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## Impact of Chinese College Students' Professional Identity on Their Academic Achievement: Career Maturity as a Mediator

Pei Gang Zhang

Krirk University, THAILAND

Chia Ching Tu\*

Krirk University, THAILAND

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**Abstract:** This study investigated college students' career maturity as a mediator of the effect of professional identity on academic achievement. The researchers developed a structural equation model and a research hypothesis using the Chinese college students' professional identity scale, career maturity scale, and academic achievement scale. After experts' revision and confirmatory analysis, the 3 scales had sufficient reliability, validity, and fit. The researchers distributed electronic questionnaires to students in 4 universities in Jilin Province, China, and participants responded using 5-point Likert-type scales. The researchers collected 1,104 valid questionnaires. According to the analysis, college students' professional identity is a positive predictor of their academic achievement, and career maturity partially mediates the influence of professional identity on academic achievement. Therefore, improving Chinese college students' professional identity may improve their academic achievement, and professional identity can have a positive effect on academic achievement through career maturity. University administrators and teachers should enhance the career maturity of college students and promote their professional development.

**Keywords:** *Achievement, career maturity, mediator, professional identity.*

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### Introduction

Higher education is a key determinant of socioeconomic mobility, and the skills cultivated at college and university are crucial for the sustainable development of society (Tobon & Luna-Nemecio, 2021). In China, several million students enter colleges and universities every year. In 2019, the gross enrollment rate of higher education in China reached 51.6%, and the majority of these students enrolled at local provincial application-oriented colleges and universities (China EOL News Center, 2020). In accordance with the theory of the popularization of higher education, higher education in China entered the popularization stage in 2019. Trow (1973) noted that in the popularization stage of higher education, college students pursue areas of study that enable them to adapt to life in a developed industrialized society. However, in a society where taking exams has become the primary measure of achievement, students are admitted to universities and select their majors according to their grades, which causes them to experience problems, such as academic maladjustment and worries about their future career prospects (Lee et al., 2020).

In contrast with Western higher education, in China, it is difficult for college students to change majors once a major has been selected (Liang, 2011). When students are admitted to Chinese colleges and universities, major adjustment is permitted (Zhu et al., 2019). However, students who adjust their majors often have insufficient knowledge of their majors and lack a clear career plan; this can lead to students' having uncertainty about their learning goals, losing learning motivation, and becoming bored with their majors, which in turn leads to dissatisfaction with their majors (He et al., 2019). Professional Identity is crucial for the development of learning behaviors, confidence, and learning motivation (Jensen & Jetten, 2016). Learning effectiveness may be enhanced through the investigation of student major identities in application-oriented institutions and by improving students' their awareness of their majors (Ding, 2019).

College is a period in which students complete required courses and prepare for their careers (Super & Kidd, 1979). The stronger their professional identity is, the more likely it will be that they can follow their choice of career (Batool & Ghayas, 2020) and the more prepared for this career they will be. The career maturity of such students is relatively high compared with peers (Kim & Shin, 2020). Career maturity is developed through a trait by which individuals become aware of their personalities and abilities, such as by exploring career information and acquiring the skills required for a

#### \* Corresponding author:

Chia Ching Tu, Department of Educational Management, International College, Krirk University, Bangkok, Thailand. ✉ [tulisa0929@gmail.com](mailto:tulisa0929@gmail.com)



career (Super, 1973). Students with greater career maturity tend to select courses that are necessary for their future careers (Tekke & Ghani, 2013). As Coertse and Schepers (2004) argue, career maturity is critical in career selection. Low career maturity causes insufficient career preparation or improper career selection (Atli, 2017). Meijers et al.'s (2013) research on high school students demonstrates that students thinking about and identifying future careers based on occupational characteristics strengthens their professional identity and thus enhances their learning motivation. Strong learning motivation can improve academic achievement (Sivrikaya, 2019). Hahm (2012) reported that students with greater career maturity had higher academic achievement. Academic achievement refers to competencies gained through internalizing knowledge, attitudes, and abilities and accumulating work experience (Saroso et al., 2019). Academic achievement can be used to assess the professional abilities of college graduates (Wang & Guo, 2020). Therefore, professional identity is related to career maturity, and career maturity, as a form of learning motivation, is related to academic achievement. However, regression or path analysis alone cannot be used to fully describe the relationship between college students' professional identity and career maturity and their academic achievement. Structural equation modeling is a multivariate statistical technique that combines factor analysis and path analysis. Its strength lies in the quantitative study of the interaction between multiple variables (Kline, 1998). Therefore, exploring the impact of professional identity on the academic achievement of university students by using structural equation modeling and whether professional identity affects academic achievement through the mediation of career maturity, which is of great significance for the employment guidance of college students, is required to provide a theoretical basis for educational managers' work.

### Literature Review

Professional identity is a process in which learners, on the basis of their perceptions of their majors, accept and associate with their major (Zeng et al., 2021) and generate positive major learning behaviors. The process involves learners transferring emotions and attitudes to their major (Wu, 2020). Major self-concept is defined as students' perceptions of their major competence, and professional identity strongly reflects student perceptions of which majors they are capable of achieving academic success in (Legette & Kurtz-Costes, 2021). Jensen and Jetten (2016) noted that professional identity is crucial for college students to achieve good learning behaviors, feel confident, and maintain learning motivation. Strong professional identity stimulates students' enthusiasm and motivation for learning (Jackson, 2016), and professional identity can affect students' career goals, employment competitiveness, and the degree of learning burnout they experience (Cao et al., 2020). College students' professional identity has been demonstrated to exert a significant predictive effect on academic engagement, learning satisfaction, learning effects (Wang & Liu, 2007), and the development and mining of their major interests (Poole & Patterson, 2021). Professional identity forms the foundation of learning in a student's chosen major. The deeper a student's major cognition is, the more positive their emotions will be, and the greater their academic achievement will be (Zhang & Li, 2018). Therefore, this study proposes Hypothesis 1: College students' professional identity positively and significantly predicts their academic achievement.

