Study on the Effect of Professional Identity on College Students' Academic Achievement
The Mediating Effect of Learning Engagement

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ABSTRACT

On the basis of summarizing the relevant literature and theories, this study analyzes the impact of professional identity on academic achievement of Chinese college students through sample empirical investigation, focusing on the mediating role of learning engagement. The study clarifies the connotation and dimensions of the three core variables of professional identity, learning engagement and academic achievement, constructs a theoretical model for college students, and puts forward a research hypothesis. Using factor analysis, regression analysis and structural equation modeling to verify the hypotheses, the following conclusions are drawn: the relationship between the three variables and their dimensions is clarified, and the research model of the relationship between professional identity and academic achievement of college students is established. Based on the research findings, this study proposes a series of strategies and suggestions to effectively improve the academic achievement of college students, so as to improve professional identity, stimulate learning engagement, and ultimately improve academic achievement. The research results of this study will provide theoretical basis and practical reference for optimizing the education and teaching of Chinese college students, and provide new research perspectives and valuable suggestions for improving the teaching quality of higher education.

Keywords: Professional identity, Academic achievement, Learning engagement.

1. INTRODUCTION

1.1 Research Necessity

In recent years, with the rapid popularization of higher education, the academic performance of Chinese college students has attracted much attention. Academic achievement is not only an important indicator to measure the personal growth of students, but also an important manifestation of the quality of higher education. The research shows that professional identity plays a key role in students' academic development. Professional identity refers to the degree of students' recognition of the value and significance of their major, as well as the resulting emotional attachment and sense of belonging, which directly affects students' learning attitude and behavior. However, in the actual education process, many college students have the problems of blind choice of major and insufficient sense of identity, which may lead to the lack of learning motivation and the decline of academic performance.

At the same time, as an important intermediary factor of academic achievement, learning engagement has gradually been widely concerned by the academic community. Learning engagement refers to the time, energy and emotion invested by students in learning activities, which reflects the learning state and effectiveness of students to a certain extent. Previous studies have shown that a high level of learning engagement can effectively improve students' academic achievement, but there is still a lack of in-depth discussion on how professional identity indirectly affects academic achievement through learning engagement.

Therefore, this study aims to explore the influence of professional identity on academic achievement and further examine the mediating role of learning engagement, aiming to provide

theoretical basis and practical enlightenment for higher education management and student training.

1.2 Research Purpose

The purpose of this study is to explore the influence mechanism of professional identity on academic achievement of Chinese college students, focusing on the mediating role of learning engagement. The specific objectives are as follows: first, to measure the relationship between professional identity and academic achievement of college students, and to clarify the direct impact of professional identity on academic achievement; second, it is to analyze the mechanism of learning engagement, and to explore its mediating effect between professional identity and academic achievement; Thirdly, according to the results of the study, it provides theoretical support and practical suggestions for colleges and universities to enhance students' professional identity, stimulate learning engagement and promote academic success. This study is expected to enrich the theoretical research in the field of professional identity and academic achievement, and provide empirical evidence for optimizing the quality of higher education and student training mode.

1.3 Research Significance

Theoretical significance: The purpose of this study is to reveal the relationship among professional identity, learning engagement and academic achievement, and to provide a new perspective for the theoretical research in the field of higher education. Firstly, by analyzing the influence mechanism of professional identity on academic achievement, we can further deepen the understanding of the formation process of students' academic behavior and results. Secondly, exploring the mediating role of learning engagement is helpful to enrich the theoretical framework of the impact path of learning behavior. The findings of this study not only expand the research scope of professional identity and academic achievement, but also provide empirical support and theoretical reference for subsequent related research.

Practical significance: This study has important practical value for higher education management and student development. By clarifying the internal relationship between professional identity and academic achievement, it can provide a basis for colleges and universities to optimize professional education and career planning guidance, and help to improve students' sense of belonging to their major and learning motivation. At the same time, it reveals the key role of learning engagement, which provides inspiration for colleges and universities to design intervention strategies in teaching management, especially how to effectively stimulate students' learning enthusiasm and enhance learning efficiency, so as to comprehensively improve students' academic performance and development potential. Ultimately, this study aims to provide guidance for the cultivation of excellent college students with high professional identity and academic ability, and to help improve the quality of higher education and achieve the goal of personnel training.

2. RESEARCH QUESTION

Based on the above research objectives and significance, this study focuses on the following four research questions:

Q1. How does professional identity affect the academic achievement of Chinese college students?

