

An Analysis of Metacognitive Learning Strategies of Physician Candidates in Terms of Some Variables

Hekim Adaylarının Bilişötesi Öğrenme Stratejilerinin Bazı Değişkenler Açısından İncelenmesi

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ABSTRACT

The aim of this research is determining the metacognitive learning strategies of the 1st, 2nd and 3rd year students (N=614) of Hacettepe University's Faculty of Medicine and analyzing these strategies in terms of different variables. It can be argued in general that in accordance with the collected data they are good at the "Organization" and "Observation" sub-dimensions in terms of knowledge and awareness of the information processing process and they are on an intermediate level in the other two sub-dimensions called "Evaluation" and "Planning". The findings presented with this research show that there is a significant difference regarding gender, academic success and class levels variable on sub-dimensions of metacognitive learning strategies.

Key words: metacognitive learning strategies; physician candidates; academic success; learning

ÖZET

Bu araştırmanın amacı, Hacettepe Üniversitesi Tıp Fakültesinde birinci, ikinci ve üçüncü sınıflarda öğrenim gören öğrencilerin (N=614) bilişötesi öğrenme strateji düzeylerini belirleyerek, bu stratejileri çeşitli değişkenler açısından incelemektir. Genel olarak elde edilen veriler doğrultusunda hekim adaylarının bilgiyi işleme süreci hakkındaki bilgisinin ve farkındalıklarının "örgütlenme" ve "denetleme" alt boyutlarında iyi, diğer iki alt boyut olan "Değerlendirme" ve "Planlama"da ise orta düzeyde olduğu söylenebilir. Ulaşılan diğer sonuçlar hekim adaylarının bilişötesi öğrenme stratejilerinin cinsiyet, akademik başarı ve sınıf düzeyi değişkenlerine göre alt boyutlarda anlamlı farklılıklar olduğunu göstermektedir.

Anahtar kelimeler: bilişötesi öğrenme stratejileri; hekim adayları; akademik başarı; öğrenme

Introduction

Learning is basically a process of permanent changes in behaviors where an individual efficiently and consciously gets new knowledge from the environment and integrates it with information already stored in memory through several strategies¹. In this process external and internal factors play an important role. External factors can be defined as the contextual features where learning takes place, and internal factors are the strategies used by individuals in the learning process².

Orienting towards the cognitive theories of behavioral theories brought attention to learning strategies³. In brief, learning strategies are ways for individuals to be self-directed and to develop autonomous and independent skills for this purpose². When the literature is examined, it is seen that learning strategies concentrate generally in two categories (cognitive learning strategies and metacognitive strategies). The metacognitive concept, also defined as thinking about thinking and described as "individuals' knowledge of the self-cognitive system and structure"⁴.

In metacognitive learning strategies there are three groups of strategies⁵. These are centering, planning and evaluation. In the questionnaire called "Motivation and Strategies of Learning Questionnaire (MSLQ)" were divided learning strategies into nine sub-dimensions without differentiating cognitive and metacognitive strategies⁶. These are explanation, analysis, organization, critical thinking, metacognition, time management, learning from peers of the same age and cooperation.

As mentioned above it was assessed that students with high metacognitive learning strategies were

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better in problem solving and they learned easily. However when the literature was examined, it was determined that there was no study indicating the relationship between physician candidates' metacognitive learning strategies and their academic success. In this context the aim of this research is determining the metacognitive learning strategies of the 1st, 2nd and 3rd year students of Hacettepe University's Faculty of Medicine and analyzing these strategies in terms of different variables:

1. Which cognitive learning strategies do physician-candidates use?
2. Is there a meaningful difference in the metacognitive learning strategies that physician-candidates use according to classes and genders?
3. Is there a meaningful difference in the learning strategies that physician-candidates use according to their academic success?

Material and Method

Research Model

The survey method is used in this research. The survey model is a research approach aiming to define a present situation as it is⁷.

Study Group

The study group consists of freshman, junior and senior physician candidates of the 2014–2015 academic year in Hacettepe University's Faculty of Medicine (N=614). 51.5% of students were female and 48.5% of them were male who participated in study.

