

Research on the Influence of Academic Self-concept on Academic Achievement of College Students: A double-chained mediation model

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Keywords: Academic self-concept; College students' academic achievement; Mastery goal; Performance goal; Metacognitive strategy; Surface cognitive strategy.

Abstract: Academic self-concept is a key factor affecting college students' academic achievement, but the mechanism of academic self-concept on college students' academic achievement has not been perfect so far. Based on the achievement goal theory and learning strategy, this study constructs a double-chain mediation model of the influence of academic self-concept on academic achievement of 815 college students. The results show that academic self-concept has a significant positive predictive effect on college students' academic achievement. Mastery goal, metacognitive strategy, performance goal and surface cognitive strategy have significant independent mediating effects between academic self-concept and college students' academic achievement. Academic self-concept has a positive effect on college students' academic achievement through the double-chain mediating effect of mastery goal and metacognitive strategy, performance goal and surface cognitive strategy. The mediation model of this study enriches the theories related to academic self-concept and academic achievement of college students, which can promote the subsequent research.

1. Introduction

College students are talents in need of modernization construction. Their study is closely related to personal growth, social development and national prosperity. However, in recent years, a series of phenomena, such as weariness, truancy and Internet addiction, have appeared on college campuses, which affect students' study and are called "study problems". There are many different reasons for learning problems. It can be seen from the existing researches that many psychological researchers have conducted researches from different aspects such as learning motivation, academic procrastination, personality or family rearing style, etc, but few researches have been conducted on college students' academic self-concept. Many researchers pointed out that academic self-concept is not only the overall cognition of students in academic aspects, but also has the dynamic nature, which can regulate and control individual learning behaviors, and having a positive and high level of academic self-concept is one of the important indicators of students' mental health [1]. Therefore, the study of college students' academic self-concept and academic achievement is of great significance for the development and improvement of talent cultivation strategies.

Literature studies have shown that academic self-concept not only has a direct relationship with academic achievement, but also has a complex influence on academic achievement through various mediating variables. The researchers put forward many important intermediary variables, such as self adjusting learning, social comparison, and academic adjustment, but the achievement goal orientation, and few scholars chain intermediary effect of achievement goal orientation and learning strategy as the bridge between academic self-concept and academic achievement, with college students as the research object of more rare. Therefore, this study starts from college students' academic self-concept, and analyzes the direct and indirect influence paths of academic self-concept on academic achievement.

2. Theoretical basis and research hypothesis

2.1 The relationship between academic self-concept and academic achievement of college students

Academic self-concept is a relatively stable cognition, experience and evaluation of students' academic development [2], and its relationship with academic achievement has always been a topic of concern to psychologists. Since the big fish and small pool effect theory was put forward, the empirical research on the causal relationship between academic self-concept and academic achievement has gone through four theoretical models: self-enhancement model, skill development model, reciprocal effect model and development perspective. Many scholars take primary and secondary school students as research objects, and discuss the relationship between academic self-concept and academic achievement. Chen Xiaohui and Shi Wendian found that for fifth-grade students, the relationship between academic self-concept and academic performance conforms to the self-enhancement model, while for grade 2 and Grade 2 students, the skill development model works, which also proves the existence of the concept of development [3]. Xu Fuming's research showed that there is a significant positive correlation between academic self-concept and academic achievement of middle school students [4]. Lu Ping pointed out that improving college students' academic self-concept is beneficial to their academic achievement [5]. Fang Ping pointed out that academic self-concept has a significant direct impact on students' academic achievement [6]. In view of this, this study puts forward the hypothesis:

H1 Academic self-concept has a direct effect on college students' academic achievement, and academic self-concept can positively predict college students' academic achievement.

2.2 The mediating role of mastery goal/performance goal between academic self-concept and academic achievement of college students

According to the theory of achievement goal, achievement goal represents an individual's cognition of his efforts to pursue success or the reasons for his achievement in the achievement situation. Different individuals have different understandings of the reasons for pursuing success or achievement, that is, different individuals have different achievement goal orientations. Previous studies have shown that academic self-concept is dynamic [1], and achievement goal orientation is one of the factors of achievement motivation. Academic self-concept makes students have different achievement goal orientations, and then influences their academic achievements by influencing task selection and task execution degree during homework.

