International Journal of Sociologies and Anthropologies Science Reviews
Volume 5 Issue 5: September-October 2025: ISSN 2985-2730
Website: https://so07.tci-thaijo.org/index.php/IJSASR/index

The Impact of Learning Motivation on Learning Engagement of Undergraduates: The Mediating Role of Academic Self-efficacy and Major Identity

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Received 18/03/2025 Revised 01/04/2025 Accepted 17/05/2025

Abstract

Background and Aim: In this era of rapidly advancing technological and industrial revolution, the demand for talent in terms of quantity and type has reached a new stage. However, undergraduate students in applied programs often lack clear learning objectives and suffer from the disconnect between theory and practice. These issues lead to low learning engagement, which has an obvious negative impact on learning outcomes. This study aims to explore the basic situation of learning motivation, academic self-efficacy, major identity, and learning engagement among students in newly established applied undergraduate institutions, as well as the relationships between these variables and strategies to enhance learning engagement.

Materials and Methods: This study used convenience sampling, selecting undergraduates from three newly established applied undergraduate institutions in Henan Province as the research subjects. We distributed electronic questionnaires and collected 1,156 valid samples. Then, we conducted analyses, including independent - samples T - test, ANOVA, Pearson correlation analysis, confirmatory factor analysis, and Amos structural equation modeling analysis using SPSS 27.0 and AMOS 22, to draw the research conclusions.

Results: The positive impact of learning motivation, academic self-efficacy, and major identity on learning engagement is significant; Academic self-efficacy and major identity play a mediating role in the impact of learning motivation on learning engagement.

Conclusion: Based on the above research results, effective strategies that can significantly enhance the learning engagement of students in newly established applied undergraduate colleges are explored, in order to cultivate talents for Chinese-style modernization and promote national development.

Keywords: Learning Motivation; Major Identity; Academic Self-efficacy; Learning Engagement

Introduction

Globally, a comprehensive and systemic transformation is underway. Technological and industrial revolutions are advancing rapidly, innovation is accelerating, and all industries are undergoing unprecedented changes and reshaping. As Flexner (1910) noted, universities reflect the times and have the power to influence the present and future. Education, a key area with far-reaching impacts on society and influenced by various factors, now faces unique challenges. Higher education must respond quickly to these changes so that students can meet professional challenges and adapt to national economic transformation and upgrading. In higher education, institutions have different talent - cultivation goals and are classified into three types: research - oriented, applied - oriented, and vocational - skills - oriented. Unlike research-oriented universities, applied-oriented ones focus on cultivating talents with practical skills through application-driven research, promoting social and technological progress, and comprehensive economic and social development. In recent years, supported by national policies, applied-oriented undergraduate education has reached a new stage. Amid rapid development, application-oriented undergraduate institutions currently in transition face dual demands: adapting to new educational trends and market needs, while confronting significant challenges, particularly enhancing college students' learning engagement. There is also a pressing need to cultivate practical talent with both innovative and entrepreneurial qualities to meet societal demands. This study focuses on exploring how learning motivation, academic self-efficacy,

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and major identification among undergraduates in newly established application-oriented institutions influence learning engagement. The goal is to boost students' academic involvement, improve their academic performance and personal growth, and ultimately enhance the quality of talent cultivation.

Objectives

This study centers on students at applied-oriented undergraduate colleges in Henan Province, China. Using convenience sampling, it unveils their real-world situations in key aspects: learning motivation, academic self-efficacy, major identity, and learning engagement. It delves into the internal links between these factors and offers multi-dimensional references. For university education administrators and teachers, it provides a practical reference to boost the learning engagement of undergraduates at newly established applied-oriented institutions.

1. How do learning motivation, major identity, and academic self-efficacy collectively influence the learning engagement of undergraduates at newly established applied-oriented institutions in China?
2. What mediating mechanisms exist among these factors to inform effective strategies for enhancing student engagement?
3. What evidence-based interventions can be designed to enhance learning engagement by targeting key drivers (motivation, identity, self-efficacy) and their interactions?

Literature review

At present, the field of higher education is undergoing a crucial transformation, with its development goals and direction focusing on the path of connotation-oriented development, placing greater emphasis on exploring the depth and breadth of education. It has shifted from a previous singular focus on scale expansion to moderate-scale development centered on quality improvement. This is also the theoretical achievement and practical exploration of China's long-term pursuit of distinctive higher education (Zhang, 2018). To achieve this goal, the quality of higher education urgently needs to be continuously enhanced. Students' learning engagement and dedication will become the key factors in determining the improvement of teaching and educational quality. The depth of students' learning engagement is fully integrated into the entire process of personal growth and academic advancement, having a far-reaching and lasting impact on individual development and academic achievement, and is closely related to whether students can complete their studies (Yuan,2020). In the field of higher education at home and abroad, the study of learning engagement has always been a key issue, running through educational development and guiding the improvement of quality and the cultivation of talents (Long & Ni,2020). Learning engagement has become a key variable that determines learning outcomes (Xie, 2020). Learning engagement is closely related to many key factors. It is not only deeply associated with students' sustained learning motivation and satisfaction with their studies but also has a significant impact on the display of academic achievements and the ultimate degree of achievement of educational goals (Kuh, 2009). Looking back at the past decade, the concept and measurement of learning engagement have increasingly attracted the attention of researchers (Bond & Bedenlier,2019). Moreover, among the many indicators for evaluating the quality of university education, learning engagement is in the category of key core indicators (Kuh, 2009). Learning engagement is regarded as a quality evaluation standard on par with educational outcomes, resource allocation, school reputation, and value addition, forming a key and indispensable part of the relevant research field.