The major that an individual study typically relates to their desired career (Felton et al., 2007). If positive feelings toward the major are maintained, students are eager to succeed in the learning process of their major, which promotes their career development (Owen, 2016). By analyzing the learning outcomes of 35 senior psychotherapy students, Paterson et al. (2002) observed that confidence in future occupations is one of the core dimensions of professional identity. Tomlinson and Jackson (2021) also noted that professional identity can improve students' confidence in their future careers, improve their self-awareness of their professional behavior, and enhance their career commitment, which can lead to career success. The higher is an individual's achievement motivation, the higher their career expectations are. Achievement motivation also promotes the development of career maturity (Kenny et al., 2010).

Achievement motivation theory posits that, in the process of completing tasks, individuals require internal motivation for success; that is, an internal driving force motivates individuals to pursue what they regard as important and valuable and strive to achieve perfection (McClelland, 2005). Bandura (1977) and Bandura and Cervone (1986) have noted that an individual evaluates their own abilities and the possible consequences of their actions when deciding whether to act or not. If a student identifies with and has a positive attitude toward their major, they are willing to engage in work related to their major, and thus, they will invest more energy in their career field and exhibit greater career maturity (J. Li et al., 2021).

When students identify with their majors (Zhong & Zeng, 2017), they are willing to explore the knowledge related to their major with a positive attitude; this willingness can be considered to be preparation for a future career identity (Deuze, 2005). For college students, careers relate to their futures (York et al., 2021). Walker and Tracey (2012) noted that individuals' reflections on the future focus on their current major and future career. Research by Johnson et al. (2014) and Lennings (1994) has reported that future orientation is related to career maturity. Moreover, the higher the students' initial career maturity level is, the greater academic achievements they will make. (Grossen et al., 2017; Jeong et al., 2017). On the basis of a literature analysis, we examined whether career maturity mediates the effect of professional identity on academic achievement. Therefore, this study proposes Hypothesis 2: College students' career maturity plays a mediating role in the relationship between their professional identity and academic achievement.

We constructed a model of the hypothesis based on previous research and learning motivation theory. The model indicates that professional identity positively affects academic achievement. Further, we assumed that career maturity

is a mediator between professional identity and academic achievement. The model of the hypothesis is illustrated in Figure 1.

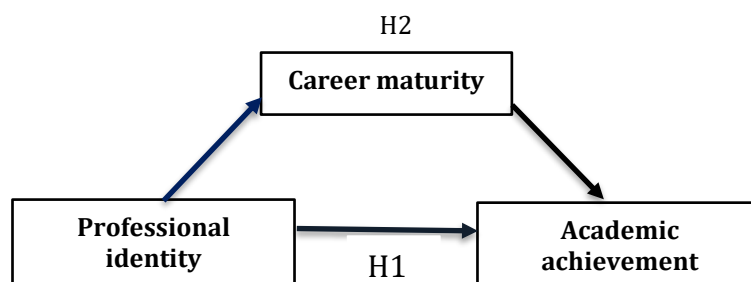


Figure 1. Research Hypothesis Framework.

## Methodology

### Research Design

In this study, we designed a model of a hypothesis based on previous studies and used structural equation modeling to analyze data regarding professional identity, academic achievement, and career maturity, which were collected using questionnaires submitted by Chinese college students, to verify the proposed hypothesis. This study verified the mediating role of career maturity in the relationship between the professional identity and academic achievement of Chinese college students by using structural equation modeling.

### Sample and Data Collection

In this study, purposeful sampling was undertaken at four universities. Among the 1,104 student participants, 517 (46.8%) were men, and 587 (53.2%) were women. A total of 184 students were majoring in engineering (16.7%), 123 were majoring in science (11.1%), 377 were majoring in liberal arts (34.1%), 64 were majoring in management (5.8%), and 320 were majoring in art (29.0%).

To facilitate the issuance and collection of research questionnaires, four representative universities offering various majors and located in three cities of Jilin Province were selected. These universities recruited students from all over the country. Questionnaires were sent to 1,200 students by e-mail by student counselors, who collected 1,104 valid questionnaires, demonstrating a completion rate of 92%.

Because the data of this study were collected and processed anonymously and were only used for research purposes, this research did not involve serious ethical considerations. After obtaining approval from the Institutional Review Board of the International College of Krirk University, the researchers obtained verbal consent from the school administrators, teachers, students, and their parents before conducting this study. Students were informed that their participation in the study was voluntary and that they could stop participating at any time.

### Research Instruments

This study adopted the professional identity questionnaire developed by J. L. Liang et al., (2017). At the suggestion of experts, the researchers revised the language of 7 of the 18 questions. This study adopted the academic achievement scale developed by X. Y. Li., et al. (2016), which has been verified by numerous scholars and has sufficient reliability and validity. In accordance with the opinions of experts, the researchers revised the language of 6 of the 14 items in the original scale, resulting in a total of 16 items. This study adopted the career maturity scale developed by Lee (2001) and revised by Zhang et al. (2006). In accordance with the suggestions of experts, the researchers revised the language of 8 of the original 16 questions and formed a scale with 17 questions.

Holding a professional identity means that on the basis of certain perspectives regarding their major, students recognize the value of the major, are willing to conduct professional learning with a positive attitude and commitment, and are willing to engage in work related to the major after graduation (Fitzgerald, 2020; Kalet et al., 2016). The professional identity scale was used to measure the level of individual professional identity. The content of the questionnaire includes four dimensions: cognitive identity, emotional identity, behavioral identity, and professional appropriateness.

Academic achievement refers to the comprehensive quality of college students' thinking, their learning ability, the knowledge acquired from self-evaluation in the process of college study and life, and their ability to adapt for future career development (Li et al., 2016). The academic achievement scale was used to measure the level of academic achievement of the college students, the scale contains four dimensions: academic cognitive ability, communication ability, self-management, and interpersonal promotion.

