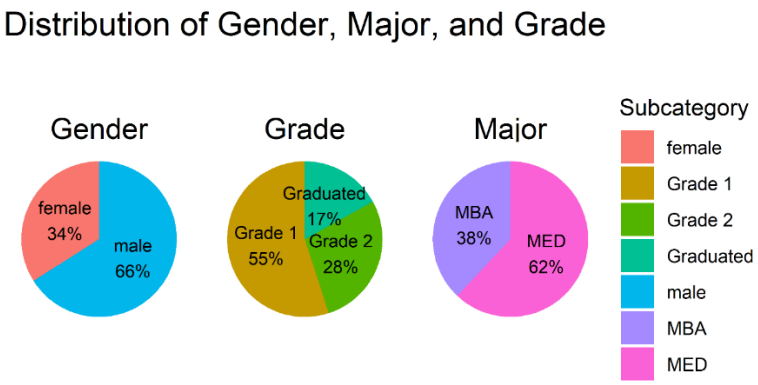
Results

Demographic Characteristics Statistics

In the sample of 423 graduate students, male students account for a more significant proportion,

with 281 individuals representing 66% of the sample. In contrast, there are 142 female graduate students, accounting for 34%. This gender ratio is crucial for assessing the potential impact of gender on academic achievement.

Regarding major distribution, students from the Master of Education (MED) program dominate the sample, with 261 individuals accounting for a high proportion of 62%. This indicates the significant role of the Master of Education program in graduate education at University N. Students from the Master of Business Administration (MBA) program also have a high level of participation, with 162 individuals surveyed, accounting for 38%. Regarding grade distribution, first-year graduate students constitute the largest group in the sample, with 234 individuals participating in the survey, accounting for 55%.



Picture 2: Distribution of Gender, Major, and Grade

This suggests that we have obtained substantial data on the early learning engagement of graduate students, which is crucial for understanding the role of learning engagement in the early stages of academic performance. Second-year graduate students comprise 120 individuals, accounting for 28%, while graduates comprise 16% of the sample, with 69 individuals. Graduates' participation allows us to track the long-term effects of learning engagement on academic achievement. Please refer to Figure 2 for specifics.

Analysis of Variables

Dimension analysis of the questionnaire survey revealed three key variables: learning engagement, flipped classroom model, and academic achievement.

Table 1: Survey Items and Dimensions

Contents	Dimensions	Variables
LE1-LE17	Learning Engagement	Learning Engagement
AO1-AO13	Academic Outcomes	Academic Outcomes
FCM1-FCM21	Flipped Classroom Model	Flipped Classroom Model

CFA Results Confirmation

The results of the Confirmatory Factor Analysis (CFA) demonstrate that the loadings of each variable are relatively high. For instance, the loadings for learning engagement range from 0.744 to 0.918; for academic achievement, they range from 0.806 to 0.966; and for the flipped classroom model, they range from 0.624 to 0.788. These findings indicate a robust structural validity of the scale.

Correlation Table Results

The correlation table reveals the relationships between different variables. When analyzing the correlation matrix of graduate students at University N, several critical relationships among variables become apparent.

Firstly, a strong positive correlation of 0.949 exists between learning engagement (LE) and academic achievement (AO), indicating that the more students engage in learning, the higher their academic achievement. This further confirms the crucial role of learning engagement in improving academic performance. Secondly, a negative correlation of -0.311 is observed between grade level (Grade) and learning engagement (LE), suggesting that as students' progress to higher grades, their engagement in learning may decrease. Similarly, a negative correlation of -0.283 exists between grade level (Grade) and academic achievement (AO), possibly reflecting a decline in students perceived or actual academic performance as they advance in grade level.

The weak positive correlation (0.163) between gender (Gender) and the flipped classroom model (FCM) is noteworthy, implying that gender may have a subtle impact on satisfaction with the flipped classroom model. However, this influence is not particularly strong. The negative correlation of -0.232 between major (Major) and grade level (Grade) suggests differences in the distribution of students across different grade levels in various majors, possibly related to the characteristics of the majors or the curriculum setup. These notable correlations provide insight into the relationship between students' learning behavior and academic performance, offering valuable data support for educational practices and policy formulation. In further research, these findings can serve as a starting point for exploring the complex dynamics between learning engagement, teaching methods, and academic achievement.