Data Collection Tools

In this research, the "Bilişötesi Öğrenme Stratejileri Ölçeği (BÖSÖ) [Metacognitive Learning Strategies Scale]" developed by Namlu (2004) was used for examining metacognitive learning strategies of physician-candidates. BÖSÖ consists of 4 factors and 21 questions. In the scale including Never (1), Sometimes (2), Often (3) and Always (4) choices, the first, second and fifth questions were graded in reverse order. The lowest score to be obtained from the scale was 21 and the highest score was 84. The lowest score for the sub-dimensions of the scale called "planning strategies" and "organization strategies" was 6 and the highest score was 30; the lowest

score for "observation strategies" was 5 and the highest score was 25; the lowest score for "evaluation strategies" was 4 and the highest score was 20. For the validity and credibility of the scale, normal distribution analyses, factor analyses, internal consistency coefficients, item-total correlation coefficients and distinctive validity analyses were conducted. The university students who participated in the research numbered 655. Structure validity results indicated that the scale has four factors explaining the total% 45 of variance. For example, the Cronbach Alpha coefficient was .82 for the whole scale .69 for "planning strategies", .74 for "organization strategies", .67 for "observations strategies", and .48 for "evaluation strategies". As a result of all analyses, it was assessed that the scale was valid and credible in measuring the metacognitive learning strategies of university students. In this research, the Cronbach Alpha coefficient was .76 for the whole scale .63 for "planning strategies", .71 for "organization strategies", .64 for "observation strategies", and .42 for "evaluation strategies".

Data Analysis

For the statistical analysis of the collected data for the research, the Statistical Package for the Social Sciences (SPSS) 18 package program was used. For the normality assumption test of the data obtained in BÖSÖ, the Shapiro-Wilks Normality Test was used. As a result of this test, it was determined that the data showed a normal distribution. Therefore the t test from the parametric tests and Anova test methods were used in data analysis. For the significance test, .05 level was administered.

Results

Metacognitive Learning Strategies of Physician-Candidates

In accordance with the first sub-problem of the research, descriptive statistics related to the metacognitive learning strategies scores of physician-candidates are indicated in Table 1.

In accordance with the collected data they are good at the "organization" and "observation" sub-dimensions in terms of knowledge and awareness of the information processing process and they are on an intermediate level in the other two sub-dimensions called "Evaluation" and "Planning".

Changes in Physician-Candidates' Scores Related to Metacognitive Learning Strategies According to Genders

The Levene test was applied to determine whether the scores related to metacognitive learning strategies of physician-candidates differ according to genders or not and scale distribution came out to be homogenous ($p > 0.05$). In accordance with this, the t test was applied to independent groups to determine if the difference among the average scores in terms of the gender variable is significant or not.

In Table 2, total scores obtained from all dimensions are indicated to be 58.95 for females and 58.01 for males according to views of physician-candidates. According to t-test results applied to determine if the difference is statistically significant, physician-candidates' scores of metacognitive learning strategies in terms of the

gender variable showed significant differences in sub-dimensions. When sub-dimensions were examined, in "organizations strategies" and "observation strategies" dimensions the difference came out to be significant in favor of females.

Changes in Physician-Candidates' Scores Related to Metacognitive Learning Strategies According to Class Levels

In Table 3, it is seen that physician-candidates' average scores of metacognitive learning strategies indicate differences according to class levels. To determine if this difference is statistically significant the Levene test was applied and it was assessed that the distribution was homogenous ($p > 0.05$) in the whole scale and sub-scales. In accordance with this, to determine if the difference among the average scores is significant or not,

Table 1. Values related to the scores of physician-candidates in the metacognitive learning strategies

Dimensions	Number of questions	Lowest score	Highest score	\bar{x}	Sd
Planning strategies	6	6.00	24.00	14.79	1.88
Organization strategies	6	6.00	24.00	16.50	2.30
Observation strategies	5	5.00	20.00	17.64	2.81
Evaluation strategies	4	4.00	16.00	9.54	2.03
Whole scale	21	21.00	84.00	58.49	7.15