Career maturity refers to precareer preparation and career decisions made as required by the school curriculum. The task of career development varies with age, citizenship, experience, and socioeconomic conditions (Super & Kidd, 1979). The scale contains five dimensions for measuring the career maturity of college students, namely career goals, career self-confidence, self-cognition, career choice dependence, and career reference.

The research instruments were scored using 5-point Likert-type scales. The scales were scored as follows: 1 (*highly disagree*), 2 (*disagree*), 3 (*sometimes agree*), 4 (*agree*), and 5 (*highly agree*). Higher scores indicate higher degrees of professional identity, academic achievement, and career maturity.

#### Analyzing of Data

In this study, SPSS 22 and AMOS 24 were used to verify the reliability and validity of the collected scale data, and structural equation models were used to construct measurement models (Bollen, 1989; Schumacker & Lomax, 2004). Sample data for analysis should exhibit a normal distribution (Peterson & Cavanaugh, 2020), and measurement models should have high reliability and validity (Yang et al., 2020). SPSS software was used to evaluate the normal distribution of the sample data and descriptive statistics. AMOS software was used for maximum likelihood estimation to analyze the measurement and structural models for the sample data.

The Mardia coefficient of professional identity was 255.814, which is less than  $22(22 + 2) = 528$ . The Mardia coefficient of academic achievement was 208.919, which is less than  $16(16 + 2) = 288$ . The Mardia coefficient of career maturity was 294.787, which is less than  $17(17 + 2) = 323$ . According to these results, the Mardia coefficients of the formal questionnaire data for the four scales were all less than the value of  $P(P + 2)$ ; as such, the data conform to the multivariate normality distribution standard of Bollen (1989).

The variance of error for professional identity was between 0.136 and 1.045, and the results were positive and significant. All standardized regression coefficients ranged from 0.559 to 0.910, with no coefficients above or overly close to 1. The estimated standard errors (SEs) of the variance of measurement errors ranged from 0.009 to 0.046, with no considerable SE observed. The variances of errors for academic achievement ranged from 0.103 to 0.422, and all were positive and significant; all standardized regression coefficients ranged from 0.685 to 0.924 and did not exceed or approach 1. The estimated SEs of the measurement error variance ranged from 0.006 to 0.032, with no considerable SE noted. The variance of error for career maturity was between 0.102 and 0.646, and the results were all positive and significant; all standardized regression coefficients ranged from 0.535 to 0.924, with no coefficients exceeding or approaching 1, and the estimated SEs of the measurement error variances were in the range of 0.007 to 0.029, with no considerable SE noted.

The fit test results of the three scales indicate that a few values of the professional identity scale were within an acceptable range and that the fit indices of other scales were all within an acceptable range (presented in Table 1). Confirmatory factor analysis results indicated that the three scales had sufficient validity (Wu, 2010).

Table 1. Fit Test Data for The Scales

Model	$\chi^2/DF$	RMR	RMSEA	GFI	CFI	NFI	IFI	TLI
Standard	< 3	< 0.05	< 0.08	> 0.9	> 0.9	> 0.9	> 0.9	> 0.9
Professional Identity Scale	3.162	0.043	0.070	0.880	0.934	0.907	0.935	0.924
Academic Achievement Scale	2.218	0.026	0.051	0.942	0.978	0.959	0.978	0.973
Career Maturity Scale	1.813	0.019	0.043	0.948	0.986	0.969	0.986	0.982

Tests for convergent validity indicated that the standardized factor loadings of the professional identity scale, career maturity scale, and academic achievement scale were in the range of .565–.830, .855–.928, and .743–.889, respectively; these values were all greater than the acceptable criterion of .5 and were all significant (Hair et al., 2009; Nunnally, 1978). The combined reliability values for each dimension of each scale range from .811 to .953, all reaching the standard of being higher than .6 (Bagozzi & Yi, 1988; Fornell & Larcker, 1981). Average variant extraction (AVE) values ranged from .508 to .871, meeting the standard of being higher than .5 (Fornell & Larcker, 1981). Therefore, the professional identity scale has sufficient convergent validity.

The discriminant validity test indicated that the correlation coefficient of each dimension of the three scales was between .042 and .668, and a significant correlation was observed. The square root of AVE of each dimension of the scale was between .713 and .930, and the correlation coefficient value of each dimension was less than the square root of the AVE. This indicates a certain correlation and a certain degree of discrimination between the latent variables. This also indicates that the three scales had sufficient discriminant validity (Fornell & Larcker, 1981).

### Common Method Variance

Prior to testing, we separated the dimensions of the questionnaire, changed the order of the questions, and instructed the students on how to fill in the questionnaire; this not only clarified the purpose of the research but also reduced the common method variance (Peng et al., 2006). In addition, this study adopted the common method variance test method of Lindell and Whitney (2001). First, the researchers set all the dimensions using a factor-related framework and the researchers obtained the squared mean of the standard path coefficients, which was .264. A value lower than this can be regarded as the criterion for potential common method bias. The critical criterion was 40 (Podsakoff et al., 2003), and therefore, common method variance did not have a serious impact on the results of this study.

## Results

### Descriptive Analysis

The mean (M) and standard deviation (SD) values for professional identity were 3.57 and 0.64, respectively. The M and SD values for academic achievement were 3.56 and 0.55, respectively. The M and SD values for career maturity were 3.47 and 0.48, respectively. This demonstrates that, in this sample, college students in application-oriented universities had average levels of professional identity, academic achievement, and career maturity.

### Direct Effect and Mediating Effect Tests

According to the results of the data normality test and the violation estimation test, the data from the three scales conformed to the standard for normal distribution, and no violation estimation was observed. The researchers used AMOS24.0 to apply the maximum likelihood estimation method in order to test the fitness of the structural equations (Schumacker & Lomax, 2004; Wu, 2010).