By searching the Chinese and English databases of China National Knowledge Infrastructure (CNKI), Google Scholar, and Web of Science, which are domestic and international literature resource libraries, it is found that most researchers have directly explored the correlation between learning motivation, academic self-efficacy, Major identity, and learning engagement, or studied the correlation between learning motivation, academic self-efficacy, Major identity, and learning engagement as separate mediating variables and other learning factors. For example, Pan (2020) used structural equation modeling and bootstrap analysis methods to deeply analyze how the three teachers' online feedback, student learning

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motivation, and learning engagement interact and influence each other. Wu (2020) conducted a national survey focusing on medical students, delving into the close relationship between their learning motivation and academic performance, and at the same time, analyzing the key mediating role of self-efficacy in promoting learning engagement. Yang (2023) selected 680 master's degree students as research subjects for a questionnaire survey, aiming to analyze the actual current situation of their academic self-efficacy, learning engagement, and academic achievement, and then used scientific research methods to deeply explore the correlation patterns among the three. However, there is still a lack of research on the interaction between the four elements of academic self-efficacy, learning motivation, Major identity, and learning engagement, especially the rare research on how academic self-efficacy and learning motivation play a role through the mediating mechanism of learning engagement.

Conceptual Framework

This study is based on the Reciprocal Determinism proposed by Bandura (1977) in his Social Learning Theory, and draws on literature concerning the relationships between learning motivation, academic self-efficacy, Major identity, and learning engagement. It is determined that learning motivation consists of two dimensions: intrinsic motivation and extrinsic motivation (Chi & Xin,2006). Academic self-efficacy is found to be unidimensional (Schwarzer, Mueller & Greenglass,1999). Major identity encompasses four aspects: cognitive, affective, behavioral, and appropriateness (Qin,2009). After organizing the information, this study presents a structural diagram, as shown in Figure 1.

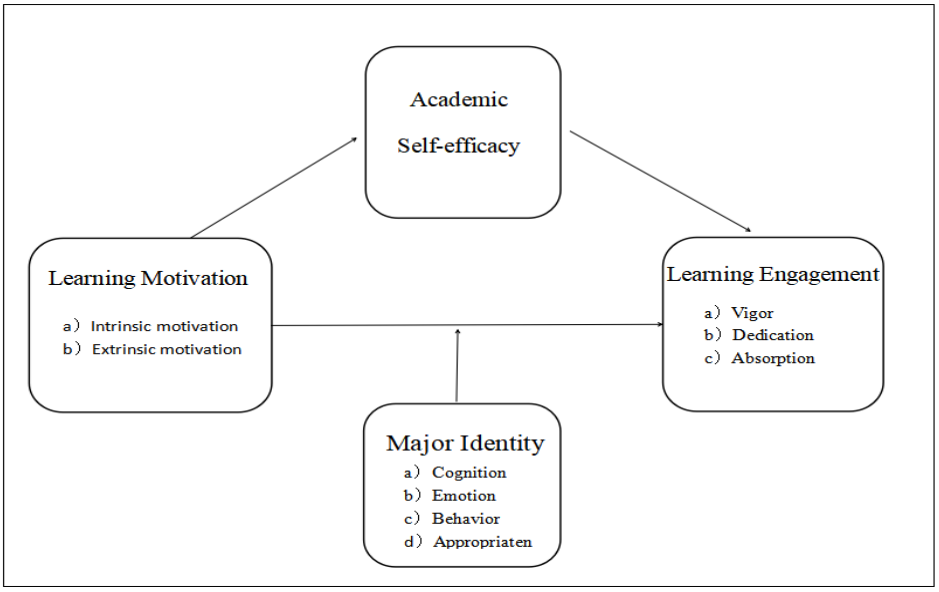

Figure 1 Research Framework
Note: Constructed by the researcher

Methodology

To ensure its comprehensiveness and scientific nature, this study employed research methods including literature review, questionnaire survey, and quantitative data analysis. To extensively gather domestic and international academic literature on undergraduates' learning motivation, major identity, academic self-efficacy, and learning engagement at newly established applied-oriented undergraduate institutions. Meanwhile, deeply investigate and analyze the collected literature from various angles and levels. Extract theoretical underpinnings and research trends regarding relevant variables. Delve into the theoretical foundations of academic pursuits. Then, based on research goals and framework, carefully design a questionnaire with questions on the dependent variables of learning motivation, major identity, academic self - efficacy, and learning engagement, and questionnaires were distributed to 1,200 students across four academic years (grades) at three newly-established applied-oriented undergraduate institutions

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in Henan Province, and 1,156 valid questionnaires with a recovery rate of 96.3% were collected. Use SPSS for an in-depth evaluation of the questionnaire's reliability and validity to ensure effectiveness. Next, build a statistical model using data from the questionnaire and literature review to explore relationships between variables. Utilize AMOS for model-fitting of the questionnaire data, covering model fit evaluation and path coefficient estimation, which reveals relationships between variables and their specific impact on learning engagement.

