

The Relationship between Cognitive and Metacognitive Strategies and Academic Achievement of Students of Birjand University of Medical Sciences

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Background and objectives: Nowadays, the educational system is considered as the basis and infrastructure of socio-economic, political, and cultural development of the society. Educational progress is one of the important indicators in educational system evaluation. The aim of this study was to determine the relationship between cognitive and meta-cognitive strategies with academic achievement of students of Birjand University of Medical Sciences. **Method:** The present correlation study was conducted on 342 students of Birjand University of Medical Sciences during the 2016 – 2017 academic year that were selected randomly. The data collection tool included a standard questionnaire for cognitive and meta-cognitive strategies and also the average score of the students in order to study academic achievement. Data were analyzed using SPSS (ver.18) software and descriptive statistics (mean, standard deviation, frequency and percentage of frequency), multiple regression tests, independent t-test and analysis of variance.

Results: 58.5% (200 students) of the participants were female. The result of multiple regression showed a significant difference between cognitive and metacognitive strategies with academic achievement ($p < 0.001$). There was a statistically significant relationship between gender and academic achievement of the students ($p < 0.001$) and between the faculty that they belonged to with meta-cognitive strategies ($P = 0.40$) and academic achievement ($P = 0.005$).

Conclusion: Considering the relationship between cognitive and meta-cognitive strategies and the academic achievement of the students, it is recommended to improve the academic achievement of the students via designing suitable curriculum assignments, teaching learning strategies, and using new educational methods.

Key words: cognitive strategies, metacognition, academic achievement

بررسی رابطه راهبردهای شناختی و فراشناختی با پیشرفت تحصیلی دانشجویان دانشگاه علوم پزشکی بیرجند

زمینه و هدف: امروزه نظام تعلیم و تربیت هر جامعه زیربنای توسعه اجتماعی- اقتصادی، سیاسی و فرهنگی آن جامعه به شمار می‌رود و پیشرفت تحصیلی، یکی از شاخص‌های مهم در ارزیابی نظام آموزشی می‌باشد. مطالعه حاضر با هدف تعیین رابطه راهبردهای شناختی و فراشناختی با پیشرفت تحصیلی دانشجویان دانشگاه علوم پزشکی بیرجند انجام شد.

روش: این مطالعه همبستگی بر روی 342 نفر از دانشجویان مشغول به تحصیل در دانشگاه علوم پزشکی بیرجند در سال تحصیلی 95-96 که بصورت تصادفی- طبقه ای انتخاب شدند، انجام شد. ابزار جمع آوری داده‌ها شامل پرسشنامه استاندارد راهبردهای شناختی و فراشناختی وان و همچنین معدل کل دانشجویان جهت بررسی پیشرفت تحصیلی بود. تحلیل داده‌ها با نرم افزار SPSS نسخه‌ی 18 و استفاده از آمار توصیفی (میانگین، انحراف معیار، فراوانی و درصد فراوانی)، آزمونهای رگرسیون چندگانه، تی مستقل و تحلیل واریانس انجام شد.

یافته‌ها: 58/5٪ (200 نفر) از دانشجویان مورد مطالعه دختر بودند. نتیجه رگرسیون چندگانه نشان داد معنی داری بین راهبردهای شناختی و فراشناختی با پیشرفت تحصیلی وجود دارد ($p < 0/001$). همچنین بین جنس و پیشرفت تحصیلی دانشجویان ($p < 0/001$) و نیز بین دانشکده محل تحصیل دانشجویان با راهبردهای فراشناختی ($P = 0/040$) و پیشرفت تحصیلی ($P = 0/005$) دانشجویان رابطه آماری وجود داشت.

نتیجه گیری: با توجه به رابطه راهبردهای شناختی و فراشناختی با پیشرفت تحصیلی دانشجویان، پیشنهاد می‌شود با طراحی تکالیف مناسب درسی، آموزش راهبردهای یادگیری و استفاده از روش‌های آموزشی جدید، پیشرفت تحصیلی دانشجویان بهبود یابد.

واژه های کلیدی: راهبردهای شناختی، فراشناختی، پیشرفت تحصیلی

العلاقة بين الإستراتيجيات المعرفية وإستراتيجيات ما وراء المعرفة مع التفوق العلمي لطلاب جامعة بیرجند للعلوم الطبية

الأرضية والهدف: يعتبر نظام التربية والتعليم في وقتنا الحاضر في كل مجتمع حجرة البناء للتوسع الاقتصادي والسياسي والثقافي في ذلك المجتمع ويعتبر التفوق العلمي عنصراً مهماً لتقييم النظام التعليمي.