### Main Effect

The researchers observed the main effect between professional identity and academic achievement. The standardized regression coefficient of the main effect was between 0.555 and 0.864. The error variance also reached a significant level, and no large SE was observed, indicating that the sample data fit the equation model reasonably well (Schumacker & Lomax, 2004). The overall model fit indices for main effect were as follows:  $\chi^2$  degrees of freedom = 9.388, root mean square residual = 0.024, root mean square error of approximation = 0.087, goodness-of-fit index = .964, adjusted goodness-of-fit index = .924, comparative fit index = .954, normed fit index = .949, incremental fit index = .954, Tucker-Lewis index = .925 (Bollen, 1989). The overall model is good fit. (Wu, 2010). Professional identity explained 68% of the variance in academic achievement ( $\gamma = .82, p < .001$ ), and therefore, Hypothesis 1 is supported; professional identity positively affected academic achievement. The detailed data are presented in Figure 2.

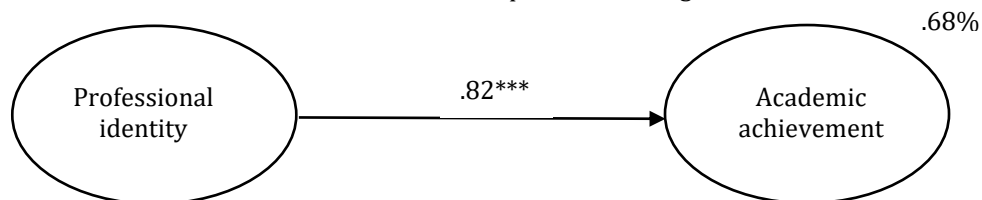


Figure 2. Structural Model of Main Effect of Professional Identity on Academic Achievement.

### Structural Model and Academic Achievement

Figure 3 illustrates a structural equation model of the differences in path coefficients of professional identity, academic achievement, and career maturity. The standardized regression coefficient of the structural equation was in the range of 0.532–.0817, and the fit indices of the structural equation model were as follows:  $\chi^2 = 461.412$  ( $p < .001$ ),  $\chi^2$  degrees of freedom = 7.442, root mean square error of approximation = 0.076, goodness-of-fit index = 0.941, adjusted goodness-of-fit index = 0.913, comparative fit index = 0.929, normed fit index = 0.919, Tucker-Lewis index = 0.910, and parsimony-adjusted measures index = 0.730 (Bollen, 1989; Schumacker & Lomax, 2004); therefore the structural equation model is good fit. Additionally, professional identity explained 46% of the variance in career maturity ( $\gamma = .68, p < .001$ ), and professional identity ( $\gamma = .36, p < .001$ ) and career maturity ( $\gamma = .56, p < .001$ ) together explained 73% of the variance in academic achievement.

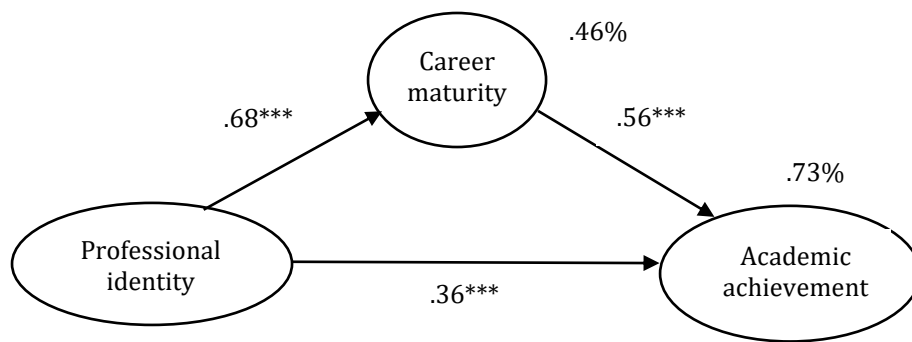


Figure 3. Structural Model of Professional Identity, Academic Achievement, and Career Maturity

Mediating Role of Career Maturity

As presented in Figure 2, when the main effect of professional identity on academic achievement was independently examined, the positive and significant predictive effect of professional identity on academic achievement was 0.82 ( $t = 12.434, p < .01$ ). The researchers adopted the bootstrapping approach recommended by MacKinnon (2008) to test the mediation effect through 2,000 repeated samples within a 95% confidence interval. The test results are presented in Table 2. The confidence interval estimates of the overall effect, indirect effect, and individual indirect effect of professional identity on academic achievement did not contain 0, indicating that the parameters are all statistically significant. The overall effect of professional identity on academic achievement was 0.748; the direct effect was 0.365, and the indirect effect was 0.384. The direct effect of professional recognition on academic achievement was reduced to 0.365 and was significant at the 95% confidence interval. The overall, direct, and indirect effects of professional identity on academic achievement suggest that career maturity partially mediated the relationship between professional identity and academic achievement. Therefore, the second research hypothesis was supported (see table 2).

Table 2. Mediating Effect Test

Total, Direct, and Indirect Effect	Path Coefficient	Bias-Corrected		Percentile	
		Lower	Upper	Lower	Upper
Total effect (PI→AA)	.748***	.653	.824	.661	.827
Direct effect (MI→AA)	.365***	.199	.506	.212	.516
Indirect effect (MI→CM→AA)	.384***	.287	.508	.281	.498

Note. \*\*\*  $p < .001$ ; PI: Professional identity; CM: Career maturity; AA: Academic achievement

Discussion

On the basis of achievement motivation (McClelland, 2005), this study constructed a mediating model for the effect of professional identity on academic achievement as mediated by career maturity and verified the quality of the model by using structural equation modeling, with the model demonstrating good fit and an overall explanatory power of 73%. We identified that in the process of pursuing academic achievement, students identify with their majors and exhibit greater maturity in their own professional fields, which validates achievement motivation theory.

The findings of this study demonstrate that the stronger the professional identity of college students in application-oriented universities was, the better their sense of academic achievement was; this is consistent with the findings of Inglehart and Brown (1990), Karanauskien and Kardelis (2005), S. Sun et al. (2020), and X. Sun et al. (2020). This study also supports the view that a stronger identification of college students with their own major indicates a higher awareness of the importance of learning and time spent learning; this motivated them to devote greater efforts to their major program and improve their academic achievement (Osborne et al., 2002; S. Sun et al., 2020; and X. Sun et al., 2020). When college students have a strong identification with their major, they have a positive evaluation of their major, have a strong emotional investment in their major, and continue to explore professional knowledge after college (Yu et al., 2021). The deeper students' knowledge of their major, the better was their understanding of its value for their career. These students were willing to explore the professional knowledge they had learned with a positive and proactive attitude (Storlie & Toomey, 2020), and they used their full potential to improve their professional abilities. College students desired to be outstanding in their profession, and therefore, they were more proactive in their studies and in improving their academic achievement (Cimermanová, 2018).