Q2. Does learning engagement mediate the relationship between professional identity and academic achievement?

Q3. Are there significant differences in the interrelationships among professional identity, learning engagement, and academic achievement?

Q4. How to promote the academic achievement of college students by enhancing professional identity and learning engagement?

3. THEORETICAL BACKGROUND AND LITERATURE REVIEW

3.1 Theoretical Background

3.1.1 Professional Identity Theory

Professional identity is a specific application of Social Identity Theory in the field of education, which reflects students' value perception and emotional belonging to their major. Tajfel (1979)[7] proposed, social identity is an important part of individual self-concept, and professional identity, as an important dimension of individual self-identity of college students, has a profound impact on their learning attitude and behavior. From the perspective of educational psychology, professional identity is not only a static cognitive experience, but also a dynamic psychological construction process. Its formation is influenced by many factors,

such as professional choice motivation, curriculum content, career prospects and so on.

3.1.2 Learning Engagement Theory

Academic Engagement is the core concept in the field of positive psychology, which usually refers to the degree of students' behavioral, cognitive and emotional engagement in learning activities (Schaufeli et al., 2002). The level of learning engagement is one of the important factors that determine academic achievement, including behavioral engagement (such as learning time), emotional engagement (such as learning interest) and cognitive engagement (such as concentration). Astin (1984)[1] proposed that student engagement theory (Student Involvement Theory) further emphasizes that the learning outcomes of students are proportional to the resources they invest in learning activities. Learning engagement plays a bridge role in connecting intrinsic motivation and extrinsic academic performance, which provides theoretical support for this study.

3.1.3 Academic Achievement Theory

Academic achievement is a comprehensive reflection of knowledge, skills and abilities acquired by individuals in educational activities, and an important indicator to measure the effect of education. Atkinson (1964)[2], according to the achievement motivation theory (Achievement Motivation Theory), academic achievement is closely related to individual learning motivation, goal setting and environmental support. In addition, Social Cognitive Theory proposes that academic achievement is influenced by both student self-efficacy and the learning environment. From the perspective of professional identity and learning engagement, this study attempts to further reveal the influence mechanism of academic achievement from the psychological and behavioral dimensions, and expand the application scenarios of related theories.

3.2 Literature Review

3.2.1 Research on Professional Identity

In foreign studies, the concept of professional identity originated from social identity theory (Tajfel, 1979).[7] And then gradually developed in the field of education. Foreign scholars pay attention to the formation process of professional identity and its impact on students' development,

for example, the relationship between professional identity and career development expectations and learning adaptation (Smith & Taylor, 2016).[6] Domestic research mainly focuses on the development of professional identity measurement tools and their application in different disciplines. Wang Qiang (2020)[10] proposed that professional identity is an important factor affecting college students' academic satisfaction and career readiness. Although scholars at home and abroad have made more and more in-depth studies on professional identity, there are still insufficient discussions on its dynamic changes and cross-cultural differences. This provides a space for further analysis of its impact path.

3.2.2 Research on Learning Engagement

Foreign scholars generally believe that learning engagement is an important variable to predict students' academic performance. Fredricks et al. (2004) divided learning engagement into three dimensions: behavior, emotion and cognition, and verified the applicability of the model through empirical research. Domestic research started late and has gradually risen in recent years. For example, Li Na (2019)[8] analyzes the promotion effect of college students' learning engagement on classroom participation, and finds that high level of learning engagement significantly improves students' academic performance. However, the current research mainly focuses on the static measurement of learning engagement, and the research on its dynamic change and influence mechanism is insufficient, especially how to improve the effective strategy of learning engagement through intervention needs to be further explored.

3.2.3 Research on Academic Achievement

The study of academic achievement has a rich theoretical basis abroad. For example, Atkinson (1964)[2], according to the theory of achievement motivation, individual achievement is determined by the interaction between intrinsic motivation and external environment. In recent years, scholars have begun to explore the impact of non-cognitive factors (such as emotion, self-efficacy) on academic achievement. Domestic research focuses on the evaluation methods of academic achievement and the excavation of influencing factors. Wang Ming (2021)[9] points out that learning strategies and academic self-efficacy are important factors affecting academic achievement. Although there

are abundant research results at home and abroad, there is still a lack of interdisciplinary and multi-level model exploration on the impact of academic achievement, which provides an opportunity for this study to integrate perspectives.