Ames and Archer divided achievement goal into mastery goal and performance goal according to the influence of mother's achievement goal on children's achievement behavior. When individuals adopt mastery goals, they pay attention to developing new skills and gaining a sense of mastery, and regard learning as the expected result and need to rely on efforts; When individuals adopt performance goals, they are more concerned about being evaluated as capable, and the ability is proved by success, or by succeeding beyond others, or by a small amount of efforts [7]. Fang Ping pointed out that academic self-concept indirectly affects academic achievement by mastery goals or performance goals, which shows that students' good academic self-concept can promote the development of their goal orientation and the improvement of their academic achievement level [4], and this result also supports some existing research conclusions [8][9]. Wang Ling and Guo Dejun pointed out that there is a close relationship between academic self-concept and achievement goal orientation [10]. In view of this, this study puts forward the hypothesis:

H2a: Mastery goal plays an intermediary role between academic self-concept and academic achievement of college students.

H2b: Performance goal plays an intermediary role between academic self-concept and academic achievement of college students.

2.3 The mediating role of metacognitive strategy/surface cognitive strategy between academic

self-concept and academic achievement of college students

Based on cognitive theory, this paper expounds the characteristics of learning strategy from different angles. Nisbet & Shucksmith (1987) thought that learning strategy is a set of operation process of selecting, integrating and applying learning skills. According to Dansereau (1985), learning strategies are a series of processes and steps that can promote the acquisition and storage of knowledge and the utilization of information. Mayer (1984) held that learning strategies are activities that purposefully influence self-information processing.

Although researchers have given different explanations to learning strategy, the same thing is that they do not deny that learning strategy includes cognitive strategy and metacognitive strategy. Surface cognitive strategy is a part of cognitive strategy, which refers to retelling strategy, such as repetition and emphasis, and its function is to help students encode new information into short-term memory. Metacognitive strategy includes planning, monitoring and adjustment, which helps students control and execute their own learning process, helps students gain an understanding of their own learning situation, and helps them decide how to adjust their learning strategies and processes [11]. By verifying the relationship between learning strategy and academic self-concept, researchers found that academic self-concept has a significant positive correlation with deep learning, superficial learning, strategic learning and academic achievement [12]. Li Shan and Yu Xinxin pointed out that the application of learning strategy will be influenced by academic self-concept, and the application of learning strategy can promote students' learning and improve students' academic performance, and it is indicated that the variable with significant regression effect on academic performance is cognitive strategy [13]. In view of this, this study puts forward the hypothesis:

H3a: Metacognitive strategy plays an intermediary role between academic self-concept and academic achievement of college students.

H3b: Surface cognitive strategy plays an intermediary role between academic self-concept and academic achievement of college students.

2.4 The chain mediation of mastery goal and metacognitive strategy, performance goal and surface cognitive strategy

According to the theory of achievement goal, achievement goal is students' perception or understanding of their pursuit of academic achievement, which is closely related to students' learning efforts, internal motivation, external motivation and the use of learning strategies, and will affect students' choice of academic tasks and academic achievements [14][15]. When students tend to have mastery goals, they are more willing to think deeply about their studies. They use effective self-regulation strategies in the learning process, including learners monitoring and thinking about the relationship between their academic tasks and the knowledge they have learned. Individuals with performance goals pay attention to how to achieve good results, gain others' recognition and reflect good abilities, so they tend to adopt shallow processing learning strategies, and rely on recitation and emphasis to achieve goals quickly and effectively. Liu Huashan pointed out that the relationship between goal orientation and academic performance is not direct, it may affect academic performance through intermediary factors such as learning strategy [16]. In addition, Yesim found that learning goal orientation is strongly related to deep cognitive and metacognitive strategy, but weakly related to surface cognitive strategy. Grade goal orientation is strongly correlated with surface cognitive strategy, but not with deep cognitive and metacognitive strategy [11]. Zhang Wangfeng pointed out in "Research on College Students' Achievement Goal Orientation, Metacognitive Strategy and Academic Achievement" that college students' achievement goal orientation can influence their academic achievement through the application of metacognitive strategy[17]. In view of this, this study puts forward the hypothesis:

H4a: Mastery goal and metacognitive strategy play a chain intermediary role between academic self-concept and academic achievement of college students.