Results

1. Procedure for Administering the Pretest Questionnaire and Project Analysis, as well as Validity and Reliability Tests

In this study, when administering the questionnaire, a pilot questionnaire was first used to initiate the testing process. After conducting item analysis to check the discriminability and performing reliability and validity tests on the questionnaire, the formal questionnaire was then administered. For each department, 1-2 classes were selected from freshmen to seniors for group testing. For each class, 1-2 proctors were first selected. After the questionnaires were collected in this survey, the completion of the questionnaires was first checked. Of the 215 electronic questionnaires recovered from the three institutions, 209 valid questionnaires were obtained after screening out invalid ones (abnormal values, excessively long or short response times, and patterned answering). After the pilot questionnaires were collected, this study used SPSS 27.0 software to lead the item analysis process, focusing on validity testing through Exploratory Factor Analysis (EFA) to verify the reliability and validity of the questionnaire. At the same time, a comprehensive Confirmatory Factor Analysis (CFA) was carried out to construct the formal questionnaire for this study.

This study employed the item analysis criteria of Wu (2008), dividing item analysis into three categories: extreme group comparison, correlation analysis, and homogeneity testing, with six judgment criteria. If two or more indicators were not met, the item was deleted. For extreme group comparison, the total sum of all items was divided into two groups, with the top and bottom 27% forming the high and low groups, respectively. A t-test was conducted on the mean scores of each item for the two groups of respondents to obtain the t-value and determine its significance. A critical ratio (CR) of ≥3.0 and a significant difference indicated that the item had good discriminability; otherwise, it was considered for deletion. Through correlation and homogeneity testing, the item analysis and reliability and validity tests of the four pilot scales - the Learning Motivation Scale, the Academic Self-efficacy Scale, the Learning Engagement Scale, and the Major Identity Scale - revealed that four items were deleted from the Learning Motivation Scale, leaving 26 items; five items were deleted from the Learning Engagement Scale, leaving 12 items; one item was deleted from the Major Identity Scale, leaving 22 items; and all items in the Academic Self-efficacy Scale were retained. Thus, the formal questionnaire was compiled. Combined with AMOS 22.0 software, a Confirmatory Factor Analysis (CFA) was carried out on the obtained data. Since the correlation analysis results showed that the pilot questionnaire in this survey was confirmed to have good reliability, the formal questionnaire was then compiled to enable more precise subsequent research work.

2. The Test of the Reliability and Validity of the Overall Scale

Firstly, the overall data of the scale was processed and analyzed, and the results showed that the overall Cronbach's α coefficient of the scale was 0.964, which is greater than 0.7, as shown in Figure 1. Therefore, the reliability of the results of this survey is extremely good.

Table 1 Overall Reliability Test and Analysis of the Scale

Dimension	Corrected for Item Total Correlation （CITC）	The item has been deleted Cronbach's Alpha Value	Cronbach's *α*
DJ1_1	.500	.963	0.964
DJ1_3	.601	.963	
DJ1_4	.593	.963	
DJ1_5	.549	.963	
DJ1_6	.629	.963	
DJ1_7	.598	.963	

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Dimension	Corrected for Item Total Correlation（CITC）	The item has been deleted Cronbach's Alpha Value	Cronbach's *α*
DJ1_8	.567	.963	
DJ1_9	.628	.963	
DJ1_10	.611	.963	
DJ1_11	.568	.963	
DJ1_12	.574	.963	
DJ2_1	.430	.963	
DJ2_2	.456	.963	
DJ2_3	.549	.963	
DJ2_4	.514	.963	
DJ2_5	.554	.963	
DJ2_6	.547	.963	
DJ2_7	.586	.963	
DJ2_8	.514	.963	
DJ2_9	.497	.963	
DJ2_10	.529	.963	
DJ2_11	.578	.963	
DJ2_12	.567	.963	
DJ2_13	.596	.963	
DJ2_16	.564	.963	
TR1_1	.537	.963	
TR1_4	.507	.963	
TR1_5	.502	.963	
TR2_1	.671	.963	
TR2_2	.666	.963	
TR2_3	.629	.963	
TR2_4	.634	.963	
TR2_5	.627	.963	
TR3_1	.609	.963	
TR3_2	.585	.963	
TR3_3	.578	.963	
TR3_5	.552	.963	
ZY1_1	.489	.963	
ZY1_2	.457	.963	
ZY1_3	.476	.963	
ZY1_4	.465	.963	
ZY1_5	.491	.963	
ZY2_1	.440	.963	
ZY2_2	.466	.963	
ZY2_3	.443	.963	
ZY2_4	.482	.963	
ZY2_5	.447	.963	
ZY2_6	.469	.963	
ZY2_7	.510	.963	
ZY2_8	.430	.963	
ZY3_1	.494	.963	
ZY3_2	.515	.963	
ZY3_3	.511	.963	
ZY3_4	.469	.963	
ZY3_5	.481	.963	
ZY3_6	.480	.963	
ZY4_2	.484	.963	