Table 2: Correlation Coefficient

Term	Gender	Major	Grade	LE	AO	FCM
Gender	1.000					
Major	-0.076	1.000				
Grade	0.129	-0.232	1.000			
LE	-0.036	0.081	-0.311	1.000		
AO	0.007	0.093	-0.283	0.949	1.000	
FCM	0.163	0.033	-0.075	0.006	0.008	1.000

T-Test Results

According to the inferential statistical results provided, it can be seen that there is no significant difference between Group 1 and Group 2 in terms of academic outcomes and learning engagement. Specifically, the statistics show -0.137 with a p-value of 0.891, indicating that the differences in academic outcomes and learning engagement between the two groups are not statistically significant ($p>0.05$). However, the situation is different for the Flipped Classroom Model. There is a significant difference between Group 1 and Group 2 in this aspect. Specifically, the statistics show -3.539 with a p-value of 0.000462, indicating that the Flipped Classroom Model significantly impacts the two groups, and this difference is statistically significant ($p<0.05$). Therefore, the data results show that while there is no significant difference between the two groups in terms of academic outcomes and learning engagement, there is a significant difference in the effectiveness of the Flipped Classroom Model between the two groups. This suggests that the Flipped Classroom Model may affect different student groups differently, warranting further research and exploration.

Table 3: T-Test Results of Gender across Variables

Group1	Group2	n1	n2	Statistic	df	P Value	Variable
1	2	281	142	0.711	261	0.478000	Learning Engagement
1	2	281	142	-0.137	257	0.891000	Academic Outcomes
1	2	281	142	-3.539	317	0.000462	Flipped Classroom Model

Based on the T-test results from Table 4, the differences between Group 1 and Group 2 regarding Learning Engagement and Academic Outcomes did not reach statistical significance ($p>0.05$). Specifically, the statistic for Learning Engagement was -1.679 with a p-value of 0.0940, and for Academic Outcomes, it was -1.952 with a p-value of 0.0517. This indicates that the differences between the groups in these two aspects have not reached a significant level, but the p-values are close to 0.05, suggesting a potential trend. However, for the Flipped Classroom Model, no significant differences were observed between Group 1 and Group 2 ($p>0.05$). The statistic was -0.675 with a p-value of 0.5000, indicating that students from both groups performed similarly regarding the Flipped Classroom Model.

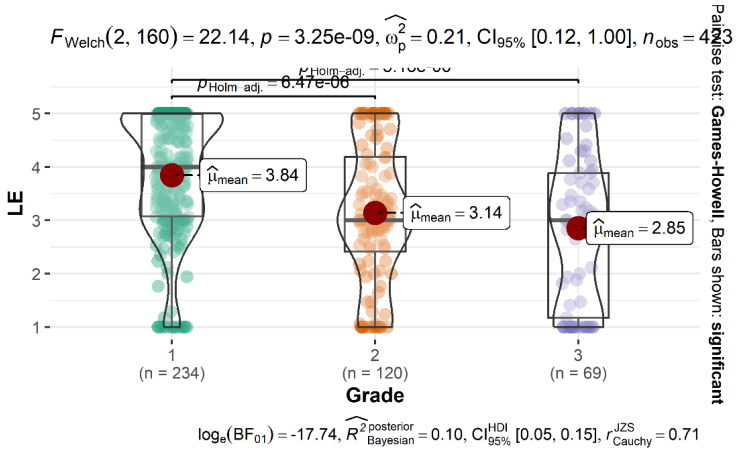
While there are some Learning Engagement and Academic Outcomes trends, these differences have not reached statistical significance. Furthermore, the Flipped Classroom Model did not significantly impact students from these two groups.

Table 4: T-Test Results of Major across Variables

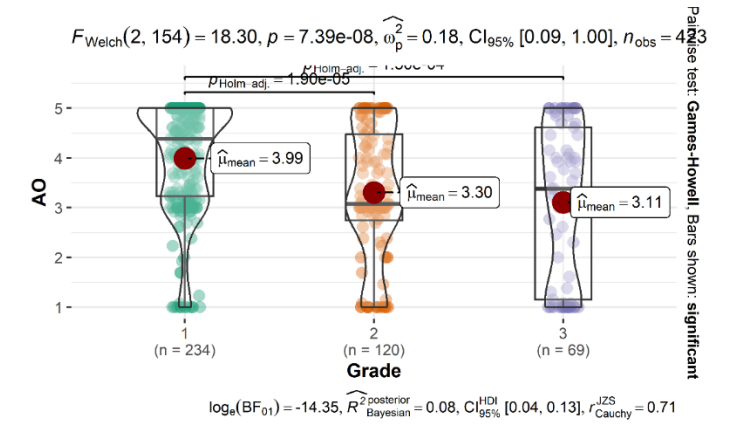
Group1	Group2	n1	n2	Statistic	df	P Value	Variable
1	2	261	162	-1.679	356	0.0940	Learning Engagement
1	2	261	162	-1.952	363	0.0517	Academic Outcomes
1	2	261	162	-0.675	341	0.5000	Flipped Classroom Model