3.2.4 *Research on the Relationship Among Professional Identity, Learning Engagement and Academic Achievement*

Foreign studies have initially revealed the relationship between professional identity, learning engagement and academic achievement. Kuh et al. (2008)[4] shows that professional identity indirectly promotes academic achievement by enhancing learning engagement. Most of the domestic studies focus on the direct relationship between professional identity and academic achievement, but there are few studies on learning engagement as a mediator variable. For example, Zhang Hua (2022)[11] found that professional identity significantly affects academic achievement, and learning engagement plays a partial mediating role in it.

In general, the research on the relationship among professional identity, learning engagement and academic achievement has not yet formed a systematic theoretical framework, especially in the context of China. The purpose of this study is to analyze the relationship among the three factors, especially to explore whether learning engagement plays a mediating role between professional identity and academic achievement.

4. RESEARCH METHODOLOGY

4.1 Research Model

This study focuses on the relationship among professional identity, learning engagement and academic achievement of Chinese college students, aiming to use empirical methods to examine the structural relationship among professional identity, learning engagement and academic achievement of Chinese college students. To this end, a research model was proposed and the research variables were classified as follows (see "Table 1" and "Figure 1"). This study will conduct a questionnaire survey on Chinese college students to test the hypotheses described in the research questions. Based on the existing experts' opinions and theoretical assumptions, this paper establishes a research model of the influence of professional identity on academic achievement of Chinese college students.

Table 1. Research variables

Variable name	Observation dimension
Professional identity (independent variable)	Cognitive identity dimension (understanding professional information)
	Emotional identity dimension (emotional attitude towards the profession)
	Behavioral identity dimension (behavioral performance in learning)
	Relevance identity dimension (the degree of matching between specialty and one's own characteristics)
Learning engagement (mediating variable)	Behavioral engagement
	Cognitive engagement
	Emotional engagement
Academic achievement (dependent variable)	Expertise
	Professional skills
	Comprehensive quality
	Innovation ability

In this study, professional identity was the independent variable, academic achievement was the dependent variable, and learning engagement was the mediating variable. The study model is shown in "Figure 1".
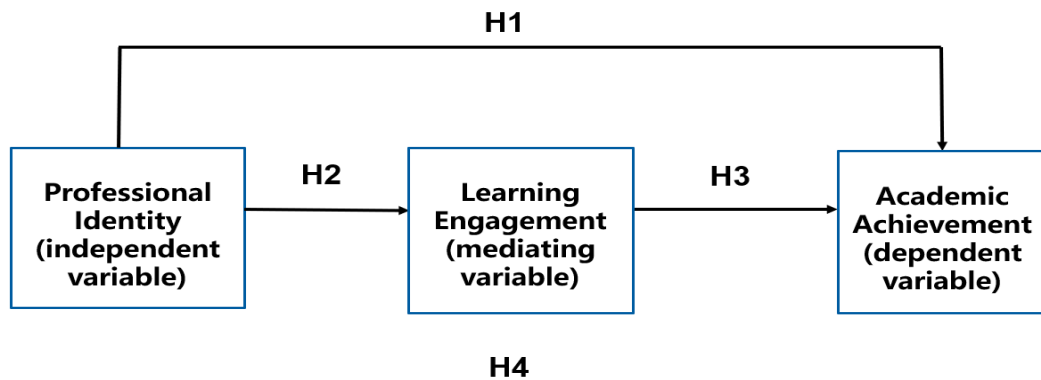
H1

H4

Figure 1 Research model.

4.2 Research Hypothesis

The research hypothesis of this study aims to investigate the relationship among professional identity, learning engagement and academic achievement of Chinese college students. Based on the previous research on this topic, the following four hypotheses are put forward:

H1: Professional identity has a significant impact on academic achievement;

H2: Professional identity has a significant impact on academic engagement;

H3: Learning engagement has a significant impact on academic achievement;

H4: Learning engagement partially mediates the relationship between professional identity and academic achievement.

4.3 Research Participants

The formal subjects of this study are college students in ordinary undergraduate colleges and

universities in China, and random sampling method is used. From December 2024 to January 2025, relying on the questionnaire star platform, questionnaires were distributed online, and 275 questionnaires were finally recovered. After eliminating the obvious tendency to answer and the lack of more than 20% of the answers as invalid questionnaires, 262 valid questionnaires were recovered, with an effective recovery rate of 95.27%.

In the course of the survey, the investigators first introduced the process and purpose of the survey in detail on the online questionnaire platform, emphasizing the principle of confidentiality of the survey. The results of the survey are only for research and will not have any adverse impact on the respondents. It is hoped that the subjects can answer these questions truthfully. The demographic variables involved in this study include gender, grade, professional category, province and region where the school is located, etc. See "Table 2" for the distribution of demographic classification variables of the formal respondents.