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Dimension	Corrected for Item Total Correlation （CITC）	The item has been deleted Cronbach's Alpha Value	Cronbach's α
ZY4_3	.502	.963	
ZY4_4	.516	.963	
XN2	.419	.963	
XN3	.386	.963	
XN4	.430	.963	
XN5	.374	.963	
XN6	.265	.964	
XN7	.399	.963	
XN8	.409	.963	
XN9	.362	.963	
XN10	.322	.964	

The CITC (Corrected Item-Total Correlation) is used to identify the correlation between each item and the overall scale. Items with a CITC correlation coefficient below 0.3 should be deleted. After reliability analysis, it was found that the correlation between items and the total score in this questionnaire was all above 0.3. According to Table 1, the results show that all items are related to the overall scale and have discriminability.

The overall data of the scale was subjected to KMO and Bartlett tests using SPSS 27.0, and the results are shown in Table 2. The KMO value of the questionnaire is 0.957, which is greater than 0.9. The observed value of Bartlett's sphericity test is 46999.640, with a significance level of 0.000, which is less than 0.01. This indicates that the variables are not antagonistic but share common factors, suggesting that this set of sample data has a high degree of correlation and is highly suitable for factor analysis. It also indicates that the validity of the overall scale is extremely good.

Table 2 Overall Scale Validity Analysis

		Overall Scale
KMO		0.957
Bartlett's Test for Sphericity	**Approximate Chi-square**	46999.640
	Df	2485
	Sig	0.000

3. Correlation Analysis

This study used Pearson correlation analysis in SPSS to examine the correlation between learning engagement, learning motivation, academic self-efficacy, and major identity among students in newly established applied undergraduate colleges. The Pearson correlation coefficient was used to verify the strength of the correlation between variables. The detailed analysis results are presented in Table 3.

Table 3 Pearson Correlation Analysis of Learning Engagement, Learning Motivation, Academic Self-Efficacy, and Major Identity

Dimension	Average Value	Standard Deviation	learning motivation	Learning Engagement	Major Identity	Academic Self-efficacy
Learning Motivation	4.295	0.418	1			
Learning Engagement	4.200	0.448	.593**	1		
Major Identity	4.447	0.342	.477**	.482**	1	
Academic Self-Efficacy	4.450	0.327	.332**	.456**	.523**	1

Note：* p<0.05； ** p<0.01

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As can be seen from Table 3, there is a significant correlation between learning engagement and learning motivation, academic self-efficacy, and major identity, with correlation coefficients of.593.456, and.482, respectively. Since all correlation coefficients are greater than 0, it indicates that learning engagement is positively correlated with learning motivation, academic self-efficacy, and major identity.

Upon analysis, the Pearson correlation coefficient between learning motivation and academic self-efficacy is 332, which is significant at the 0.01 level and positive. This suggests that enhancing learning motivation can improve academic self-efficacy, providing a basis for optimizing learning strategies. In addition, the correlation coefficient between learning motivation and major identity is 477, which is also significant at the 0.01 level, making it an important driving force in the formation of major identity.

The correlation coefficient between academic self-efficacy and major identity is 523, and it is significant at the 0.01 level. This demonstrates a significant positive correlation between academic self-efficacy and the profession.

Through Pearson correlation analysis, the correlations between internal motivation, external motivation, cognitive, affective, behavioral, appropriateness, vitality, dedication, concentration, and academic self-efficacy were studied. The strength of the relationships between variables and dimensions was verified using Pearson correlation coefficients. The specific analysis results are shown in Table 4.

Table 4 Pearson Correlation Analysis among the Sub-dimensions of Each Variable

Dimension	Average Value	Standard Deviation	Intrinsic Motivation	Extrinsic Motivation	Vigor	Dedication	Absorption	Cognition	Emotion	Behavior	Appropriateness	Academic Self-efficacy
Intrinsic Motivation	4.345	0.476	1									
Extrinsic Motivation	4.258	0.466	.569**	1								
Vigor	4.049	0.591	.410**	.337**	1							
Dedication	4.227	0.534	.522**	.524**	.506**	1						
Absorption	4.19	0.538	.456**	.422**	.675**	.640**	1					
Cognition	4.403	0.428	.412**	.339**	.309**	.460**	.396**	1				
Emotion	4.494	0.385	.384**	.327**	.311**	.417**	.407**	.566**	1			
Behavior	4.430	0.396	.403**	.323**	.352**	.482**	.457**	.583**	.644**	1		
Appropriateness	4.430	0.433	.353**	.348**	.326**	.414**	.423**	.583**	.605**	.659**	1	
Academic Self-efficacy	4.450	0.327	.339**	.261**	.427**	.420**	.428**	.333**	.466**	.483**	.471**	1