H4b: Performance goal and surface cognitive strategy play a chain intermediary role between academic self-concept and academic achievement of college students.

To sum up, academic self-concept, achievement goal theory, learning strategy and college students' academic achievement are closely related. Therefore, the purpose of this study is to comprehensively investigate the influence mechanism of academic self-concept on college students' academic achievement and the chain mediation between achievement goal orientation and learning strategy. The theoretical model of this study is shown in Figure 1.

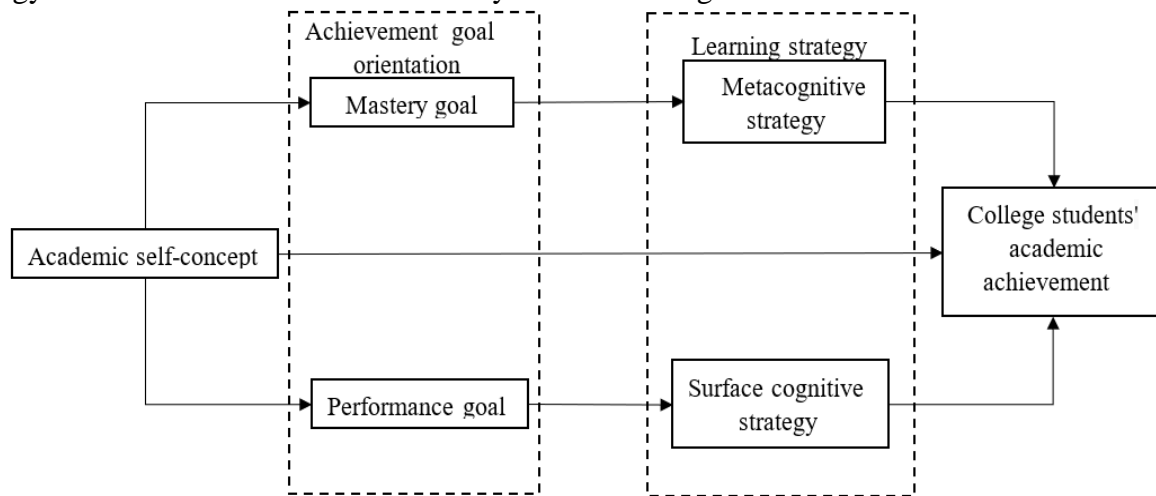


Figure 1. Theoretical model

3. Research technique

3.1 Subjects

815 college students were selected by random sampling method, and completed the Academic Self-Concept Scale, Achievement Goal Orientation Scale, Learning Strategy Scale and Academic Achievement Self-Rating Scale. A total of 815 questionnaires were distributed, of which 791 were effectively recovered, with an effective recovery rate of 97%. There are 61 freshmen, 429 sophomores, 206 juniors and 95 seniors, including 539 girls and 252 boys.

3.2 Research tool

All variables in the study were measured by maturity scale. Academic self-concept, achievement goal orientation and learning strategy scale items are scored by Likert 7 points, from "completely disagree" to "completely agree", which are recorded as 1-7 points respectively; College students' academic achievement scale adopts six-point scoring method, with 1-6 points indicating that the scores are from low to high.

(1) Academic Self-concept Scale, which was compiled by Guo Cheng, Zhao Xiaoyun and Zhang Dajun in 2011, includes four subscales: academic behavior self-control, academic achievement value, academic ability perception and academic emotional experience, and each subscale has five questions [18]. The internal consistency coefficients (α) of the total table and the four subscales are: .917, .754, .685, .801 and .749, respectively.

(2) Achievement Goal Orientation Scale adopted the achievement goal questionnaire revised by Xu Fangzhong and Zhu Zuxiang [19], including mastery goal subscale (6 questions) and performance goal subscale (6 questions). The overall reliability of the scale is .854.

(3) Learning Strategy Scale was revised by Jiang Jingchuan (2004) based on the "Learning Strategy Questionnaire" compiled by Yesim Somuncuoglu et al. This study adopted two subscales: surface cognitive strategy (7 questions) and metacognitive strategy (5 questions). The overall reliability of the scale is .916.

