METACOGNITIVE AWARENESS OF PRE-SERVICE TEACHERS

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ABSTRACT

The purpose of the study is twofold: (1) to investigate the pre-service teachers' levels of "metacognitive awareness" and comparison of sub-awareness scores, and (2) to explore relationships among metacognitive awareness factors and other independent variables including gender, GPA, course grades, and graduated high school type. The data were collected during "Computer Applications in Education" course in Spring-2010. 49 students completed the "Metacognitive Awareness Inventory (MAI)" developed by Schraw and Dennison (1994). There are 52 items loaded into 2 factors which are 'knowledge of cognition' and 'regulation of cognition'. High reliability coefficients were found for these factors (form .91 to .97). Students' scores on MAI were calculated and used to find out relations with other descriptive factors. Results and interpretation of the statistical analyses reporting mutual interaction among these variables were presented.

Keywords: Metacognitive awareness, pre-service teachers, success factors.

INTRODUCTION

Increasing the efficiency in learning at any part of the life is almost always a consideration for educators. As lifelong learning becomes important in the information society, the target of such a consideration goes beyond professions. That is, learners become self-educators bringing the issue of metacognition on the table. It can be defined as cognitions of cognitions (Dunlosky & Metcalfe, 2009). Metacognition is classically divided into two major components that are "metacognitive knowledge" and "metacognitive regulation". The former can be simply explained by knowledge of cognition while the latter can be referred as the way for regulation of cognition (Schraw & Moshman, 1995).

Since success is closely related with metacognition (Schraw, 1998), shaping or improving metacognitive awareness of learners might be considered as one of the goals in education (Kuhn, 2000). In this way, learners can either build their own ways to understand their own cognitive processes or find ways and strategies to manage the obstacles about cognition. In a recent study conducted by Young and Fry (2008), the relations between metacognitive awareness components and specific factors of success were investigated. That research includes some contributions to the metacognition literature by confirming the importance of

metacognition in academic achievement. Among factors of success, especially both GPA and course grade were correlated with metacognitive awareness factors.

Appropriate use of metacognitive strategies is one of the keys to success. However, the relationship between awareness and the practice is not very simple as proposed by Cao and Nietfeld (2007). In their study, it was expected from students to adjust their strategies when faced with different levels of difficulties. However, the findings revealed the existence of a sophisticated relation between awareness and regulation because being metacognitively aware did not guarantee the strategy shift. Both studies were run in higher education context. Metacognition is expected to develop over years (Flavell, 1979). Cao and Nietfeld's (2007) study shows that components of metacognition might not always develop at a parallel fashion. That is why, supporting this process is important for educators. For example, metacognitive awareness training should be available for students. This might lead them to learn better (Wade & Reynolds, 1989).

In this study, the aim is to survey the levels of pre-service teachers' metacognitive awareness with the utilization of Schraw and Dennison's (1994) Metacognitive Awareness Inventory (MAI). The levels include two main (knowledge of cognition; regulation of cognition) and eight sub-scales (declarative, procedural, and conditional knowledge; planning, information management, monitoring, debugging, and evaluation). As a follow-up analysis, pre-service teachers' awareness types were compared. Another aim of the study is to explore the existent relations among metacognitive awareness measures, academic success (GPA and course grade), and demographic variables (gender and graduated high school type).

METHOD

49 First year undergraduate students participated in the study. All of them were from college of education. 46 students were enrolled in the department of elementary science education; 2 students were enrolled in the department of elementary mathematics education, and 1 student was enrolled in the department of early childhood education. 80 % (N=39) of participants were female and 20 % (N=10) of them were male. Most of them graduated from Anatolian high schools (N=20) providing English-based scientific curriculum. 10 students were graduates of general public high schools providing Turkish standard curriculum. Only 1 student graduated from a science high school and the rest reported other types of high schools. Cumulative GPAs of participants were ranging from .77 to 3.73 out of 4 (M=2.04, SD=.63). Course grades were between 10-100 out of 100 (M=82, SD=15.22).

Survey was distributed to participants during spring 2010 term. They attended CEIT 100 – a course offering the basic computer applications for teachers. During the semester, they completed weekly tasks and at the end of the semester, they were graded according to those assignments. The survey was administered at the end of the term. Voluntary participation was required.

Metacognitive Awareness Inventory was developed by Schraw and Dennison (1994). In the literature, validity and reliability of it were confirmed through certain studies (Schraw and Dennison, 1994; Young and Fry, 2008). There are 52 items loading 2 factors with 8 subscales. The 2 factors are parallel with the components of traditional metacognition theories: (1) Knowledge of Cognition; (2) Regulation of Cognition. In the first construct, there are three main knowledge types that are declarative, procedural, and conditional. Declarative knowledge refers to the awareness of the possessed learning abilities while procedural is the awareness of how to do's for learning. Conditional knowledge, on the other hand, deals with the when and why to do's. The second major construct comprised of strategies including planning, information management, monitoring, debugging, and evaluation. In the original inventory internal consistency was almost excellent [Cronbach's alpha values for factor 1 (⬚=.88); factor 2 (⬚=.88); entire inventory (⬚=.93)]. For this study, all items were applied and analyzed in consistence to Schraw and Dennison's (1994) article.