Table 2. Demographic factors for formal respondents (N = 262)

Variables	Category	Number of people (N)	Percentage (%)
Gender	Male	63	24.0
	Female	199	76.0
Grade	First year of college	101	38.5
	Sophomore year of college	100	38.2
	Junior year of college	34	13.0
	Senior year of college	23	8.8
	Graduate and above	4	1.5
Age	Under 18 years old	1	.4
	18 years old	58	22.1
	19 years old	71	27.1
	20 years old	79	30.2
	21 years old	25	9.5

Variables	Category	Number of people (N)	Percentage (%)
Age	22 years and above	16	6.1
Professional category	Liberal arts majors	198	75.6
	Major in science	47	17.9
	Engineering major	14	5.3
	Major in art	2	.8
	Major in sports	1	.4

4.4 Research Instruments

This study uses three scales as the survey tool in the empirical survey: the professional identity scale, the learning engagement scale and the academic achievement scale, all of which adopt the mature scale with high reliability and validity. The professional identity scale and the learning engagement scale all adopt the original classical scale. The academic achievement scale was developed by the research team. In this study, the reliability, exploratory factor analysis, convergent validity and discriminant validity of the three scales were tested. The data of empirical investigation were input and processed by SPSS 27.0 and AMOS 26.0.

4.4.1 Professional Identity Scale

The professional identity scale was developed by Qin Panbo (2009) to assess the degree of identity of college students with their major. The scale is designed based on social identity theory, covering multiple dimensions to fully reflect students' professional identity status. The scale includes four dimensions: cognitive identity, affective identity, behavioral identity and appropriate identity. There are 23 items in the scale. Likert 5-point scoring method is used (1 = completely inconsistent, 5 = completely consistent). The scale shows good reliability and validity in multiple sample tests, and is suitable for the measurement and research of professional identity in the field of higher education.

4.4.2 Learning Engagement Scale

The Learning Engagement Scale was developed by Youguo Liao (2011) to measure students' engagement in learning activities. Based on the theory of positive psychology, the scale divides learning engagement into three dimensions: behavioral engagement, cognitive engagement and emotional engagement, including 20 items, and uses Likert five-point scoring method (1 = completely inconsistent, 5 = completely consistent). The scale has high internal consistency coefficient and construct validity, and is suitable for the assessment of students' learning behavior and psychological state in educational research.

4.4.3 Academic Achievement Scale

The academic achievement scale used in this paper is developed by our research team, which is mainly used to evaluate students' comprehensive academic performance. The scale includes four dimensions: professional knowledge, professional skills, comprehensive quality and innovative ability. It contains 20 items, each dimension has 5 items, and Likert 5-point scoring method is used (1 = completely inconsistent, 5 = completely consistent). The scale emphasizes multi-dimensional evaluation of students' academic performance, which can fully reflect the level of students' knowledge mastery, skill application and ability improvement, and is suitable for higher education and research application.

Table 3. Summary of scale reliability and validity analysis

Scale	Cronbach's alpha coefficient	KMO value	Bartlett's test for sphericity		
			Approximate chi-square	df	Sig
Professional Identity Scale	.975	.961	6645.868	253	.000
Learning Engagement Scale	.983	.967	7152.651	190	.000
Academic Achievement Scale	.981	.961	7546.488	190	.000

As shown in "Table 3", the Cronbach α of the three measurement tools of the professional identity scale, the learning engagement scale and the academic achievement scale are respectively: .975.983 and .981, which are all higher than .7, and the reliability (internal consistency) of the three scales is good. The results of exploratory factor analysis showed that the KMO were .961 .967 and .961, which were all higher than .7; The chi-squares of Bartlett's sphericity test were 6645.868, 7152.651 and 7546.488 respectively, and the significance level was.000 (p<.001), which meant that the three scales were suitable for factor analysis, so the construct validity of the three measurement tools was good.

5. RESEARCH RESULTS

5.1 Descriptive Statistical Analysis

Descriptive statistics is the statistical data that can be used for research after preliminary collation of the data collected from the survey questionnaire. It is a preliminary statistic of the survey object, reflecting the basic situation of the survey object in the form of data. In this study, SPSS27.0 software was used to make descriptive statistics on the minimum value, maximum value, mean value, standard deviation, variance, skewness and kurtosis of each variable measurement item. See "Table 4" for details.