Table 2. T-test results of physician-candidates' scores of metacognitive learning strategies according to the gender variable

Gender	N	Metacognitive learning strategies	\bar{x}	sd	T	p
Female	316	Planning strategies	14.72	612	1.00	0.315
Male	298		14.88			
Female	316	Organization strategies	16.86	612	2.80	0.005*
Male	298		16.11			
Female	316	Observation strategies	17.91	612	2.44	0.015*
Male	298		17.36			
Female	316	Evaluation strategies	9.44	612	1.30	0.193
Male	298		9.65			
Female	316	Whole scale	58.95	612	1.62	0.104
Male	298		58.01			

Table 3. Values of physician-candidates' scores of metacognitive learning strategies in terms of Class Levels

Dimensions	1. Class			2. Class			3. Class		
	N	\bar{x}	sd	N	\bar{x}	sd	N	\bar{x}	sd
Planning strategies	151	14.99	2.31	267	14.60	1.74	196	14.91	1.94
Organization strategies		18.18	3.10		15.75	2.96		16.21	3.56
Observation strategies		18.39	2.84		17.36	2.69		17.45	2.91
Evaluation strategies		10.17	1.86		9.15	1.88		9.59	2.21
Whole scale		61.74	7.38		56.88	6.32		58.18	7.26

one way analysis of the variance was conducted. The results are indicated in Table 4.

According to the findings obtained in Table 4, it was assessed that physician-candidates' average scores of metacognitive learning strategies indicate significant differences in class levels sub-dimensions and that it showed significant differences ($p < 0.05$). The reason for this significant difference in metacognitive learning strategies of physician-candidates is that according to Tukey test analysis results, among first-year,

second-year and third-year students there is a significant difference in favor of first-year students.

Changes in Physician-Candidates' Scores Related to Metacognitive Learning Strategies According to Academic Success

In accordance with the third problem of the research, the Anova analysis test results, regarding the fact that the average scores of metacognitive learning strategies of physician-candidates in terms of the academic success variable indicate changes in sub-dimensions creating the metacognitive learning strategies, can be seen in Table 5.

Table 4. The analysis of variance results of physician-candidates' scores of metacognitive learning strategies according to class levels variable

Dimensions	Class	N	\bar{x}	Sd	F	P	Variables with significant differences
Planning strategies	1. Class (A)	151	14.99	2.31	2.505	0.083	
	2. Class (B)	267	14.60	1.74			
	3. Class (C)	196	14.91	1.87			
Organization strategies	1. Class (A)	151	18.18	3.10	28.860	0.000*	A-B, A-C
	2. Class (B)	267	15.75	2.96			
	3. Class (C)	196	16.21	3.56			
Observation strategies	1. Class (A)	151	18.39	2.84	7.048	0.001*	A-B, A-C
	2. Class (B)	267	17.36	2.69			
	3. Class (C)	196	17.45	2.91			
Evaluation strategies	1. Class (A)	151	10.17	1.86	12.728	0.000*	A-B, A-C
	2. Class (B)	267	9.15	1.88			
	3. Class (C)	196	9.59	2.21			
Whole scale	1. Class (A)	151	61.74	7.38	24.209	0.000*	A-B, A-C
	2. Class (B)	267	56.88	6.32			
	3. Class (C)	196	58.18	7.26			

Table 5. The analysis of variance results of physician-candidates' scores of metacognitive learning strategies according to the academic success variable

Dimensions	Academic success	N	\bar{x}	sd	F	P	Variables with significant differences
Planning strategies	Low (A)	200	14.35	2.18	11.677	0.000*	A-B, A-C, B-C
	Medium (B)	152	14.54	1.96			
	High (C)	139	15.30	1.46			
Organization strategies	Low (A)	200	16.12	3.63	3.631	0.027*	A-B, A-C, B-C
	Medium (B)	152	16.87	3.03			
	High (C)	139	17.12	3.28			
Observation strategies	Low (A)	200	17.47	3.12	3.959	0.020*	A-B, A-C, B-C
	Medium (B)	152	17.71	2.81			
	High (C)	139	18.38	2.45			
Evaluation strategies	Low (A)	200	9.14	2.18	3.976	0.019*	A-B, A-C
	Medium (B)	152	9.67	1.88			
	High (C)	139	9.71	1.79			
Whole scale	Low (A)	200	56.29	8.36	5.344	0.005*	A-B, B-C
	Medium (B)	152	58.05	6.20			
	High (C)	139	59.58	6.07			