(4) Academic Achievement Self-Rating Scale: This study defines college students' academic achievement as the sum of their learning results, learning behaviors and learning attitudes in a certain period [20], which mainly includes two parts: college students' behavioral performance and objective

achievements. Among them, college students' behavioral performance scale was adapted from Wang Yanfei's employee performance scale, which consists of three dimensions: learning performance, interpersonal promotion and learning dedication [21].The objective score consists of intellectual education, moral education, stylistic and comprehensive scores, with a total of 19 questions. The higher the score, the higher the performance. The overall reliability of the scale is good, the KMO value is 0.902, and the validity of the research data is good.

3.3 Data processing

From September to October 2020, a formal survey was conducted to Chinese college students online and questionnaires were issued.All data were analyzed by SPSS 22.0.

3.4 Common method deviation

Harman single factor test recommended by Zhou Hao and Long Lirong (2004) was used to test the deviation of common method. Fifteen factors with characteristic roots greater than 1 were obtained without rotating shaft. The explanatory variation of the first factor was 32.84%, which was lower than the critical standard by 40%. Therefore, there is no serious common method deviation in the data of this study.

4. Analysis of data

4.1 Correlation analysis

It can be seen from Table 1 that academic self-concept is related to college students' academic achievement, performance goal and mastery goal, and it is significant at the level of .01. At the same time, the performance goal and surface cognitive strategy, mastery goal and metacognitive strategy are significantly positive correlation. In addition, the correlation coefficient between the two dimensions of learning strategy and college students' academic achievement is significant at the level of .01, which indicates that they are closely related. These results also provide useful information for the test of double chain mediation effect. The correlation coefficient between academic self-concept and academic achievement of college students is 0.790, which shows that H1 is supported.

Table.1. Descriptive statistics and correlation analysis(n=791)

Variable	1	2	3	4	5	6
Academic self-concept	1					
Performance goal	0.738**	1				
Mastery goal	0.785**	0.747**	1			
Surface cognitive strategy	0.799**	0.763**	0.824**	1		
Metacognitive strategy	0.776**	0.724**	0.783**	0.845**	1	
College students' academic achievement	0.790**	0.735**	0.781**	0.791**	0.783**	1
Average value	5.604	5.604	5.672	5.689	5.649	4.822
Standard deviation	0.683	0.724	0.673	0.677	0.674	0.524
* $p < 0.05$ ** $p < 0.01$						

4.2 Hypothesis test

Bootstrap method was used to test hypothesis, and gender, grade and student origin were taken as control variables.

Firstly, independent mediation effect was tested. Bootstrap method was used to test the independent mediating effects of mastery goal, metacognitive strategy, performance goal and surface cognitive strategy. The results show that the effect of academic self-concept on college students' academic achievement through mastery goal is 0.249, and the confidence interval is [0.239, 0.385]; The effect of academic self-concept on college students' academic achievement through metacognitive strategy is 0.247, and the confidence interval is [0.234, 0.393]. The effect of academic self-concept on college students' academic achievement through performance goal is 0.180, and the confidence interval is [0.157, 0.311]. The effect of academic self-concept on college students' academic achievement through surface cognitive strategy is 0.261, and the confidence interval is [0.234, 0.432]. Therefore, the confidence interval of the mediating effect model of mastery goal, performance goal, metacognitive strategy and surface cognitive strategy between academic self-concept and college students' academic achievement does not contain 0, that is, H2a, H2b, H3a and H3b are supported.

Secondly, chain mediation effect was tested. Bootstrap method was used to further test the chain mediation model.

(1) Establish a chain intermediary model 1 of "academic self-concept → mastery goal → metacognitive strategy → college students' academic achievement" (see Figure 2 for path coefficient). It can be seen from Table 2 that the chain mediating effect is 0.078, the confidence interval is [0.071, 0.105], and it does not include 0, which indicates that mastery goal and metacognitive strategy play a chain mediating role between academic self-concept and academic achievement of college students. In the chain action, there are two intermediary paths: academic self-concept → mastery goal → college students' academic achievement, academic self-concept → metacognitive strategy → college students' academic achievement. The results show that mastery goal and metacognitive strategy play a chain mediating effect in the process of academic self-concept affecting college students' academic achievement, and H4a is supported.