The results indicate that stronger was college student's professional identity, the stronger was their career maturity; this finding is consistent with those of L. Y. Zhang et al. (2018) and Y. M. Yang et al. (2019). Students' professional identity directly affected their career maturity. If students recognized and accepted their majors, they also accepted future careers related to these majors (Zhao, 2022). If students agreed with their future occupational identity, they clarified their professional goals and provided detailed evaluations of their future career choices. These students also wished to improve their abilities to achieve their career development goals (Kapoor & Gardner-McCune, 2019).

Our findings demonstrate that college students' career maturity partially mediated the influence of Professional identity on academic achievement. If students identified with their major, they also identified with their future career direction. A firm career goal can positively affect the learning style of college students and can thereby enhance the learning quality of such students; this is consistent with the findings of Han (2021). In the process of professional learning, college students with strong professional identity independently collected professional information related to their majors. Through their acquired career information and self-awareness, these students can rationally face the employment environment and effectively conduct career analysis. Through investment in professional learning and career support from their families, they can improve their career confidence and remain committed to their career choices. This confirms the research conclusion of Wang and Ding (2021), that is, professional identity positively affects the willingness of college students to engage in work related to their major. Career maturity mediates the influence of professional identity on academic achievement. This is evidenced by the fact that college students invest more time and energy in acquiring professional knowledge and enhancing their academic performance to achieve their career goals. Second, students with high career maturity also exhibit autonomous learning related to their major, which is consistent with the findings of Sheng et al. (2022).

### Conclusions

The mediating model constructed in this study was acceptable, and it supported the value of achievement motivation theory (McClelland, 2005). Its conclusions are as follows: (a) The professional identity of college students in application-oriented universities has a positive impact on their academic achievement; (b) The career maturity of college students in application-oriented universities has a mediating role on the relationship between their professional identity and academic achievement.

The results also explain why professional identification can improve academic achievement by causing students to identify with their future careers. This indicates that Chinese college students identify with their major in addition to their future careers. Career maturity, as motivation for professional learning, can encourage college students to invest more time and energy in their studies to improve their academic achievement and enhance their vocational abilities.

### Recommendations

This study may inform the educational policies of colleges and universities. Administrators of colleges and universities should implement curriculum reform and increase the availability of professional introductory courses and professional practice courses to allow students to systematically understand knowledge related to their major and to experience their future professional work (Chen et al., 2019); this may enhance their Professional identity. College administrators should regularly invite alumni and entrepreneurs to the school for career planning education to enhance students' confidence in their career development (Shi, 2015).

When cultivating students' professional knowledge, teachers should strengthen students' cognition of their majors and cultivate students' interest in and positive emotions toward their majors (Kapoor & Gardner-McCune, 2019). Teachers must clarify the career development opportunities related to the majors that are available to students, strengthen students' major practice, enable students to actively improve their professional skills and increase their self-confidence and career development opportunities (L. Y. Zhang et al., 2018); therefore, students are more willing to devote time and energy to enhancing their academic performance. Therefore, teachers must introduce knowledge regarding the development of careers related to students' majors to enhance students' positive attitude toward their major and increase their career maturity.

### Limitations

Because of location and time constraints, this study only included four application-oriented colleges and universities in Jilin Province. The sample only included senior students who were close to graduating, and therefore, the sample range of this study was relatively small. Future researchers should increase the sample size to increase the generalizability of our findings. Moreover, this study only used quantitative methods to investigate Chinese university students. Alternatively, follow-up research may integrate interviews to further supplement the research data. In addition, further relevant variables can be added for further discussion to improve the research results.

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### Ethics approval

The design of this study was reviewed and approved by the institutional review board at International College of Kirk University.

### Consent to participate

The participants had the study purpose explained to them first, and then they were asked to provide informed consent. Participation was voluntary, and all data were handled confidentially.

### Authorship Contribution Statement

Zhang: Conceived of the study and drafted the manuscript. Tu: Conceived of the study and revised the article. All authors read and approved the final manuscript.