When Table 5 is examined, it is indicated that there are significant differences in physician-candidates' metacognitive learning strategies in terms of academic success ($p < 0.05$). In other words, it was determined that overall success levels increase in parallel with adequacy levels in metacognitive learning strategies of physician-candidates. The reason for this significant difference in the success levels of the physician-candidates between students with low academic success levels and medium academic success levels and between students with medium academic success levels and high academic success levels is, according to Tukey HSD test analysis results, due to the metacognitive learning strategies of the physician-candidates.

Discussion

One of the principal purposes of education is providing the significance of the information taught and learned in an educational institution and increasing its connection with real life and schooling students to adopt the idea of life-long learning. The metacognitive learning strategies, which have an important place in the framework of cognitive theory, are basically strategies that enable students to control their cognition and arrange their learning processes using centering, ordering, planning and evaluating functions. It is stated that first these strategies should be known and awareness should be increased in order for individuals to use strategies requiring metacognitive skills at work⁸. From this perspective for a physician to be successful, it is necessary for them to have knowledge regarding their own beliefs and knowledge and skills in order to have comprehensive knowledge of learning and teaching.

The first sub-dimension of metacognitive learning strategies is "organization strategies". These strategies that are to prepare the mind while starting to study suggest that the information needs to be determined in advance according to the metacognitive schemas that exist in the mind. Determining the subjects and key concepts before any learning activity and organization strategies requiring the review of the context to be learned has an important role in metacognitive learning strategies.

The second sub-dimension called "observation strategies" consists of strategies including observation activities focused on the permanent self-learning of a student during a learning activity. It can be stated that these strategies are for checking if a student understands a

subject or not, assessing the accuracy of the information in comparison with the previous information, determining information validity and the hierarchical structure of information during learning and enabling self-observation of a student and information observation.

In the third dimension of metacognitive learning strategies, "evaluation strategies" defined as the student's exhibit of learning and following learning skills, exist. In this dimension where a student self-assesses what is learned and to what extent it is learned, strategies including self-testing in terms of information and analyzing unknown information according to test results can be stated to be dominant.

Especially preparing a study plan regarding learning, doing things in time, preparing the right conditions for pre-preparation and mental preparing regarding courses exist under the "planning strategies" sub-dimension.

In this research the aim was to determine metacognitive learning strategies of physician-candidates. The data of 614 out of 1361 students that could be contacted and showed willingness was collected. Of these, 298 (48.5%) are male and 316 (51.5%) are female. Out of the physician candidates, 151 (24.6%) are first-year students, 267 (43.5%) are second-year students and 196 (31.9%) are third-year students.

It can be argued in general that in accordance with the collected data they are good at the "organization" and "observation" sub-dimensions in terms of knowledge and awareness of the information processing process and they are on an intermediate level in the other two sub-dimensions called "Evaluation" and "Planning". It can be considered that their intensive education prevents them from planning and evaluating.

The findings presented with this research show that there is a significant difference regarding the gender variable, in favor of females, in the "organization" and "observation" sub-dimensions of metacognitive learning strategies. This result supports the other findings in literature stating that female students use more learning strategies than male students^{9,10,11,12}.

According to another finding obtained with this research, metacognitive learning strategies of physician-candidates indicate significant differences in the "organization", "observation" and "evaluation" sub-dimensions in terms of the class levels variable. So it

was determined that this difference is in favor of first-year students in comparison with second and third-year students. This result is pretty shocking. When the literature is reviewed there are findings opposing this finding^{11,13,14}. This situation should be remedied by working with bigger examples and by supporting qualitative analyses in detail.