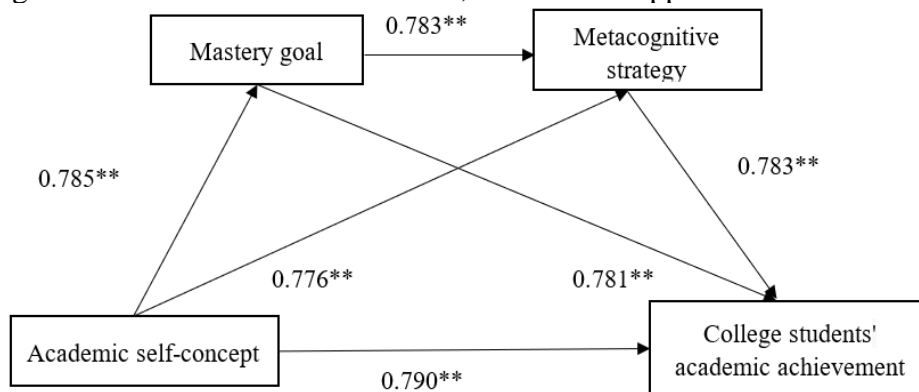


Figure 2. Path coefficient of model 1

(2) Establish a chain intermediary model 2 of "academic self-concept → performance goal → surface cognitive strategy → college students' academic achievement" (see Figure 3 for path coefficient). Table 2 shows that the chain mediating effect is 0.069, and the confidence interval is [0.013, 0.061], excluding 0, which indicates that performance goal and surface cognitive strategy have chain mediating effect between academic self-concept and academic achievement of college students. In the chain action, there are two intermediary paths: Academic self-concept → performance goal → college students' academic achievement, academic self-concept → surface cognitive strategy → college students' academic achievement. The results show that performance goal and surface cognitive strategy play a chain mediating effect in the process of academic self-concept affecting college students' academic achievement, and H4b is supported.

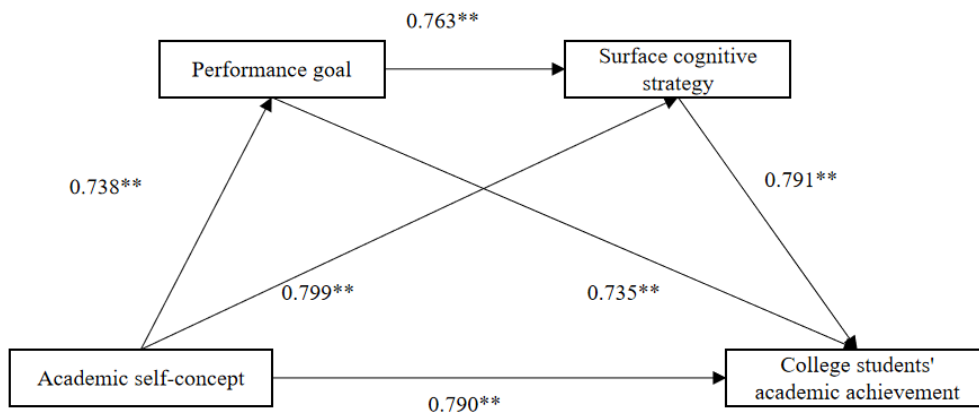


Figure 3. Path coefficient of model 2

Table.2. Analysis results of chain mediation effect

Model	Action path	Effect quantity	SE	Lower limit of 95% CI	Upper limit of 95% CI
Model 1	Academic self-concept⇒Mastery goal⇒College students' academic achievement	0.171	0.008	0.169	0.202
	Academic self-concept⇒Metacognitive strategy⇒College students' academic achievement	0.095	0.012	0.089	0.135
	Academic self-concept⇒Mastery goal⇒Metacognitive strategy⇒College students' academic achievement	0.078	0.009	0.071	0.105
Model 2	Academic self-concept⇒Performance goal⇒College students' academic achievement	0.111	0.004	0.105	0.122
	Academic self-concept⇒Surface cognitive strategy⇒College students'academic achievement	0.136	0.018	0.138	0.209
	Academic self-concept⇒Performance goal⇒Surface cognitive strategy⇒College students' academic achievement	0.069	0.013	0.061	0.112