تهدف هذه الدراسة إلى تعيين العلاقة بين إستراتيجية المعرفة وما وراء المعرفة مع التفوق العلمي لطلاب جامعة بیرجند للعلوم الطبية. هذه الدراسة المترابطة تمت على 342 طالب من طلاب جامعة بیرجند للعلوم الطبية للعام الدراسي 2016 – 2017 وتم اختيارهم بطريقة عشوائية. وسيلة جمع المعلومات هي ورقة أسئلة إستراتيجية التعلم والمعرفة ل فان وأيضاً تم الإعتماد على معدل الطلاب ومستوى تفوقهم العلمي. تم تحليل المعلومات عن طريق برنامج SPSS النسخة 18 والإحصاء الوصفي (المعدل، انحراف المعيار، التكرار ومعدل التكرار) تم أيضاً إجراء إختبارات الرجوع المتعددة وتي المستقل وتحليل واريانس.

المحصلة: 58.5٪ من الطلاب المسجلين في الدراسة كانوا من الإناث اي ما يعادل 200 طالبة. نتيجة الرجوع المتعدد أظهرت أن هناك اختلاف ذو معنى بين إستراتيجية المعرفة وما وراء المعرفة والتفوق العلمي وكان $p < 0.001$. وكان أيضاً هناك إرتباط إحصائي بين الجنس والتقدم العلمي للطلاب ($p < 0/001$). وبين أيضاً كلية الطلاب مع الإستراتيجيات ما وراء المعرفة ($P = 0/040$) والتقدم العلمي للطلاب ($P = 0/005$).

النتيجة: بالنظر إلى العلاقة بين الإستراتيجيات المعرفية وما وراء المعرفية مع التقدم العلمي للطلاب لذلك يقترح تحسين التحصيل العلمي للطلاب عن طريق طرح مبرام تستند إلى الدرس وإستراتيجيات التعلم واستخدام طرق تعلم جديدة. **الكلمات الرئيسية:** إستراتيجيات المعرفة، ما وراء المعرفة، التقدم العلمي

كاگنيٲيو اور ميٲا كاگنيٲيو حڪمت عملي اور بيرجند كي ميٲيكل يونيورسٲي ميٲن طلباء كي تعليمي پيشرفت كا اٲسي تعلق

بيك گراؤٲ: آج كي دنيا ميٲن تعليم و تربيت بر معاشرے كي سماجي، اقتصادي، سياسي اور ثقافتي ترقي كي بنياد ہے، تعليمي ميدانوں ميٲن پيشرفت تعليمي نظام كي افاديت كو جانچنے كا ايك معيار ہے۔ يہ تحقيق بيرجند يونيورسٲي كي ميٲيكل طلباء كي علمي پيشرفت اور كاگنيٲيو اور ميٲا كاگنيٲيو اسٲرائيٲيز كي درميان تعلق جاننے كي لئے انجام دي گئي ہے۔

روش: اس تحقيق ميٲن تين سو بياليس طلباء شريك تھے، يہ تحقيق دوٲزار سولہ اور دوٲزار سترہ ميٲن انجام پائي تھی۔ طلباء كو ايك سوالنامہ ديا گیا جس ميٲن كاگنيٲيو اور ميٲا كاگنيٲيو حڪمت عملي كي معياريات نيز بر طالب علم كي اوسط نمبر كو مد نظر ركها گیا تھا۔ ڈيٲا كا تجزيہ ايسي پي ايس ايس اٲھارہ سے كيا گیا، اس ميٲن ملئي ريگریشن، انٲيٲنڈنٲ ٹي سٲٹ اور واريانس اٲنالائس سے استفادہ كيا گیا۔

نتيجه: اس تحقيقي ميٲن دو سو طالبات نے شركت كي تھی، ملئي ريگریشن سے پٲه چلتا ہے كي كاگنيٲيو اور ميٲا كاگنيٲيو حڪمت عملي اور طلباء كي پيشرفت ميٲن گهرا رابطہ ہے۔ اس كي علاوہ طلباء كي جينٲر اور تعليمي پيشرفت نيز يہ امر كي يونيورسٲي كہاں واقع ہے اس كا ميٲا كاگنيٲيو اسٲرائيٲيز اور طلباء كي تعليمي پيشرفت ميٲن كافي تعلق ہے۔

سفارش: چونكہ كاگنيٲيو اور ميٲا كاگنيٲيو اسٲرائيٲيز اور طلباء كي علمي پيشرفت كا براہ راست تعلق ہے لہذا سفارش كي جاتي ہے كي نصاب كو بہتر بناكر، تعليمي اسٲرائيٲيز كي بهي تعليم دي جائے، اس كي علاوہ طلباء كو تعليم كي نئي روشين بهي سكهائي جاتين تا كي ان كي تعليمي سرگرميوں ميٲن پيشرفت آسكے۔