Table 4. Descriptive statistical analysis of measurement scale data (N = 262)

	Min (minimum)	Max (maximum)	Mean (average)	SD (standard deviation)	Ske (skewness)	Kur (kurtosis)
Professional identity	1.61	5.00	3.8370	.80620	.017	-.883
Cognition	1.60	5.00	3.9687	.81955	-.346	-.624
Emotional	1.25	5.00	3.7586	.92850	-.128	-.952
Behavioural	1.00	5.00	3.8562	.84990	-.320	-.169
Relevance	1.25	5.00	3.8006	.90129	-.041	-.939
Academic achievement	1.00	5.00	3.8494	.80050	.012	-.616
Expertise	1.00	5.00	3.7389	.90681	-.077	-.479
Professional skills	1.00	5.00	3.7382	.89801	-.062	-.594
Comprehensive quality	1.00	5.00	3.8664	.83800	-.149	-.574
Innovation ability	1.00	5.00	4.0542	.77744	-.302	-.580
Learning engagement	1.00	5.00	3.7771	.84968	-.074	-.456
Behavioral engagement	1.00	5.00	3.7137	.90896	-.078	-.595
Cognitive engagement	1.00	5.00	3.8304	.86720	-.228	-.494
Emotional engagement	1.00	5.00	3.7781	.88315	-.108	-.381

It can be seen from "Table 4" that the skewness distribution of the measurement scale data is between -.346 and .017, the kurtosis distribution is between -.883 and -.169, and there is no abnormal value in the mean value of each variable. According to the research results of Kline (1998), when the absolute value of bias is less than 3 and the absolute value of kurtosis is less than 10, the normality is considered acceptable. It shows that the sample data obey the normal distribution and have an ideal statistical form, which can be used for further test and analysis. It can be seen from the above table that all variables are approximately in normal distribution. Since the scale used in this study is a 5-point scale, 3 is the median. It can be seen from Table 4 that the overall average values of the three variables are 3.8370, 3.8494 and 3.7771 respectively, which indicates that the professional identity, learning engagement and academic achievement of college students are in the middle level.

5.2 Correlation Analysis

This study focuses on the relationship among professional identity, learning engagement and academic achievement of Chinese college students. This study uses Pearson correlation analysis to analyze the overall correlation between the three variables of professional identity, learning engagement and academic achievement of Chinese college students and each dimension. The analysis results are shown in "Table 5" and "Figure 2".

Table 5. Pearson correlation analysis among the three variables

Variable name	Professional identity	Learning engagement	Academic achievement
Professional identity	1	.873	.864
Learning engagement	.873	1	.907
Academic achievement	.864	.907	1

a   * *. Correlation is significant at the 0.01 level (two-tailed).
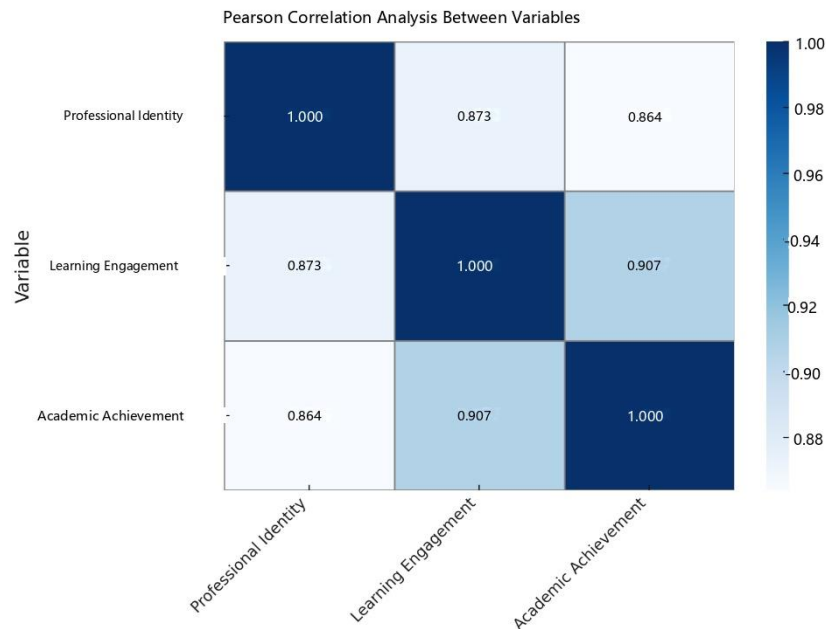

Figure 2 Correlation heatmap generated from Pearson correlation.