Note：* $p<.05$； ** $p<.01$

As can be seen from Table 4, vitality is significantly correlated with seven items: internal motivation, external motivation, cognitive, affective, behavioral, appropriateness, and academic self-efficacy, with correlation coefficients of.410,.337,.309,.311,.352,.326, and.427, respectively. Since all correlation coefficients are greater than 0, it means that there is a positive correlation between vitality and these seven items. Dedication is also significantly correlated with the same seven items, with correlation coefficients of.522,.524,.460,.417,.482,.414, and.420, respectively, all greater than 0, indicating a positive correlation between dedication and these items. Concentration is significantly correlated with the seven items as well, with correlation coefficients of.408,.422,.396,.407,.457,.423, and.428, respectively, all greater than 0, indicating a positive correlation between concentration and these items.

The correlation coefficient between academic self-efficacy and internal motivation is 339, which is significant at the 0.01 level, indicating a significant positive correlation between academic self-efficacy and

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internal motivation. The correlation coefficient between academic self-efficacy and external motivation is 261, which is also significantly positively correlated at the 0.01 level, meaning that enhancing external motivation can promote the improvement of academic self-efficacy.

The Pearson correlation coefficient between cognitive and internal motivation is.412, significantly positively correlated at the 0.01 level, indicating that deepening cognition can significantly stimulate internal motivation. The correlation coefficient between cognitive and external motivation is 339, also significantly positively correlated at the 0.01 level, indicating that improving cognition can enhance external motivation. The correlation coefficient between affective and internal motivation is.384, significantly correlated at the 0.01 level, showing a significant positive correlation between affective and internal motivation. The correlation coefficient between affective and external motivation is.327, significantly correlated at the 0.01 level, indicating a significant positive correlation between affective and external motivation. The correlation coefficient between behavioral and internal motivation is.403, significantly correlated at the 0.01 level, showing a significant positive correlation between behavioral and internal motivation. The correlation coefficient between behavioral and external motivation is.323, significantly correlated at the 0.01 level, indicating a significant positive correlation between behavioral and external motivation. The correlation coefficient between appropriateness and internal motivation is.353, significantly correlated at the 0.01 level, showing a significant positive correlation between appropriateness and internal motivation. The correlation coefficient between appropriateness and external motivation is.348, significantly correlated at the 0.01 level, indicating a significant positive correlation between the two.

4. Structural Equation Model Analysis

This study employs Structural Equation Modeling (SEM) to validate the model of factors influencing the learning engagement of students in newly established applied undergraduate colleges. SEM is chosen because of its ability to simultaneously handle observed variables and latent variables. It can not only deeply analyze the relationships between multiple variables and mediating variables but also, based on the concepts and hypotheses presented earlier, construct a fitting structural equation model to explain the underlying associations. Subsequently, the model results are derived through SEM analysis, which reveal the factors influencing the learning engagement of college students in newly established applied undergraduate institutions. As shown in Figure 2.

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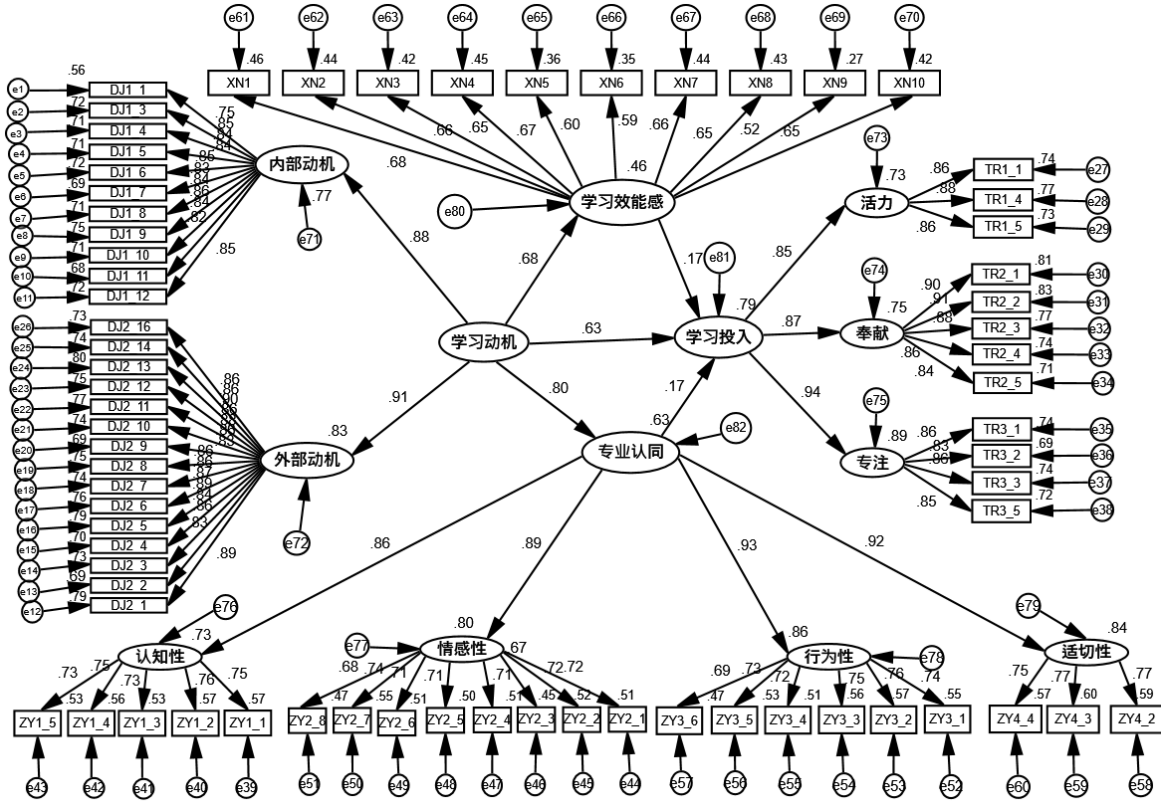