كليدي الفاظ: تعليمي، پيشرفت، كاگنيٲيو، ميٲا كاگنيٲيو۔

INTRODUCTION

Nowadays, the educational system is considered as the basis and infrastructure of socio-economic, political, and cultural development of the society. Analyzing the factors of improvement in developed societies present that all of them have a capable, effective and efficient education system (1). Academic achievement is a crucial issue in the higher education of countries. The framework that is designed for academic achievement could influence the future of a country or nation (2). In recent years, the cause of attention to the phenomenon of academic achievement is the essence to make quick decisions in order to improve the students with lower motivation. Contrary to what was supposed in the past that everyone's ability to learn is a function of his/her intelligence and talents, in the last few years, this belief has grown stronger among psychologists that other intrinsic factors are also considered important in this regard (3).

The factors affecting the academic achievement of students are learning strategies. Researches in the field of learning strategies have shown that these strategies improve students' academic achievement. For instance, Ashori and his colleagues' study (2013) represented that Students who were trying to learn cognitive and metacognitive strategies had a better academic performance than those who did not want to use these strategies (4).

On the other hand, poor educational progress is associated with other problems, according to Beck et al. (2012), there is a significant relationship between low academic achievement and non-educational progress (5). According to Clarebout (2010), most students with low learning achievement motivation, in addition to having difficulty in study programs or inability to obtain higher scores, are upset and feel alert in various aspects of life (6). On the other hand, students' academic achievement can affect the enthusiasm of students to continue their education (7). Therefore, it is essential to enhance the academic achievement of individuals via using learning strategies. Learning strategies are divided into three sections: cognitive, metacognitive, and motivational beliefs that can be effective on academic achievement. Meta-cognitive strategy is any knowledge or cognitive activity whose subject is cognition or regulation of cognition. Flavel (2000), first considered cognitive consciousness as a new concept called metacognition to describe individual knowledge of cognitive processes and products, or anything related to it (8).

Cognitive strategy is the recognition of a broad term used primarily in referring to mental activities such as thinking,

perception, and reasoning. A learner will learn a new subject when the new concept that is consistent with the cognitive structure, is the same as learning strategies that facilitates learning process and enhances academic achievement (9). Cognitive and metacognitive strategies are, for various reasons, one of the most important areas of research in the higher education system. The first reason is that cognitive and meta-cognitive strategies can be the key to understand the different behaviors of students, such as academic performance, academic failure, and academic burnout during student studies. The second reason is that creativity and problem solving can affect student relationships with their university. According to the researches, academic achievement is not affected by one factor, but many factors such as academic ability, intelligence, academic self-efficacy, self-regulation strategies, creativity, classroom structure, problem-solving skills, teacher training and learner motivation affect it (7).

Regarding these points, identification of predictive variables of academic achievement is one of the basic issues in this field and few quantitative researches have been conducted that can examine several effective variables with academic achievement. Accordingly, the purpose of this study was to determine the relationship between cognitive and meta-cognitive strategies with the academic achievement of medical students of Medical Sciences of Birjand University.

METHODS

This research is descriptive and analytical. The statistical population included university medical students. A sample of 342 students (200 girls and 142 boys) were selected based on Morgan's table. The students were selected by stratified random sampling. Students were classified in homogeneous variable classes for less variation among groups. Then, from each of the classes, a number of students were randomly selected. Students entering the study were informed by written consent. The data were collected via demographic questionnaire and standard cognitive and metacognitive strategies questionnaire of Van. This questionnaire contained 86 questions and two subsections of knowledge and control including commitment, attitude, attention, knowledge and process control including planning, control, and evaluation and regulation. In the Likert scale, there are 10 options that can be scored from zero (not done at all) to 9 (always done). According to Karami (10), content validity, criterion, structure, and factor of this tool have been confirmed. In content validity, two formal and logical methods have been

Table 1. Analysis of variance to examine the relationship between cognitive and metacognitive skills with academic achievement

Model	Total square	Degrees of freedom	R	R2	F Statistics	p-value
Regression	18.125	2	0.166	0.027	3.74	0.025
Remaining	641.628	265	60.680			
Total	659.753	267				

used, and the average of all students was used to assess academic achievement. The validity of the questionnaire was confirmed by the experts in the field of medical education. To determine the reliability of the questionnaire, the Cronbach's alpha method was used and the reliability coefficient was 92. Data were analyzed by SPSS software version 18, descriptive statistics (frequency, mean, and standard deviation), multiple regression and independent t-test at a significance level of 0.05.