ANOVA Test

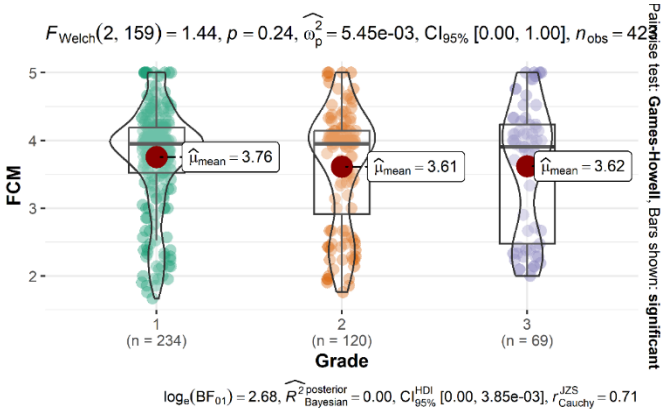
In a one-way analysis of variance conducted on graduate students at N University, we focused on three variables: Learning Engagement (LE), Academic Outcomes (AO), and Flipped Classroom Model (FCM), examining their differences across different academic years. Here is the analysis based on the p-values: 1. Learning Engagement (LE) comparison across different academic years revealed a significant statistical difference, with a p-value of 7.39e-08, well below the 0.05 significance level. This indicates that the academic year is an essential factor influencing Learning Engagement, suggesting that students' engagement levels may change as they progress through their academic years. 2. The p-value for the Flipped Classroom Model (FCM) was 3.25e-09, also significantly lower than 0.05, indicating a significant impact of the academic year on the satisfaction with the Flipped Classroom Model. This could imply that students from different academic years exhibit significant differences in acceptance and satisfaction with the Flipped Classroom Model. 3. Regarding Academic Outcomes (AO), the analysis did not show significance, with a p-value of 0.24, higher than 0.05. This suggests insufficient evidence to support significant differences in academic achievement among students from different academic years; the academic year does not significantly impact students' academic performance.



Picture 3: ANOVA Test of Grade and LE



Picture 4: ANOVA Test of Grade and AO



Picture 5: ANOVA Test of Grade and FCM

In summary, based on the results of the analysis, the academic year significantly impacts learning engagement and the flipped classroom model, but not academic outcomes. These findings are crucial for understanding the needs and preferences of students at different stages of their academic journey and can provide valuable guidance for educational practices.

Structural Equation Modeling (SEM) Results

Structural Equation Modeling (SEM) results provide quantitative estimates of the relationships between variables. Learning Engagement (LE) significantly impacts Academic Outcomes (AO) in the model. Specifically, the regression coefficient (Est) is 1.087, indicating that for every one-unit increase in Learning Engagement, Academic Outcomes increase on average by 1.087 units. This impact is statistically significant, as the p-value is 0.000, much lower than the significance level of 0.05. The 95% confidence interval (Ci. Lower and Ci. Upper) does not include 0, further confirming this significance. The standard error (Se) is 0.054, and the Z-statistic is 20.183, indicating a substantial effect size.

On the other hand, the impact of the Flipped Classroom Model (FCM) on Academic Outcomes (AO) is minimal, with a regression coefficient (Est) of only 0.006. This means that for every one-unit increase in FCM, AO only increases by an average of 0.006 units. This impact is not statistically significant, as the p-value is 0.792, much higher than 0.05. The 95% confidence interval also includes 0, suggesting that FCM has no significant predictive power for AO. Furthermore, the Z-statistic is 0.263, indicating that the influence of FCM on AO is insignificant.

Table 5: SEM Result

LHS	Op	RHS	Label	Est	Se	Z	P-Value	Ci. Lower	Ci. Upper
AO	~	LE	c	1.087	0.054	20.183	0.000	0.982	1.193
AO	~	FCM	a	0.006	0.024	0.263	0.792	-0.041	0.054
FCM	~	LE	b	0.004	0.034	0.108	0.914	-0.063	0.071

Discussion

This study aims to explore the relationships between Learning Engagement (LE), Academic Outcomes (AO), and the Flipped Classroom Model (FCM) among graduate students at University N. Through a comprehensive analysis of the results of one-way ANOVA, linear regression analysis, and independent sample t-tests, we have made several meaningful discoveries, which we will discuss in the following paragraphs.

1. Relationship between Learning Engagement and Academic Outcomes

Our linear regression analysis results indicate that Learning Engagement significantly predicts Academic Outcomes. This finding aligns with existing theories in educational psychology, which suggest that students' active involvement and engagement are critical factors in improving academic performance. Specifically, for every one-unit increase in students' LE levels, their AO levels increase by an average of 1.087 units, a statistically significant effect. This emphasizes the importance of encouraging and promoting student engagement in educational practices.