According to the results of Pearson correlation analysis in "Table 5" and "Figure 2", the following conclusions can be drawn: the correlation coefficient between professional identity and learning engagement is.873, indicating that there is a strong positive correlation between them, and it is significant at the level of.01; The correlation coefficient between professional identity and academic achievement is.864, which also shows a high positive correlation between them, and it is significant at the level of.01. The correlation coefficient between learning engagement and academic achievement is. 907, which is the strongest one among the three correlations, indicating that learning engagement has the most obvious effect on academic achievement, and the correlation is significant at the level of. 01. Overall, the three variables of professional identity, learning engagement and academic achievement are highly positively correlated, indicating that there is a significant interaction between the three factors. This provides an empirical basis for further study on the influence mechanism of professional identity on academic achievement of Chinese college students.

5.3 Regression Analysis

According to the regression analysis results of college students' professional identity, learning engagement and academic achievement in Table 6, the following conclusions can be drawn:

- The overall explanatory power of the model: the adjusted R^2 of the regression model = .843, indicating that the two independent variables of professional identity and learning engagement can jointly explain 83.4% of the variation in academic achievement. This shows that the model has a high explanatory power. The Durbin-Watson statistic is 2.053, which is close to 2, indicating that there is no serious autocorrelation problem in the regression model.

- Contribution and significance of independent variables: standardized coefficient of professional identity Beta = .302, significant within 95% confidence interval (.201 .398), significance water p < .001. This suggests that professional identity is a significant positive predictor of academic achievement. The unstandardized coefficient of learning engagement, Beta = .643, was significant within the 95% confidence interval (.513 .700), with a significance level of p <.001. The positive predictive effect of learning engagement on academic achievement is stronger than that of professional identity, and its standardized coefficient Beta is the largest of the two independent variables.

- Collinearity diagnosis: The tolerance values of professional identity and learning engagement were both .237, and the Vif values were both 4.216, which were higher than 1, but did not exceed the critical value of 10, indicating that the model did not have serious multicollinearity problems.

Table 6. Regression analysis of college students' professional identity, learning engagement and academic achievement

Model	Unnormalized coefficient		Standardization Coefficient	Significance P	After adjustment R2	95.0% confidence interval for B		Collinearity statistics		Durbin-Watson
	B	Beta				Lower limit	Upper limit	Tolerances	VIF	
1	(Constant)	.410		<.001		.221	.599			
	Professional identity	.300	.302	<.001	.843	.201	.398	.237	4.216	2.053
	Learning engagement	.606	.643	<.001		.513	.700	.237	4.216	

a Dependent variable: academic achievement

Therefore, the results of regression analysis show that learning engagement is the most important factor to predict academic achievement, and professional identity also has a significant positive impact on academic achievement. The overall explanatory power of the model is high, and the regression model has a good fitting effect.

5.4 Mediating Effect Test

5.4.1 Analysis of the Mediating Effect of Learning Engagement

SPSS27.0 was used to test the mediating effect of learning engagement in the research model. The test results are shown in "Table 7", "Table 8", "Table 9" and "Table 10".

Table 7. Learning engagement → professional identity (X →M)

Model	Unnormalized coefficient		Normalization factor	t	Significance
	B	Standard error	Beta		
1	(Constant)	.245	.125		1.964	.000
	Professional identity	.920	.032	.873	28.915	.000

a Dependent variable: Learning engagement

Professional identity significantly and positively predicted learning engagement (B = .920, Beta = .873, p <.001), indicating that the higher the level of professional identity, the stronger the learning engagement of students.

Table 8. Learning engagement → academic achievement (M → Y)

Model		Unnormalized coefficient		Normalization factor	t	Significance
		B	Standard error	Beta		
1	(Constant)	.622	.095		6.529	.000
	Learning engagement	.855	.025	.907	34.730	.000

a   Dependent variable: academic achievement

Learning engagement significantly and positively predicted academic achievement (B = .855, Beta = .907, p <.001), indicating that learning engagement significantly promoted academic achievement.