### References

- Atli, A. (2017). Five-factor personality traits as predictor of career maturity. *Eurasian Journal of Educational Research*, 17(68), 151-165. <https://reurl.cc/LNn4b7>
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16, 74-94. <https://doi.org/10.1007/BF02723327>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215. <https://doi.org/10.1037/0033-295X.84.2.191>
- Bandura, A., & Cervone, D. (1986). Differential engagement of self-reactive influences in cognitive motivation. *Organizational Behavior and Human Decision Processes*, 38(1), 92-113. [https://doi.org/10.1016/0749-5978\(86\)90028-2](https://doi.org/10.1016/0749-5978(86)90028-2)
- Batool, S. S., & Ghayas, S. (2020). Process of career identity formation among adolescents: Components and factors. *Heliyon*, 6(9), Article e04905. <https://doi.org/10.1016/j.heliyon.2020.e04905>
- Bollen, K. A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods & Research*, 17(3), 303-316. <https://doi.org/10.1177/0049124189017003004>
- Cao, M., Wei, Y., & Yang, H. (2020). Investigation and Countermeasures of students' professional identity status in Guangzhou University of traditional Chinese medicine. *Journal of TCM Management*, 28(1), 5-8. <https://doi.org/10.16690/j.cnki.1007-9203.2020.01.003> [In Chinese]
- Chen, X., Chen, X., & Chen, Z. (2019). Construction and application of professional ability based on professional identity. *Journal of Fujian Business University*, (2), 50-55. <https://doi.org/10.19473/j.cnki.1008-4940.2019.02.008> [In Chinese]
- China EOL News Center. (2020). *2019 National Statistical Bulletin on Educational Development*. Ministry of Education of the People's Republic of China. <https://reurl.cc/MR841p> [In Chinese]
- Cimermanová, I. (2018). The effect of learning styles on academic achievement in different forms of teaching. *International Journal of Instruction*, 11(3), 219-232. <https://doi.org/10.12973/iji.2018.11316a>
- Coertse, S., & Schepers, J. M. (2004). Some personality and cognitive correlates of career maturity. *SA Journal of Industrial Psychology*, 30(2), 56-73. <https://doi.org/10.4102/sajip.v30i2.150>
- Deuze, M. (2005). What is journalism? Professional identity and ideology of journalists reconsidered. *Journalism*, 6(4), 442-464. <https://doi.org/10.1177/1464884905056815>
- Ding, Q. N. (2019). Which matters? Selection or cultivation: the relationship between independent selection, commitment and satisfaction of undergraduate's professional study. *Educational Development Research*, 39(23), 27-33. <https://reurl.cc/9V4Ynj> [In Chinese]
- Felton, T. M., Nickols-Richardson, S. M., Serrano, E., & Hosig, K. W. (2007). African-American students' perceptions of their majors, future professions, and the dietetics major and profession: A qualitative analysis. *Journal of the Academy of Nutrition and Dietetics*, 108(7), 1192-1197. <https://doi.org/10.1016/j.jada.2008.04.022>
- Fitzgerald, A. (2020). Professional identity: A concept analysis. *Nursing Forum*, 55(3), 447-472. <https://doi.org/10.1111/nuf.12450>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.1177/002224378101800104>
- Grossen, S., Grobler, A. A., & Lacante, M. (2017). Repeated retention or dropout? Disputing Hobson's choice in South African township schools. *South African Journal of Education*, 37(2), 1-11. <https://doi.org/10.15700/saje.v37n2a1367>
- Hahm, S.-Y. (2012). An empirical study on career maturity, achievement goal, learning attitude and academic achievement of middle school students: Focused on subjects-related career education. *Journal of Fisheries and Marine Sciences Education*, 24(5), 616-626. <https://doi.org/10.13000/JFMSE.2012.24.5.616>



- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2009). *Multivariate data analysis*. Prentice Hall.
- Han, T. Z. (2021). How do career goals affect undergraduates' learning quality: mediating and masking effects of curiosity and self-efficacy. *China Higher Education Research*, 2021(12), 30–36. <https://reurl.cc/XLEYQ3> [In Chinese]
- He, A.-L., Zhao, J.-J., & Gao, D. -D. (2019). The relationship between professional identity and learning burnout: The mediating role of academic self-efficacy and the moderating role of perceived social support. *Psychological Monthly*, 14(17), 1–3. <https://reurl.cc/2WLkQE> [In Chinese]
- Inglehart, M., & Brown, D. R. (1990). Professional identity and academic achievement--Considerations for the admission process. *Academic Medicine*, 65(9), 3–4. <https://doi.org/10.1097/00001888-199009000-00016>
- Jackson, D. (2016). Re-conceptualising graduate employability: The importance of pre-professional identity. *Higher Education Research & Development*, 35(5), 925–939. <https://doi.org/10.1080/07294360.2016.1139551>
- Jensen, D. H., & Jetten, J. (2016). The importance of developing students' academic and professional identities in higher education. *Journal of College Student Development*, 57(8), 1027–1042. <https://doi.org/10.1353/csd.2016.0097>
- Jeong, Y., Lee, J., & Ahn, H. (2017). Verification of the structural relationship between longitudinal changes in social support and career maturity and academic participation and academic achievement. *The Journal of Career Education Research*, 30(3), 1-24. <https://doi.org/10.32341/ICER.2017.09.30.3.1> [In Korean]
- Johnson, S. R. L., Blum, R. W., & Cheng, T. L. (2014). Future orientation: A construct with implications for adolescent health and wellbeing. *International Journal of Adolescent Medicine and Health*, 26(4), 459–468. <https://doi.org/10.1515/ijamh-2013-0333>
- Kalet, A., Buckvar-Keltz, L., Harnik, V., Monson, V., Hubbard, S., Crowe, R., Song, H. S., & Yingling, S. (2016). Measuring professional identity formation early in medical school. *Medical Teacher*, 39(3), 255–261. <https://doi.org/10.1080/0142159X.2017.1270437>
- Kapoor, A., & Gardner-McCune, C. (2019). Understanding CS undergraduate students' professional identity through the lens of their professional development (ITiCSE '19). *Proceedings of 24th Annual ACM Conference on Innovation and Technology in Computer Science Education* (pp. 9-15). ACM. <https://doi.org/10.1145/3304221.3319764>
- Karanauskien, D., & Kardelis, K. (2005). The relationship between students' academic identity and academic achievements. *Socialiniai Mokslai*, 1(47), 62–70. <https://www.lituanistika.lt/content/39115>
- Kenny, M. E., Walsh-Blair, L. Y., Blustein, D. L., Bempechat, J., & Seltzer, J. (2010). Achievement motivation among urban adolescents: Work hope, autonomy support, and achievement-related beliefs. *Journal of Vocational Behavior*, 77(2), 205–212. <https://doi.org/10.1016/j.jvb.2010.02.005>
- Kim, J. H., & Shin, H. S. (2020). Effects of self-reflection-focused career course on career search efficacy, career maturity, and career adaptability in nursing students: A mixed methods study. *Journal of Professional Nursing*, 36(5), 395–403. <https://doi.org/10.1016/j.profnurs.2020.03.003>
- Kline, R. B. (1998). Software review: Software programs for structural equation modeling: Amos, eqs, and lisrel. *Journal of Psychoeducational Assessment*, 16(4), 343–364. <https://doi.org/10.1177/073428299801600407>
- Lee, H.-J., Park, J.-Y., & Cho, K.-D. (2020). Effects of parental attachment on career maturity in university students: Moderating effect of career decision-making self-efficacy and cognitive flexibility. *The Journal of the Korea Contents Association*, 20(3), 324–335. <https://doi.org/10.5392/KCA.2020.20.03.324>
- Lee, K.-H. (2001). A cross-cultural study of the career maturity of Korean and United States high school students. *Journal of Career Development*, 28(1), 43–57. <https://doi.org/10.1177/089484530102800104>
- Legette, K. B., & Kurtz-Costes, B. (2021). Curricular tracking, students' academic identity, and school belonging. *Journal of Early Adolescence*, 41(7), 961–981. <https://doi.org/10.1177/0272431620977659>
- Lennings, C. J. (1994). An investigation of the effects of agency and time perspective variables on career maturity. *The Journal of Psychology*, 128(3), 243–253. <https://doi.org/10.1080/00223980.1994.9712727>
- Li, J., Hao, J. J., Hao, H. J., & Liu, Y. (2021). The effect of major commitment of free oriented medical students on career maturity: The mediating role of emotional intelligence. *Journal of Capital Medical University*, 42(3), 431–435. [In Chinese]
- Li, X. Y., Yang, N., & Liu, Z. Y. (2016). An empirical study on the factors of college students' academic achievement-taking the local colleges and universities as an example. *Educational Research*, (10), 78-86. [In Chinese]
- Liang, J. L., Cui, X. L., & Sun, Y. H. (2017). Compilation and reliability & validity analysis of the professional identity scale for college students majoring in preschool education. *Research on Higher Education in Heilongjiang*, (5), 99–102. [In Chinese]