With respect to another finding obtained from this research, metacognitive learning strategies of physician-candidates indicate significant differences in all dimensions in terms of the academic success variable. In other words it was determined that students with higher academic success levels use metacognitive learning strategies more. Studies show that there is a strong relationship between academic motivation, learning strategies adopted by students and their academic success^{15,16}.

Success and failures of learners enable them to improve their learning strategies. It was assessed in studies made in different subjects and learning levels that academically successful students use learning strategies more in comparison with academically unsuccessful students and that they are more active, aimed and flexible in terms of strategy use¹⁷⁻²¹. This may result from the fact that self-perceptions of successful students are more positive and that they focus more effort on their success. Besides using learning strategies effectively, they have more knowledge of strategies^{22,23}. Reviewed studies support the finding suggesting that learning strategies increase academic success on the university level^{13,24-27}.

As mentioned before, metacognitive information is a factor that facilitates learning. The results of this research indicate that medical education programs should take precautions in terms of improving the metacognitive information of physician-candidates. Suggestions for implementers and researchers developed in accordance with the results of this research are stated below:

The fact that there is a relationship between academic success and metacognitive learning strategies of physician-candidates reveals the necessity for medical education programs to shape these features of physician-candidates for the future. During pre-service educations of physician-candidates, selective courses aiming to improve the level of metacognitive learning strategies use can be included in training programs, and learning activities aiming to increase the use of

metacognitive learning strategies in other classes can be arranged.

The needs for metacognitive learning strategies of students with intermediate and low academic success should be met and their developing of new learning strategies and realizing self and effective learning should be supported.

Especially in the third grade where major courses become intensive, the importance of students' strategy use in planning, arranging and evaluating self-learning activities and also in cataloging learning activities should be emphasized. And students should be enabled to arrange learning activities accordingly.

Academic staff/personnel and physician-candidates should be educated in metacognitive learning strategies and students should be enabled to know the structure of their self-cognitive system and how it operates and to use effective strategies. In addition to this, instructors should raise awareness in students in terms of this case.

Research results show that female physician-candidates use metacognitive learning strategies more than male physician-candidates. It can be useful to determine the reasons why male physician-candidates use metacognitive learning strategies less and to give importance to informing them about improving their awareness starting from the first year.

In this research, only the relationships between metacognitive learning strategies used by students, socio-demographic features and academic success were examined. In studies to be conducted in the future, learning strategies of academic staff/personnel and students can be embraced together and they can be exhibited by using education platform variables and data collection techniques.

Finally, in the process of this study, lots of studies on the relationship between metacognitive learning strategies and academic success were encountered. It is thought that future studies will contribute more to this field.

Research can be remade on physician-candidates with a different exemplifying method to be chosen and the relationship between independent variables and variables that can affect metacognitive learning strategies.

Experimental studies for determining impacts of metacognitive learning strategies on academic success can be performed.