Table 9. Academic achievement → professional identity (X → Y)

Model		Unnormalized coefficient		Normalization factor	t	Significance
		B	Standard error	Beta		
1	(Constant)	.559	.122		4.592	.000
	Professional identity	.858	.031	.864	27.641	.000

a   Dependent variable: academic achievement

Table 10.   Mediating effect test of learning engagement (X → M → Y)

Model		Unnormalized coefficient		Normalization factor	t	Significance
		B	Standard error	Beta		
1	(Constant)	.559	.122		4.592	.000
	Professional identity	.858	.031	.864	27.641	.000
2	(Constant)	.410	.096		4.264	.000
	Professional identity	.300	.050	.302	5.996	.000
	Learning engagement	.606	.047	.643	12.779	.000

a   Dependent variable: academic achievement

Professional identity directly and significantly positively predicted academic achievement (B = .858, Beta = .864, p <.001), but the regression coefficient decreased to B = .300, (Beta = .302, p <.001) when learning engagement was included. Learning engagement partially mediated the relationship between professional identity and academic achievement (B = .606, Beta = .643, p <.001), significantly weakening the direct effect of professional identity on academic achievement.

Therefore, professional identity can significantly predict academic achievement, and

has an indirect impact on academic achievement through learning engagement. Learning engagement plays a partial mediating role between professional identity and academic achievement, that is, professional identity can not only directly enhance academic achievement, but also indirectly promote academic achievement through improving learning engagement. In short, learning engagement is an important bridge between professional identity and academic achievement, and plays a significant role in the promotion of academic achievement. Professional identity not only directly promotes academic achievement, but also indirectly promotes

academic achievement through learning engagement, and learning engagement is an important intermediary factor connecting the two (professional identity and academic achievement).

5.5 Structural Equation Modeling

5.5.1 Fitting of Structural Equation Model

In this study, AMOS 28.0 was used to fit the model. The fitting indicators of structural equation model and structural equation model are shown in "Table 11" and "Figure 3".

Table 11.   Initial model fit correlation index

Common indicators	χ2	df	χ2/df	GFI	RMSEA	RMR
Criteria for judgment	-	-	<5	>.9	<.10	<.05
Initial model	203.073	41	4.953	.916	.159	.03
Other indicators	TLI	CFI	AGFI	IFI	SRMR	NFI
Criteria for judgment	>.9	>.9	>.9	>.9	<.1	>.9
Initial model	.912	.935	.922	.935	.098	.926

Overall, the GFI (.916), TLI (.912), CFI (.935), AGFI (.922), IFI (.935), and NFI (.926) of the initial model were all greater than standard. It shows that the model meets the standard of good fit

in most of the absolute fit index and value-added fit index, which indicates that the model has strong explanatory power in the overall fit.
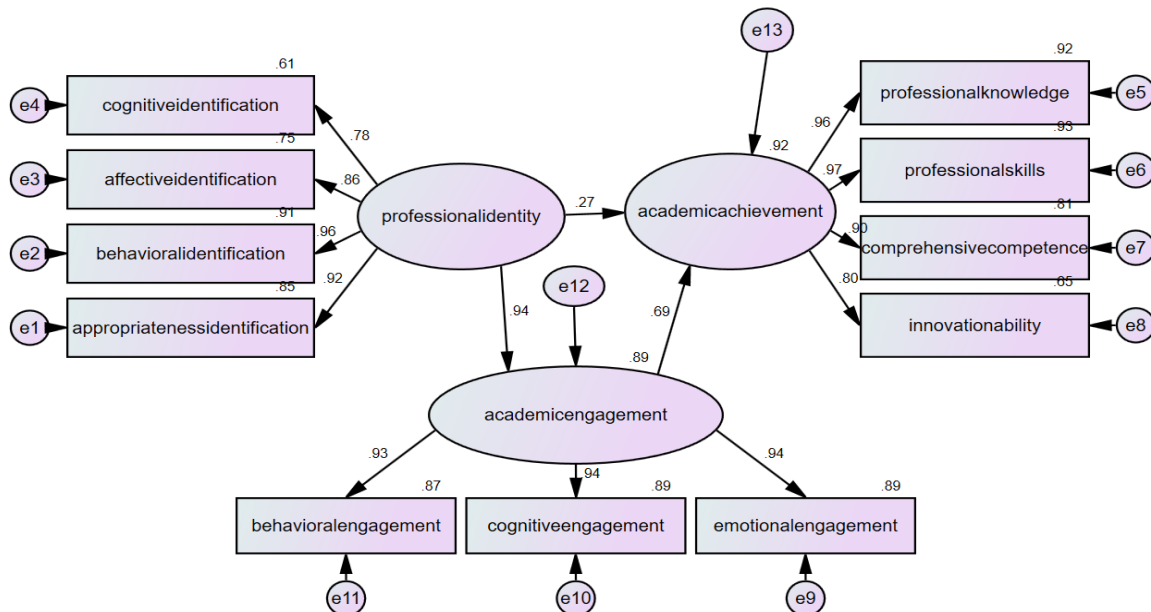

Figure 3 Structural equation model.