- Liang, M. Y. (2011). On the non-voluntary nature of college entrance examination professional volunteer filling. *Educational Measurement and Evaluation*, 2011(04), 50-52. <https://doi.org/10.16518/j.cnki.emae.2011.04.015> [In Chinese]
- Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology*, 86(1), 114-121. <https://doi.org/10.1037//0021-9010.86.1.114>
- MacKinnon, D. P. (2008). *Introduction to statistical mediation analysis*. Taylor & Francis Group/Lawrence Erlbaum Associates.
- McClelland, D. (2005). Achievement motivation theory. In J. B. Miner (Ed.), *Organizational behavior: Essential theories of motivation and leadership* (pp. 46-60). M.E. Sharpe, Inc.
- Meijers, F., Kuijpers, M., & Gundy, C. (2013). The relationship between career competencies, career identity, motivation and quality of choice. *International Journal for Educational and Vocational Guidance*, 13, 47-66. <https://doi.org/10.1007/s10775-012-9237-4>
- Nunnally, J. C. (1978). An overview of psychological measurement. In B. B. Wolman (Ed.), *Clinical diagnosis of mental disorders* (pp. 97-146). Springer. [https://doi.org/10.1007/978-1-4684-2490-4\\_4](https://doi.org/10.1007/978-1-4684-2490-4_4)
- Osborne, J. W., Walker, C., & Rausch, J. L. (2002, April 1-5). *Identification with academics, academic outcomes, and withdrawal from school in high school students: Is there a racial paradox?* [Conference presentation]. The Annual Meeting of the American Educational Research Association, New Orleans, LA.
- Owen, S. (2016). Professional learning communities: Building skills, reinvigorating the passion, and nurturing teacher wellbeing and “flourishing” within significantly innovative schooling contexts. *Educational Review*, 68(4), 403-419. <https://doi.org/10.1080/00131911.2015.1119101>
- Paterson, J., Higgs, J., Wilcox, S., & Villeneuve, M. (2002). Clinical reasoning and self-directed learning: Key dimensions in professional education and professional socialisation. *Focus on Health Professional Education*, 4(2), 5-21.
- Peng, T. K., Kao, Y. T., & Lin, C.-C. (2006). Common method variance in management research: Its nature, effects, detection, and remedies. *Journal of Management*, 23(1), 77-98. <https://reurl.cc/lvDjYd> [In Chinese]
- Peterson, R. A., & Cavanaugh, J. E. (2020). Ordered quantile normalization: A semiparametric transformation built for the cross-validation era. *Journal of Applied Statistics*, 47(13-15), 2312-2327. <https://doi.org/10.1080/02664763.2019.1630372>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Poole, C., & Patterson, A. (2021). Fostering the development of professional identity within healthcare education-interdisciplinary innovation. *Journal of Medical Imaging and Radiation Sciences*, 52(4), S45-S50. <https://doi.org/10.1016/j.jmir.2021.08.012>
- Saroso, S., Mukhadis, A., Siswanto, H., & Tuwoso, T. (2019). What factors effect to the learning achievements and self-description in polytechnic of road safety transport student? *Journal of Physics: Conference Series*, 1402(2), Article 022064. <https://doi.org/10.1088/1742-6596/1402/2/022064>
- Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling* (2nd ed.). Lawrence Erlbaum Associates Publishers. <https://doi.org/10.4324/9781410610904>
- Sheng, H., Yuan, M. L., & Lang, Q. Q. (2022). A study on the current situation and correlation between career maturity and autonomous learning of hearing-impaired college students: A case study of Leshan Normal University. *Journal of Gui Zhou Institute of Engineering Application Technology*, 40(217), 103-110. [In Chinese]
- Shi, Y. R. (2015). Reinforcing sense of major identity of preschool education. *Journal of Mian Yang Normal University*, 34(10), 41-44. [In Chinese]
- Sivrikaya, A. H. (2019). The relationship between academic motivation and academic achievement of the students. *Asian Journal of Education and Training*, 5(2), 309-315. <https://doi.org/10.20448/journal.522.2019.52.309.315>
- Storlie, C. A., & Toomey, R. B. (2020). Facets of career development in a new immigrant destination: Exploring the associations among school climate, belief in self, school engagement, and academic achievement. *Journal of Career Development*, 47(1), 44-58. <https://doi.org/10.1177/0894845319828541>
- Sun, S., Dong, B. J., & Li, Y. (2020). Study on the relationship among stomatology students' learning engagement, academic achievement and professional identity: A case study of stomatology major of Shihezi University school of medicine. *Health Vocational Education*, 38(13), 131-134. <http://c.nxw.so/60VeU> [In Chinese]