Figure 2 Test Results of the Model of Influencing Factors on Learning Engagement of College Students in Newly Established Applied Undergraduate Colleges
Note: Constructed by the researcher

This study utilized Amos22 software to conduct the relevant fit index analysis and estimate the model's parameters, employing the maximum likelihood method. Regarding the evaluation criteria for the model, the widely accepted indices are the Normed Fit Index (NFI) and the Root Mean Square Error of Approximation (RMSEA). Generally speaking, an NFI value greater than 0.8 and an RMSEA value below 0.05 indicate a good model fit, while an RMSEA value between 0.05 and 0.08 suggests an acceptable fit. These criteria were proposed by Wen et al (2004). The critical value for the Comparative Fit Index (CFI) is 0.8 (the higher, the better), the critical value for the McDonald's Omega (MC) is 0.85 (the higher, the better), and the critical value for RMSEA is 0.08 (the lower, the better). Additionally, for the "ratio of chi-square to degrees of freedom," a smaller value indicates a better model fit. After analysis, the Model Adaptability Index is presented in Table 5.

Table 5 Model Adaptability Index

CMIN	df	CMIN/DF	NFI	IFI	TLI	CFI	GFI	PGFI	PCFI	RMSEA
8020.833	2332	2.839	0.830	0.913	0.869	0.873	0.843	0.791	0.843	0.046
Suggested value		<3	>0.8	>0.9	>0.8	>0.8	>0.8	>0.5	>0.5	<0.08

According to Table 5, in the model of this study, the model fit indices such as CMIN/DF, NFI, IFI, TLI, CFI, GFI, PGFI, PCFI, and RMSEA all meet the criteria, indicating that the model fit is very good. Through path analysis conducted via AMOS, the results of the structural model path coefficients are presented in Table 6.

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Table 6 Results of the Structural Model Path Test

Path	Path of the relationship between variables			Non-standardized regression coefficient	Standardization Regression coefficient	Standard Error	T Value	P	Path test result
Path 1	Academic Self-efficacy	<---	Learning Motivation	0.219	0.676	0.013	17.156	***	Support
Path 2	Learning Engagement	<---	Learning Motivation	0.343	0.628	0.027	12.804	***	Support
Path 3	Major Identity	<---	Learning Motivation	0.318	0.796	0.015	21.950	***	Support
Path 4	Learning Engagement	<---	Academic Self-efficacy	0.281	0.167	0.051	5.505	***	Support
Path 5	Learning Engagement	<---	Major Identity	0.226	0.166	0.053	4.261	***	Support

According to Table 6, it can be seen that learning motivation has a significant positive impact on academic self-efficacy ($\beta = 0.676$, $p < 0.05$), thus supporting Path 1; learning motivation has a significant positive impact on learning engagement ($\beta = 0.628$, $p < 0.05$), thus supporting Path 2. Learning motivation has a significant positive impact on major identity ($\beta = 0.796$, $p < 0.05$), thus supporting Path 3; academic self-efficacy has a significant positive impact on learning engagement ($\beta = 0.167$, $p < 0.05$), thus supporting Path 4; major identity has a significant positive impact on learning engagement ($\beta = 0.166$, $p < 0.05$), thus supporting Path 5.

5. Mediating Effect Test Analysis

In the process of academic inquiry, mediation effect analysis is an important step in assessing the validity of a mediating variable in a particular variable. Its core lies in clarifying the extent to which the mediating effect can influence the research outcomes. This study examines the various mediating paths of the model, the bias-corrected confidence intervals corresponding to each path's indirect effect, and checks for significance as shown in Table 7.