References

1. Shuell TJ. The role of the student in learning from instruction. *Contemp Educat Psychol* 1988;13:276–95.
2. Namlu AG. Bilisötesi öğrenme stratejileri ölçme aracının geliştirilmesi: Geçerlilik ve güvenilirlik çalışması. *Anadolu Üniv Sosyal Bil Derg* 2004;4(2):123–36.
3. Weinstein CE, Mayer RE. The teaching of learning strategies. *Handbook of research on teaching* (Ed. M. Wittrock). New York: Macmillan Company, 1986.
4. Blakey E, Spence S. (1990). Developing metacognition. National Association for Gifted Children, <http://www.nagc.org/index.aspx?id=205>.
5. Oxford RL. *Language Learning Strategies: What Every Teacher Should Know*. Boston: Heinle & Heinle, 1990.
6. Pintrich PR, Smith DA, Garcia T, McKeachie WJ. A manual for the use of the motivated strategies for learning questionnaire (MSLQ). Ann Arbor, Michigan: National Center for Research to improve PostSecondary Teaching and Learning (NCRIPTAL). The University of Michigan. ED 338122, 1991.
7. Karasar N. *Bilimsel Araştırma Yöntemi*. Ankara: Nobel Yayın Dağıtım, 2008.
8. Özcan ZÇ. Sınıf öğretmenlerinin derslerinde bilişüstü beceri geliştiren stratejileri kullanma özelliklerinin incelenmesi. Doktora Tezi, Marmara Üniv Eğitim Bil Enst, İstanbul, 2007.
9. Bulut S. İlköğretim II. kademe öğrencilerinin matematik dersinde kullandıkları öğrenme stratejileri ve başarı güdülleri, Yüksek Lisans Tezi, Trakya Üniv. Fen Bil Enst, Edirne, 2006.
10. Duman B. Öğrencilerin benimsedikleri eğitim felsefeleriyle kullandıkları öğrenme strateji ve öğrenme stillerinin karşılaştırılması. *Çukurova Üniv Sosyal Bil Enst Derg* 2008;17(1):203–24.
11. Saban AI, Bal P. Matematik ve sınıf öğretmenliği bölümlerinde okuyan öğrencilerin öğrenme stratejilerinin bazı sosyo-demografik özellikler açısından incelenmesi. *Ege Eğitim Derg* 2010;2:1–19.
12. Sheorey R. An examination of language learning strategy use in the setting of an indigenized variety of English. *System* 1999;28(2):173–90.
13. Hamurcu H. Okulöncesi öğretmen adaylarının kullandıkları öğrenme stratejileri. *Hacettepe Üniv Eğitim Fak Derg* 2002;23:127–34.
14. Saban AI, Tümkaya S. Öğretmen adaylarının öğrenme stratejileri ile sosyo-demografik özellikler ve akademik başarıları arasındaki ilişkinin incelenmesi. *Ege Eğitim Derg* 2008;9(1):1–22.
15. Young SH, Vrongistinos K. In-service teachers' self-regulated learning strategies related to their academic achievement. *J Instructional Psychol* 2001;29(3):147–54.
16. Özkal N, Çetingöz D. Akademik başarı, cinsiyet, tutum ve öğrenme stratejilerinin kullanımı. *Kuram ve Uygulamada Eğitim Yönetimi* 2006;46:259–75.
17. Jimenez RT, Garcia GE, Pearson PD. The reading strategies of bilingual Latino students who are successful English readers: Opportunities and obstacles. *Reading Research Quarterly* 1996;31(1):90–109.
18. Medo MA. The status of high school students' learning strategies: What students do when they read to acquire knowledge. Unpublished Doctoral Dissertation, University of Minnesota, USA, 2000.
19. Phakiti A. A closer look at the relationship of cognitive and metacognitive strategy use to EFL reading comprehension test performance. *Language Testing* 2003;20(1):26–56.
20. Loranger A. The study strategies of successful and unsuccessful high school students. *J Reading Behavior* 1994;26:347–60.
21. Schutz PA, Drogosz LM, White VE, DiStefano C. Prior knowledge, attitude and strategy use in an introduction to statistics course. *Learning and Individual Differences* 1998;10(4):291–308.
22. Meltzer LJ, Katzir Cohen T, Miller L, Roditi B. The impact of effort and strategy use on academic performance: Student and teacher perceptions. *Learning Disabilities Quarterly* 2001;24(2):85–98.
23. Montague M, Bos C. Cognitive and metacognitive characteristics of eighth grade students' mathematical problem solving. *Learning and Individual Differences* 1990;2:371–88.
24. Tay B. Öğrenme stratejilerinin hayat bilgisi ve sosyal bilgiler öğretimi dersinde akademik başarıya etkisi. *Milli Eğitim Derg* 2007;35(173):87–102.
25. Taşdemir A, Tay B. Fen bilgisi öğretiminde öğrencilerin öğrenme stratejilerini kullanmalarının akademik başarıya etkileri. *Uludağ Üniv Eğitim Fak Derg* 2007;20(1):173–87.
26. Lynch DJ. Motivational factors, learning strategies and resource management as predictors of course grades. *College Student J* 2006;40(2):423–28.
27. Aytunga O. Derste not almanın öğrenme ve hatırlama düzeyine etkisi. Doktora Tezi, Hacettepe Üniv Sosyal Bil Enst, Ankara, 1999.