- Sun, X., Wang, W., & Wang, Z. (2020). The relationship between college students' professional identity and academic performance: The mediating role of psychological capital. *Journal of Baoding University*, 33(1), 111–114. <https://reurl.cc/V8LvYQ> [In Chinese]
- Super, D. E. (1973). The career development inventory. *British Journal of Guidance & Counselling*, 1(2), 37–50. <https://doi.org/10.1080/03069887308259350>
- Super, D. E., & Kidd, J. M. (1979). Vocational maturity in adulthood: Toward turning a model into a measure. *Journal of Vocational Behavior*, 14(3), 255–270. [https://doi.org/10.1016/0001-8791\(79\)90054-X](https://doi.org/10.1016/0001-8791(79)90054-X)
- Tekke, M., & Ghani, M. (2013). Examining the level of career maturity among Asian foreign students in a public University: Gender and academic achievement. *Hope Journal of Research*, 1(1), 101–121.
- Tobon, S., & Luna-Nemecio, J. (2021). Proposal for a new talent concept based on socioformation. *Educational Philosophy and Theory*, 53(1), 21–33. <https://doi.org/10.1080/00131857.2020.1725885>
- Tomlinson, M., & Jackson, D. (2021). Professional identity formation in contemporary higher education students. *Studies in Higher Education*, 46(4), 885–900. <https://doi.org/10.1080/03075079.2019.1659763>
- Trow, M. (1973). *Problems in the transition from elite to mass higher education*. Carnegie Commission on Higher Education.
- Walker, T. L., & Tracey, T. J. G. (2012). The role of future time perspective in career decision-making. *Journal of Vocational Behavior*, 81(2), 150–158. <https://doi.org/10.1016/j.jvb.2012.06.002>
- Wang, B.-M., & Guo, J.-N. (2020). A study on the impact of college students' family capital on employment: The mediating role of academic achievement. *Journal of Guizhou Normal University*, 2020(08), 51–61. <https://reurl.cc/MR8xOX> [In Chinese]
- Wang, D., & Liu, Y. (2007). Master's professional identity survey. Professional identity survey among postgraduate students. *China Higher Education Research*, 2007(8), 18–22. <https://reurl.cc/ZXW5eg> [In Chinese]
- Wang, J., & Ding, H. Q. (2021). The difference between ideal and reality: A study on the status quo and impact of journalistic occupational cognitive crisis. *Journalism Research*, (3), 62–75, 119–120. [In Chinese]
- Wu, H. J. (2020). Research on the cultivation strategies of English majors in local colleges and universities based on Professional Identity theory: A case study of empirical research in five colleges and universities in Yunnan Province. *Journal of Dali University*, 5(7), 117–122. [In Chinese]
- Wu, M. L. (2010). *Operation and application of structural equation modeling-AMOS*. Chongqing University Press. [In Chinese]
- Yang, D., Swekwi, U., Tu, C.-C., & Dai, X. (2020). Psychological effects of the COVID-19 pandemic on Wuhan's high school students. *Children and Youth Services Review*, 119, Article 105634. <https://doi.org/10.1016/j.childyouth.2020.105634>
- Yang, Y. M., Liu, Q. L., & Sun, S. Y. (2019). The effect of future orientation on career maturity of college students : Chain mediation of self-identity and professional identity. *Psychological Research*, 12(06), 517–523. [In Chinese]
- York, K. M., Thrasher, G., Savage, N., Kang, J. H., Hammond, M., Demsky, C. A., & Barclay, L. A. (2021). Careers roundtable: An exercise for student career exploration and future development. *Journal of Behavioral & Applied Management*, 21(2), 100–112. <https://doi.org/10.21818/001c.29694>
- Yu, F., Chen, Q., & Hou, B. (2021). Understanding the impacts of Chinese undergraduate tourism students' professional identity on learning engagement. *Sustainability*, 13(23), Article 13379. <https://doi.org/10.3390/su132313379>
- Zeng, H., Zhao, L., & Huang, Y. (2021). The influence of the academic mentoring on the undergraduate's major identity: The mediation of self-expansion. *Forum on Contemporary Education Forum*, 2021(1), 49–58. <https://reurl.cc/GeARpd> [In Chinese]
- Zhang, L., Chen, M., Zeng, X., & Wang, X. (2018). The relationship between professional identity and career maturity among pre-service kindergarten teachers: The mediating effect of learning engagement. *Open Journal of Social Sciences*, 6(6), 167–186. <https://doi.org/10.4236/jss.2018.66016>
- Zhang, M., & Li, R. L. (2018). A study on the impact of college students' professional identity on their learning engagement: The mediating role of the sense of school belonging. *Research on Higher Education in Heilongjiang*, (3), 94–99. [In Chinese]
- Zhang, Z.-Y., Rong, Y., & Guan, Y. -J. (2006). The reliability and validity of a Chinese version of the college students' career maturity inventory Chinese full text. *Journal of Southwest China Normal University (Humanities and Social Sciences Edition)*, 2006(5), 1–6. <https://reurl.cc/MR8xjW> [In Chinese]

- Zhao, Y. (2022). A qualitative study of undergraduates' professional identity. *Advances in Psychology*, 12(3), 604–612. <https://doi.org/10.12677/ap.2022.123069> [In Chinese]
- Zhong, J. Y., & Zeng, L. J. (2017). A study on the relationship between college students' professional identity and career choice anxiety. *The Science Education Article Collects*, (12), 150–151. [In Chinese]
- Zhu, G.-Y., Liu, H. -Y., Liu, A.-N., Pan, Z.-W., Jiang, Y., Chen, G.-H., Liu, M., & Xie, X.-Y. (2019). Professional adaptability of nursing students and its influence factors. *Journal of Nursing*, 2019(11), 1–4. <https://reurl.cc/OE18Ko> [In Chinese]