Table 7 The Results of the Mediation Effect Test

Path	Mediating Variable	Indirect Effect		
		Upper Limit of Boot C1	Lower Limit of Boot C1	Significance
Learning Motivation→Academic Self-efficacy→Learning Engagement	Academic Self-efficacy	0.051	0.100	0.000
Learning Motivation→ Major Identity→Learning Engagement	Major Identity	0.040	0.082	0.000

As shown in Table 7, for the path "Learning Motivation → Academic Self-efficacy → Learning Engagement," the bias-corrected confidence interval (CI) for the mediating effect based on academic self-efficacy is [0.051, 0.100]. Since the interval does not include 0 and the significance p-value is less than 0.05, the indirect effect of the path is significant, indicating the existence of a mediating effect. For the path "Learning Motivation → Major Identity → Learning Engagement," the bias-corrected CI for the mediating effect based on major identity is [0.040, 0.082]. Similarly, as the interval does not include 0 and the significance p-value is less than 0.05, the indirect effect of the path is significant, and a mediating effect exists.

Table 8 Decomposition of Total Effect, Direct Effect, and Mediating Effect

Path	Effect	Effect Size	Relative Effect Value
Learning Motivation → Academic Self-Efficacy and Major Identity → Learning Engagement	Total Effect	0.873	
	Direct Effect	0.628	71.94%

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Path	Effect	Effect Size	Relative Effect Value
	The Mediating Effect of Academic Self-efficacy	0.113	12.94%
	The Mediating Effect of Major Identity	0.132	15.12%

As shown in Table 8, which breaks down the total effect, direct effect, and mediating effect, it can be seen that academic self-efficacy plays a mediating role in the relationship between learning motivation and major identity. The relative effect size of the direct effect is 71.94%, while the relative effect size of the mediating effect of academic self-efficacy is 12.94%, indicating a partial mediating role in this path. Specifically, learning motivation has dual pathways: on the one hand, it can directly affect learning; on the other hand, academic self-efficacy, as a key intermediate variable, can indirectly influence learning engagement. This, in turn, enables the prediction of learning engagement. The relative effect size of the mediating effect of major identity is 15.12%, indicating a partial mediating role in this path. That is to say, learning motivation can not only directly affect the degree of learning engagement but also predict learning engagement through the mediating role of major identity.

In summary, learning motivation has a positive and significant promoting effect on academic self-efficacy, major identity, and learning engagement. Academic self-efficacy plays a positive role in promoting learning engagement, effectively stimulating students' enthusiasm and initiative for learning, and increasing the degree of engagement. At the same time, the positive promoting effect of major identity on learning engagement is also quite significant, making students more focused on learning due to their recognition of the major. In the process of learning and engagement, academic self-efficacy acts as a key intermediate variable, playing a certain transmitting and regulating role, turning learning into actual behavior of learning engagement, and further enhancing the effectiveness and stability of learning engagement.

Discussion

1. The Direct Impact of Learning Motivation on Learning Engagement

This study found that learning motivation has a significant positive impact on learning engagement, that is, ($\beta = 0.628$, $p < 0.05$); hence, learning motivation also has a significant positive impact on major identity. In other words, the higher the learning motivation, the more likely they are to invest additional time and effort to explore, understand, and grasp knowledge. Students' internal drive is directly related to their learning engagement, which in turn determines learning outcomes. When students have a strong interest in and internal drive for the learning content or goals, it motivates them to engage in learning out of love and curiosity for the content itself. This internal drive can awaken students' independence and creativity, making them more willing to delve into research and solve problems, thereby enhancing their learning engagement. External learning motivations, such as achieving good grades, winning scholarships, or receiving praise from parents and teachers, motivate students through external rewards or social expectations, and these external factors can also significantly improve students' learning engagement. This positive learning state not only improves learning efficiency but also extends and expands learning outcomes in both depth and breadth. This is consistent with the findings of previous studies (Chang, 2023; Ji, 2016; Huang, 2023).

2. The Direct Impact of Academic Self-Efficacy on Learning Engagement

The results of this study indicate that academic self-efficacy has a significant positive impact on learning engagement ($\beta = 0.167$, $p < 0.05$). In the newly established applied undergraduate colleges in Henan Province, China, students' academic self-efficacy is closely linked to their learning engagement, showing a significant positive correlation. Specifically, throughout the learning process, students with a strong sense of self-efficacy tend to demonstrate a high level of engagement that matches their self-efficacy. When students have a high degree of belief in their learning abilities, they actively participate in class discussions, complete assignments diligently, and engage in self-directed learning. These findings are consistent with previous literature. For instance, Liu & Zhou (2024) found a positive correlation among academic self-efficacy, major identity, and learning engagement. When studying learning engagement, academic self-efficacy is a key indicator with positive predictive power. Yang, Li & Gao (2024) found that

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self-efficacy has important predictive value. It can not only directly have a positive impact on college students' sports learning engagement but also play a positive predictive role through indirect pathways.

3. The Direct Impact of Major Identity on Learning Engagement

This study found that major identity has a significant positive impact on learning engagement ($\beta = 0.166$, $p < 0.05$), and it plays a significant positive role in learning engagement. When students have a high degree of identification with their chosen major, they are more likely to transform their passion for the activities they are engaged in into motivation for learning, thereby investing more time and energy. This positive attitude and behavioral pattern have a significant positive effect on enhancing students' learning outcomes and can effectively improve their comprehensive quality and future career development potential. These findings are consistent with previous literature (Zeng, 2024; Zou, 2023).