5. Conclusion and significance

5.1 Research conclusion

Based on the achievement goal theory and learning strategy, this study constructs and empirically verifies the double-chain intermediary model of academic self-concept affecting college students' academic achievement. The results show that: (1) There is a direct positive correlation between academic self-concept and academic achievement of college students. (2) Mastery goal, metacognitive strategy, performance goal and surface cognitive strategy have significant independent mediating effects between academic self-concept and college students' academic achievement. (3) Mastery goal and metacognitive strategy play a chain mediating effect between academic self-concept and college students' academic achievement. Academic self-concept makes college students produce mastery goal and then enhance metacognitive strategy, which has a positive impact on academic achievement. (4) Performance goal and surface cognitive strategy play a chain mediating effect between academic self-concept and college students' academic achievement. Academic self-concept makes college students produce performance goal and then enhances surface cognitive strategy, which has a positive impact on academic achievement.

5.2 Theoretical contribution

(1) It provides new theoretical enlightenment for understanding the relationship between academic self-concept and academic achievement of college students. Taking college students as the investigation object, this study innovatively builds a bridge between academic self-concept and college students' academic achievement, which is the motivation factor of achievement goal orientation. Academic self-concept can not only have a direct positive impact on college students' academic achievement, but also have an indirect impact on their academic achievement by mastery goal or performance goal. This study proves that mastery goal and performance goal play a significant role in the independent mediation between academic self-concept and college students' academic achievement, which enriches the two-factor theory of achievement goal orientation.

(2) This study expands the research on mediating variables between academic self-concept and academic achievement of college students, and explores the chain mediating effects of achievement goal orientation and learning strategy on the relationship between academic self-concept and academic achievement of college students. Based on the achievement goal theory and learning strategy, this paper constructs a double-chain intermediary model to analyze the mechanism of the influence of academic self-concept on college students' academic achievement, that is, individuals with mastery goal orientation tend to use metacognitive strategy, while individuals with performance goal tend to use surface cognitive strategy. At the same time, it provides an empirical study on the relationship between achievement goal orientation and learning strategy proposed by Yesim and his colleagues [11].

5.3 Practical enlightenment

(1) Attach importance to the positive role of academic self-concept in college students' academic activities. This study shows that academic self-concept has a significant direct and positive impact on academic achievement, and can also indirectly affect academic achievement through achievement goal orientation. It can be seen that academic self-concept plays a key role in individual learning process. The more positive the academic self-concept, the higher the academic achievement. Universities should provide a good learning environment, guide students to establish correct learning motivation, and then improve their academic self-concept.

(2) According to the characteristics of different achievement goal orientation, different learning strategies are adopted. This study not only helps college students understand the influence of academic self-concept on academic achievement, but also proves the relationship between mastery goal and metacognitive strategy, performance goal and surface cognitive strategy. Guide students to adopt different learning strategies according to different achievement goals. Multi-factor theorists believe that mastery goal and performance goal are not completely opposite, and individuals may have two goal orientations at the same time, but only focus on specific scenarios. College students can make choices according to the actual situation, so as to improve their academic achievements.

5.4 Research limitations and future prospects

Although this research has the above theoretical contribution and practical value, it still has the following limitations: (1) The limitation of variable selection. Although this study examines the role of achievement goal orientation and learning strategy in the relationship between academic self-concept and college students' academic achievement, the relationship between them may also be influenced by teachers' supportive behavior and other factors. Therefore, the future research should also explore the boundary conditions that affect the role of academic self-concept in academic achievement, and bring both regulatory and intermediary variables into the research model for comprehensive investigation. (2) Limitations of research design. This study only adopts the cross-sectional research method, without long-term follow-up. In the future, longitudinal research can be tried to improve the generalization of the research results. (3) The questionnaire has a large number of questions. Because the subjects have participated in too many experiments or participated in too many experimental projects, their emotions and motives will be weakened, and students may have fatigue effect when answering questions [22], that is, the quality and completion rate of the questionnaire are greatly reduced.