2. Impact of Academic Year on Learning Engagement

One-way ANOVA revealed a significant impact of the academic year on Learning Engagement. This may reflect the different academic demands and pressures that students face at various stages of their study, as well as their adaptation of learning strategies and motivation. This finding suggests that educators must consider differences in academic years and provide customized support and resources for students at different levels.

3. Influence of Gender and Major on Academic Outcomes and Learning Engagement

The results of independent sample t-tests indicate no significant differences in Academic Outcomes and Learning Engagement based on gender and major. This suggests that academic outcomes and learning engagement are influenced by multiple factors, not just gender or significant background. However, this finding does not rule out the possibility that gender and major background may play a role in other educational environments.

4. Effectiveness of the Flipped Classroom Model

Regarding the Flipped Classroom Model (FCM), our research results indicate that students from different academic years respond differently to it, while the influence of gender and significant is less apparent. This suggests that the effectiveness of the FCM may need to be adjusted based on the student's academic year and study stage to ensure its efficacy. Additionally, the lack of a significant impact of FCM on Academic Outcomes suggests that further exploration of its mechanisms in different educational contexts may be necessary.

In summary, our research results emphasize the central role of Learning Engagement in improving graduate students' academic outcomes and reveal the potential variability of the Flipped Classroom Model across different student groups. These findings are significant for educational

policymakers, curriculum designers, and educational practitioners, highlighting the need for them to comprehensively consider individual differences and study stages when designing and implementing educational strategies. Through further research and practice, we can better understand how to optimize the learning environment to promote the academic achievements of all students.

Conclusions

In this study, we conducted an in-depth exploration of the relationships among learning engagement (LE), academic outcomes (AO), and the flipped classroom model (FCM) among graduate students at N University. Through a comprehensive analysis of one-way ANOVA, linear regression analysis, and independent samples T-tests, we have reached the following conclusions:

(1) Learning engagement has a significant positive impact on academic outcomes. Through linear regression analysis, we found that increased learning engagement significantly predicts improving academic outcomes (β=1.087, $p<0.001$). This finding emphasizes that investing more time and energy in learning can significantly enhance students' academic performance.

(2) Grade level significantly affects learning engagement, with differences observed among students in different grades. However, gender and major did not show significant differences in academic outcomes and learning engagement, suggesting that these demographic characteristics may not directly influence academic achievement and learning engagement.

(3) The flipped classroom model exhibits significant differences across different grades, but its impact on academic outcomes is insignificant. The independent samples T-test (Table 3) indicates a significant difference between gender and the flipped classroom model, which may imply that students of different genders have varying experiences and responses to the flipped classroom model. However, the impact of major on the flipped classroom model is insignificant (Table 4), suggesting that students from different majors may have similar experiences with this teaching strategy.

In summary, our research findings underscore the pivotal role of learning engagement in enhancing academic achievement and reveal the potential variability of the flipped classroom model among different student groups. These insights provide valuable guidance for educational practice, particularly in considering students' learning engagement and individual differences when designing and implementing teaching strategies. Additionally, they suggest that future research should further explore the effectiveness and applicability of the flipped classroom model in various educational contexts, as well as how to optimize it according to the specific needs of students.

Research Limitations and Future Studies

In this study, we explored the interrelationships among learning engagement, academic achievement, and the flipped classroom model and identified several limitations that directly inform specific recommendations for future research.

Firstly, since our sample was drawn from a single university, this may limit the generalizability of the study's findings. It is recommended that future research broaden the scope of the sample to include student populations from different regions and academic disciplines, thereby enhancing the generalizability of the results.

Secondly, the study did not establish causality, necessitating more rigorous experimental designs or longitudinal research methods in future studies to uncover the causal relationships between learning engagement and academic achievement.

Additionally, other variables may not be considered in this study, such as learning motivation and teaching methods, which could also significantly impact academic achievement. Future research is advised to delve into these potential variables to gain a more comprehensive understanding.

Furthermore, the implementation details of the flipped classroom model were not fully elaborated in this study, which may affect the interpretation of the results. It is suggested that future research include a detailed analysis of different implementation approaches of the flipped classroom model and explore how these approaches affect students' learning experiences and academic achievements.

Lastly, as this study primarily utilized quantitative research methods, future research could benefit from incorporating qualitative research methods, such as interviews and case studies, to better understand students' experiences and perspectives, thus providing a richer interpretation of the data.

In summary, the limitations of this study provide a clear direction for future research. By expanding the sample size, adopting more rigorous research designs, considering a broader range of potential influencing factors, thoroughly analyzing the implementation details of the flipped classroom model, and combining qualitative research methods, future studies will be able to offer more comprehensive and in-depth insights, contributing to the improvement of educational practices and the enhancement of student's academic achievements.

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