4. The mediating role of academic self-efficacy in the impact of learning motivation on learning engagement

In the path analysis of "learning motivation → academic self-efficacy" and the research on the path of "major identity → learning engagement," the relative effect size of the direct effect is 71.94%, while the relative effect size of the mediating effect of academic self-efficacy is 12.94%, indicating a partial role in this path. In other words, learning motivation not only directly affects the learning process but may also indirectly influence the level of learning engagement. Academic self-efficacy effectively serves as a significant intermediary in the relationship between learning behavior and learning engagement. Liu (2024) found that self-efficacy plays a mediating role between academic motivation and academic burnout. Luo, Huang & Fu (2023) pointed out that the predictive effect of self-efficacy on learning engagement is both direct and indirect through learning anticipation, with the indirect effect being greater than the direct effect. Cheng, Chen & Chen (2022) discovered a positive association between academic achievement motivation and self-efficacy, meaning that academic achievement motivation can promote self-efficacy, thereby encouraging individuals to invest in technical learning. The mediating role of academic achievement motivation in the learning engagement of technical subjects is evident. Considering the various research findings mentioned earlier, the conclusion of this study is corroborated. In the process of influencing learning engagement, academic self-efficacy plays a key intermediary role. In short, as a bridge in learning engagement, academic self-efficacy motivates students to pursue academic achievements more actively and encourages them to participate more in class discussions and extracurricular activities, demonstrating a higher level of engagement.

5. The mediating role of major identity in the impact of learning motivation on learning engagement

This study confirms that in the path analysis of "learning motivation → academic self-efficacy" and "major identity → learning engagement," the relative effect size of the direct effect is 71.94%, while the relative effect size of the mediating effect of major identity is 15.12%, indicating a partial role in this path. In other words, regarding learning motivation, on the one hand, it can directly affect learning engagement, and on the other hand, it can predict learning engagement through the mediating variable of major identity. In summary, based on the obtained data and analysis results, it can be inferred that in the relationship between learning motivation and learning engagement, major identity serves as a key mediating variable. Shi's (2024) research confirms that major identity is influenced by external factors and then affects college students' learning engagement through a series of chain-mediated reactions. Zhang's (2023) research results show that major identity and perceived social support play a parallel mediating role between the achievement motivation and learning engagement of sports, major college students. Chen, Y. R., and Wu's (2022) research found that major identity plays a key mediating role between the perception of classroom atmosphere and learning engagement. The above-mentioned studies are consistent with the results of this study, and major identity plays a key mediating role in the process of learning motivation affecting learning engagement.

Conclusion

The comprehensive analysis of the research results reveals the following key findings:1.Direct Effects: Learning motivation significantly and positively influences academic self-efficacy ($\beta = 0.676$, $p < 0.05$) and major identity ($\beta = 0.796$, $p < 0.05$); Academic self-efficacy and major identity both have significant positive impacts on learning engagement ($\beta = 0.167$ and $\beta = 0.166$, respectively, $p < 0.05$ for both); Learning motivation also directly and positively impacts learning engagement ($\beta = 0.628$, $p < 0.05$).2.Mediating Effects: Academic self-efficacy and major identity each partially mediate the relationship between learning motivation and learning engagement. This indicates that while learning motivation

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directly affects learning engagement, it also influences engagement indirectly through enhanced academic self-efficacy and major identity.

Recommendation

The core competitiveness of higher education lies in the cultivation of talent quality. In the process of nurturing talent, it is essential to deeply consider students' individuality, learning needs, and the requirements of the future workplace. This enables the design of reasonable educational plans to improve the learning engagement, laying a solid foundation for their successful entry into the workplace and the realization of personal development. The following suggestions are proposed through research:

1. Enhancing Learning Motivation

Help students set learning goals that focus on both the present and the future, enabling them to clearly understand the direction of learning and the achievements they aim to reach. ; Explore students' interests and integrate course knowledge with their favorite topics and personal hobbies to boost learning motivation ; Employ a variety of teaching methods ; Provide students with prompt and detailed feedback ; Create a positive, tolerant, and encouraging classroom atmosphere ; Offer differentiated guidance and support based on students' different needs and ability levels ; Provide students with moderate challenges to stimulate their curiosity and desire to solve problems ; Enable students to experience the satisfaction of learning, thereby achieving academic success.

2. Strengthening Academic Self-efficacy

Actively provide students with successful experiences; Offer emotional support and encouragement; Help students attribute their achievements to their diligence and talent, and their setbacks to adjustable factors; Give immediate feedback after students complete tasks or participate in discussions, helping them understand their strengths and areas for improvement, thereby enhancing their sense of self-efficacy.

3. Deepening Major Identity

Conduct in - depth professional education for students, helping them grasp the professional knowledge system and analyze the application prospects of their major ; Provide practice opportunities related to the major ; Actively build communication platforms and sincerely invite industry authorities and outstanding alumni from our school to give career development lectures, helping students stay informed about the latest industry trends and potential career opportunities ; Encourage collaborative learning to promote teamwork and further strengthen their major identity, thereby making students more engaged in their studies.

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