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References

- [1] Su Junshuai. Study on academic self-concept of college students [D]. Inner Mongolia Normal University, 2017.
- [2] Guo cheng, He Xiaoyan, Zhang Dajun. A review of academic self-concept and its relationship with academic achievement [J]. Psychological Science, 2006, (1): 133-136.
- [3] Chen Xiaohui, Shi Wendian. Cross-lag analysis of academic self-concept and academic achievement of primary and secondary school students: is it in line with the interactive influence model or the development concept? [J]. Psychological development and education, 2016.
- [4] Xu Fuming, Shi Jiannong, Liu Huaming. Middle school students' academic self-concept and its relationship with academic achievement [J]. Chinese Journal of Clinical Psychology, 2008.
- [5] Lu Ping, Liu Congying, Xia Fubin. The Relationship among Academic Self-concept, Learning Motivation and Academic Achievement of College Students [J]. Chinese Journal of Health Psychology, 2016:1089-1092.
- [6] Fang Ping. A study on the influence of parental rearing patterns on children's academic achievements [J]. Psychological Science, 2002, 26 (1): 78-81.
- [7] Ames, C., & Archer, J. Mothers' beliefs about the role of ability and effort in school learning. Journal of Educational Psychology, 1987, 79(4):409-414.
- [8] Deborah L. Bandalos & Kristin Yates et al. Effects of Math Self-Concept, Perceived Self-Efficacy, and Attributions for Failure and Success on Test Anxiety. Journal of Educational Psychology, 1995, 87(4):611-623.
- [9] Byrne, B. M. Testing for causal predominance between academic self-concept and academic achievement: A developmental perspective. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA, 1998.
- [10] Wang Ling, Guo Dejun. Research on the Relationship between Metacognition and Learning Motivation. Psychological Science, 2003, 26(5): 829-833.
- [11] Yesim Somuncuoglu & Ali Yildirim. Relationship between achievement goal orientation and use of learning strategies, The Journal of Educational Research, 1999, 92(5):267-277.
- [12] Chen B H, Chiu W C, Wang C. The Relationship Among Academic Self-concept, Learning Strategy, and Academic Achievement: A Case Study of National Vocational College Students in Taiwan via SEM [J]. The Asia-Pacific Education Researcher, 2015, 24(2):419-431.
- [13] Li Shan, Yu Xinxin. The influence of junior high school students' self-concept, self-monitoring learning behavior and learning strategy on their academic performance [J]. Journal of Ningbo University, 2002, 24(3).
- [14] Ames C A. Classroom: Goals, structures, and students motivation. Journal of Educational Psychology. 1992, 84 (2) : 261~271.
- [15] Liang Haimei, Guo Dejun, et al. Research on the Influence of Achievement Goals on Adolescents' Achievement Motivation and Academic Achievement. Psychological Science, 1998, 21 (5): 332~335.
- [16] Liu Huashan. A Review of Research on the Relationship between Achievement Goal Orientation, Learning Strategies and Academic Achievements. Psychological Science ISSN, 2004:

1000-6648.

[17] Zhang Wangfeng. Research on Achievement Goal Orientation, Metacognitive Strategies and Academic Achievements of College Students. Journal of Hubei University of Technology ISSN,2019: 1003-4684.

[18] Guo Cheng, Zhao Xiaoyun, Zhang Dajun .Compilation of Adolescent Half Academic Self Scale (Natural Science Edition).2011, 33(12), 155-161.

[19] Xu Fangzhong, Zhu Zuxiang, Lin zhi. Goal orientation measurement and its relationship with performance [D]. Psychological Development And Education, 2000, 2: 1- 6.

[20] Wang Yanfei. Research on the Relationship between College Students' Psychological Capital _ Achievement Goal Orientation and Academic Achievement. Exploration of Higher Education, 2011.

[21] Wang Yanfei. Research on achievement goal orientation of enterprise employees [D]. Institute of psychology, Chinese academy of sciences, 2002.

[22] Huang Liting. Research on the Relationship between Personality _ Achievement Goal and Academic Achievement of College Students [D]. Guangxi Normal University, 2013.