FINDINGS

Of the 324 students that were studied, 58.5% (200 persons) were female students and 41.5% (142) were males. The age of 68.4% (234) of the students was under 22, 21.6% (74 persons) were between 23 and 27 years old and 3.8% (13 patients) were over 28 years old. Meanwhile, 6.1% (21 people) did not report their age. Also, 14.9% (51 students) were from the Faculty of Paramedical Sciences of Ferdows, 17.3% (59 persons) studied at the Faculty of Nursing, and 23.4% (80 people) were at the Faculty of Medicine, 8.5% (29 persons) were at the Faculty of Nursing and Midwifery, 13.7% (47 students) were at the Faculty of Health, 13.5% (46 persons) were at the Faculty of Paramedicine and 8.8% (30 persons) were studying at the Faculty of Dentistry in Birjand. The mean and standard deviation of the cognitive strategies of the students were 282.74 ± 62.01 , meta-cognitive skills were 217.55 ± 48.70 , and their mean score was 17.57 ± 12.66 .

The results of analysis of variance (Table 1) show that the regression model is meaningful, in other words, there is a significant relationship between cognitive and metacognitive strategies with academic achievement ($p < 0.025$).

Regarding the relationship between the predictor variables (cognitive and metacognitive strategy) and the criterion variable (academic achievement) as well as the validity of the model, the results of the estimation of the meaningful model

are presented in the form of regression coefficients table, according to p-calculated values, in the significance level of 0.05 has a significant linear relationship.

Moreover, independent t-test showed that there was no significant difference between cognitive and metacognitive strategies of students based on gender ($P > 0.05$), but there was a significant difference between academic achievement of male and female students ($P < 0.05$) (Table 3).

DISCUSSION

The results of this study showed that there is a significant relationship between meta-cognitive and cognitive strategy with the academic achievement of students in Birjand University of Medical Sciences. There was a positive and significant relationship between cognitive strategies, metacognition and academic achievement of students. This result was consistent with the findings of Zarei and Marandi (2011), Parviz and Sharifi (2011), Mohammadi et al (2016) and Mohammadi et al. (2015) Matches (1.11-13). It can be argued that many learning difficulties are due to the lack of metacognitive skills and strategies. The skills and strategies mentioned above allow the individual to choose, control, monitor, manage and, as a result, improve cognitive processes; therefore, it is imperative that students learn the skills, such as arranging, self-monitoring, planning, and target setting, to learn to master the decision-making cognitive strategies and create the basis for new learning. Otherwise, it is difficult for them to solve new tasks that they have not already faced. The teaching of such strategies, namely metacognitive education, is distinct from cognitive education (14).

In addition, as the metacognitive learning strategy results in learning, organizing and storing of knowledge and facilitating their use, planning, monitoring and controlling, managing time setting, attempting, choosing the study environment and helping others, controlling anxiety and

Table 2. The result of regression analysis to examine the relationship between cognitive and meta-cognitive strategies with the academic achievement of the students

Variable	B	Benchmark error	Beta	T statistics	P-value
Stable	15.524	.455	-	34.094	.000
Cognitive strategy	.000	.003	-.018	156.-	.876
Metacognitive strategy	.006	.004	.180	1.593	.112

Table 3. Comparison of cognitive and meta-cognitive strategies and academic achievement of students based on gender

Variable-statistic	Gender	Standard deviation \pm average	T	df	Significance
Cognitive strategy	Male	56.74 \pm 284.39	0.395	340	0.693
	Female	65.93 \pm 281.46			
Cognitive strategy	Male	47.09 \pm 217.92	0.112	340	0.911
	Female	50 \pm 217.27			
Mean	Male	1.63 \pm 15.95	7.30	340	0.000
	Female	1.22 \pm 17.12			

procrastination or neglecting, highlighting the information and revising the trained; the combination of these factors and their practice improves the academic performance of the students. The mentioned strategies organizes the mind and the type of study of individuals that enable them to master and control the process of learning and study, which seems to be the practice of these skills, in the long run, to increase academic performance. (1). Students who use more meta-cognitive and self-regulation strategies use the study time to learn the meaning of information, create a logical relationship with the information and the previous ones, control how the process works and create an appropriate learning environment and consequently increase their academic performance.