By analyzing the model fitting index, it is found that $\chi^2/DF = 4.953$, which is slightly less than

commonly used standard of 5, indicating that the model fitting is acceptable. The SRMR (.098) is

slightly lower than judgment standard of .1, which reflects that the deviation of the sum of squares of residuals is acceptable, and further verifies that the fitting degree of the model is good.

5.6 Hypothesis Testing

The research hypothesis of this study aims to investigate the relationship among the three variables of professional identity, learning engagement and academic performance of Chinese college students. Based on the relevant previous research of this subject, four hypotheses are put forward in total, and the research hypotheses are verified according to the research results, as shown in "Table 12".

Table 12.   Research hypothesis testing

Research Hypothesis	Testing Results
H1: Professional identity has a significant impact on academic achievement;	Accept
H2: Professional identity has a significant impact on academic engagement;	Accept
H3: Learning engagement has a significant impact on academic achievement;	Accept
H4: Learning engagement plays a partial mediating role between professional identity and academic achievement. Set up	Accept

Based on the sample of Chinese college students, this study proposes and verifies four hypotheses about the relationship among professional identity, learning engagement and academic achievement. The results show that professional identity has a significant positive impact on academic achievement (H1) and learning engagement (H2), and learning engagement also has a significant positive impact on academic achievement (H3). In addition, learning engagement partially mediates the relationship between professional identity and academic achievement (H4). The four hypotheses have been verified, indicating that professional identity not only directly affects the academic achievement of college students, but also further promotes academic achievement by enhancing learning engagement. This study provides new empirical support for understanding the academic development mechanism of Chinese college students, and emphasizes the important role of professional identity and learning engagement in enhancing academic achievement.

6. ANALYSIS AND DISCUSSION

6.1 Research Summary

Based on the theoretical framework of professional identity, learning engagement and academic achievement, this study constructs a mediating effect model and conducts an empirical test. The results show that professional identity has a significant positive effect on both academic achievement and learning engagement, and learning engagement not only directly promotes academic achievement, but also partially mediates the relationship between professional identity and academic achievement. This finding extends the existing research on the academic development mechanism of college students, and verifies the central role of professional identity in academic performance and the key mediating role of learning engagement.

6.2 Research Findings

First of all, as an important dimension of college students' self-perception and development motivation, professional identity has a significant direct impact on academic achievement, indicating that the stronger the professional identity of college students, the better their academic performance. Secondly, professional identity significantly promotes learning engagement, which verifies the driving effect of professional identity on learning behavior and learning enthusiasm. Thirdly, learning engagement has a direct impact on academic achievement, which reveals that learning behavior is an important path to promote academic success. Finally, learning engagement partially mediates the relationship between professional identity and academic achievement, indicating that professional identity not only directly affects academic achievement, but also indirectly improves academic performance by enhancing learning engagement. The findings of this study provide a new perspective for understanding the generation mechanism of college students' academic achievement.

7. CONCLUSIONS AND PROSPECTS

7.1 Research Conclusions

Based on empirical data, this study reveals the complex relationship between professional identity, learning engagement and academic achievement of Chinese college students. The results show that professional identity has a significant direct effect on academic achievement, and has an indirect effect on academic achievement through the mediating variable of learning engagement. The mediating role of learning engagement between professional identity and academic achievement further clarifies the specific mechanism of how professional identity is transformed into academic achievement through intrinsic learning motivation. On the whole, this study deepens the understanding of the influencing factors of college students' academic achievement, and provides a theoretical basis for the practice of higher education.

7.2 Prospect of Research

Although some progress has been made in this study, there are still some shortcomings. First, the sample is limited to Chinese college students, which can be extended to students with different cultural backgrounds in the future to test the cross-cultural applicability of the research model. Secondly, this study uses cross-sectional data, which fails to reveal the dynamic changes among variables. Follow-up studies can explore the long-term impact of professional identity and learning engagement on academic achievement through longitudinal design. In addition, future research can further explore other potential mediators or moderators, such as social support and resilience, to enrich the understanding of the mechanism of academic achievement. This study provides a useful reference for theoretical research and practical innovation in the field of higher education, and provides a practical path to enhance the professional identity and academic achievement of college students.

ACKNOWLEDGMENTS

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