In addition, the results also presented that there is a significant positive correlation between cognitive learning strategy and academic achievement of students. This result is consistent with Zarei and Marandi (2011), Mohammadi et al. (1395), Babaei Amiri and Ashoori (1393). , 13, 15). In explaining this finding, students who use high-level cognitive strategies, in contrast to those who use low-level cognitive strategies (mentally subjective), learn meaningfully; that is, these students relate the material to the previous information in this field and learn the content in a consistent way (not in the form of scattered content), which will result in a more complete understanding of the information, keep the content in mind for longer, and in the test Lessons are more successful and eventually lead to higher achievement (13,15). The limitations of this study are the impossibility of

generalizing the results to students in other fields (non-medical sciences). Also, the physical and mental conditions of the students studied at the time of completion of the questionnaires could affect their response to questions that were beyond the control of the researchers.

CONCLUSION

Considering the significant relationship between cognitive and meta-cognitive strategies with academic achievement and considering the expandability of these strategies, it is recommended that the authorities of different levels of the health system of the country and the province, design the educational programs in accordance with the culture of the country in order to improve the quality and effectiveness of teaching methods.

Conflict of interest

There are no conflicts of interest in this article.

ACKNOWLEDGMENTS

This article is the result of a part of the Master's Degree in Educational Sciences and is approved by the Islamic Azad University with the code Ir.bums.1396.27, which was approved by the Ethics Committee of the University on 24 April 2017. Moreover, it is our honor to thank the financial support of the university's research department. We also appreciate all the officials and students of Birjand University of Medical Sciences who helped us in this study.

REFERENCES

- Mohammadi Y, Kaykha A, Sadeghi A, Kazemi S, Raeisoon MR. Relationship of Metacognition Learning Strategy and Locus of Control with Academic Achievement of Students. *Educ Strategy Med Sci*. 2015; 8 (5): 323-8.
- Fayaz I, Kazemi S, Raeisoon M R, Mohammadi Y. The Relationship Between Learning Motivational Beliefs and Control Source Dimensions with Academic Achievement of Students in Birjand University of Medical Sciences. *Research in Medical Education*. 2016; 8(2): 69-76.
- Schouwenburg HC. Procrastination in Academic Settings: General Introduction. In Schouwenburg CH, Lay TA, Pychyl JR, Ferrari (Eds.), *Counseling the procrastinator in academic settings*. 2004; 3-17.
- Ashoori J, Azadmard SH, Jalil Abkenar S, Moeini Ki M. A prediction model of academic achievement based on cognitive and metacognitive strategies, achievement goals orientation and spiritual intelligence in biology. *Journal of school psychology* 2014; 2(4):170-8.
- Beck BL, Koons SR, Milgrim DL. Correlates and consequences of behavioral procrastination. the effects of academic procrastination, self-consciousness, self-esteem. and self-handicapping. *Journal of social behavior and personality* 2012; 15:3-13.
- Clarebout G, Horz H, Schnotz, W. The relations between self-regulation and the embedding of support in learning environments. *Educational Technology Research and Development*, 2010; 58(5): 573-87.
- Abdolmalki J. The Relationship between Emotional Intelligence and Creativity with Academic Achievement in Shahied University Students. *New Educational Thoughts* 2012; 5(2):9-22.
- Flavell JH. Assessing student metacognitive awareness of reading strategies. *Journal of educational psychology* 2000;94 (2):249-59.
- Dignath C, Buttner G. Components of fostering self-regulated learning among students. A meta-analysis on intervention studies at primary and secondary school level. *Metacognition and Learning* 2008; 3: 231-64.
- Karami A. Developing a tool for learning strategies and studying its relevance to academic achievement. *Journal of Psychology* 2005; 36:399-411.
- Zarei HA, Marandi A. Relationship between learning strategies and problem-solving styles with academic achievement. *Quarterly Journal of Educational Management* 2014; 6(3):110-28.
- Parviz K, Sharifi M. Relationship between cognitive and metacognitive strategies and educational success in urban and rural high school students. *Educ Strategy Med Sci* 2011; 4(1):1-6.
- Mohammadi D, Moslemi Z, Ghomi M. The relationship between critical thinking skills with creativity and academic achievement in students Qom University of Medical Sciences. *Educ Strategy Med Sci*. 2016; 9(1):79-89.
- Janaabadi H. The Relationship of Metacognitive Strategies and Learning Styles of Students Who Have Siblings with Internalizing, Externalizing, and Emotional Disorders. *Biquarterly Journal of Cognitive Strategies in Learning* 2016;4(6):2-15.
- Babai Amiri N, Ashouri J. The relationship between cognitive and metacognitive learning strategies, self-efficacy, creativity and emotional intelligence with academic achievement. *Quarterly Journal of Cognitive Strategies in Learning* 2014; 2(3):93-108.