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Gathered data were analyzed descriptively to understand the levels of metacognitive awareness of students. Then, it was explored whether there is a significant difference between pre-service teachers' two types of awareness which are knowledge of cognition and regulation of cognition. To do this, paired sample t-test was performed. In order to decide on the relationships, correlations were calculated. Before starting the analysis, data cleaning was performed. Since it was less than 2 %, missing values were ignored. All the analyses were considered at .05 alpha level.

RESULTS

SPSS 15.0 was used for analyses. The original instrument has high reliability values. Similarly, in this study, the instrument Cronbach alpha coefficients were found very high [☐(factor 1)=.91; ☐(factor2)=.95; ☐(entire instrument)=.97]. To find out the answer of the first research question, descriptive statistics were explored. Table 1 summarizes the results for each subscale and the total metacognitive awareness scores. Knowledge of cognition scores ranged from 48 to 84 out of 85 (M=63.71, SD=10.03). Scores for regulation of cognition factor ranged from 88 to 169 out of 175 (M=125.86, SD=20.55). In total, metacognitive awareness scores were found between 137 and 253 out of 260 (M=189.57, SD=30.01). Frequencies indicated that 51 % of the first factor scores; 53 % of the second factor scores; and 57 % of the total scores are below the average. That is, more than half of the students have low scores in metacognitive awareness. Comparing the factors, pre-service teachers got slightly better scores in knowledge of cognition. In order to explore significance of better scores, a paired sample t-test was calculated. Before that, the mean scores were standardized because the amount of subscales and items were different for each factor. Knowledge of cognition consists of 17 items and the rest of the items belong to regulation of cognition factor. Such an imbalance results in different scores in maximum (factor 1: 85; factor 2: 175). That is why, to equate the maximum scores to be received, each score in the first factor was multiplied by the coefficient gained through division of maximum score of factor 2 by factor 1. In this way, the scores were equated to be compared. The paired t-test generated meaningful differences on the mean scores of knowledge of cognition and regulation of cognition factors (t(48)=4.45, p<.001). According to the results, knowledge of cognition scores of pre-service teachers is significantly higher than regulation of cognition scores.

Table 1: Levels of Metacognitive Awareness

		Min	Max	Mean	SD
Knowledge of Cognition	Declarative	21	40	30.25	4.91
	Procedural	10	20	14.47	2.92
	Conditional	13	25	19.00	3.32
	Total (Factor 1)	48	84	63.71	10.03
Regulation of Cognition	Planning	14	35	25.23	4.81
	Information Management	24	45	33.67	5.54
	Monitoring	15	35	25.53	4.90
	Debugging	12	25	19.59	3.60
	Evaluation	14	29	21.84	4.08
	Total (Factor 2)	88	169	125.86	20.55
	Metacognitive Awareness	137	253	189.57	30.01

While examining the correlation coefficients, those above .30 were considered as a cutoff point (Tabachnick & Fidell, 2001). GPA and course grade variables were taken as academic success variables. GPA was found negatively correlated with gender (☐=-.45) towards the opposite directions. In addition, GPA is positively

correlated with two of the regulation variables which are planning (r=.32) and monitoring (r=.31) whereas no significant correlations were found between GPA and knowledge of cognition variables. There is a significant correlation between course grade and the awareness evaluation (r=.39) that is another subscale under regulation of cognition construct. Among demographic variables, only graduated high school presented correlations with debugging skill (⬚=.35) belonging to regulation of cognition factor in the same direction. Although found correlations are not very strong, they are not too weak to ignore.

DISCUSSION AND CONCLUSION

Metacognitive awareness scores of pre-service teachers were not too low, but mean differences between knowledge of cognition and regulation of cognition factors were found significant. This finding can be associated with Cao and Nietfeld's (2007) study results. In their study, the participants did not shift strategy use as the task difficulties varied. Parallel to that, students in our study demonstrated higher awareness about their metacognitive structures with regards to knowledge. On the other hand, as the scores suggested, their regulation skills were relatively low. This might mean that the management of regulation skills is not easily adjusted no matter how high they are aware of what(declarative), how (procedural), and why (conditional) to learn.

Correlational analysis revealed certain relationships. According to these, it can be interpreted that males are tended to have lower GPA scores. Overall, academic success can be related with certain regulation skills. Results indicated that as the GPAs of pre-service teachers increase, their planning and monitoring awareness develop. Planning is a regulation skill occurring just before learning. It is a kind of preparation to decide on learning components such as goal setting. The improvement of this skill can lead to increase in the awareness of what should be done to improve academic performance. Monitoring occurs during a learning experience. It might be considered as a kind of self-evaluation or self-feedback about learning process. If the learner improves it, his/her awareness of the learning performance might become clearer after each trial. Then, academic success could be affected because of learners' awareness of what strategy work for what context or content. However, unlike the findings of Young and Fry (2008), awareness of knowledge of cognition is not a determinant factor on GPA scores in this study. Since students' regulation of cognition is relatively low, they could not perform necessary manipulations to increase their success in learning. That is why, no matter how high their knowledge of cognition, their GPAs are not determined by this factor.

Pre-service teachers' evaluation skills might be related to their high course grades because evaluation refers to an overall judgment to see the results of learning experience. As the analysis criteria develop after each experience, the strategies may be adjusted across cases. The learner can become aware of how to apply strategies for more effective and efficient learning outcomes including higher course grades. By this way, learner might use evaluation results of previous experiences in favor of upcoming learning situations in a cumulative and iterative manner.

Debugging can be thought as a self-correction skill. During a learning episode, the learner with high debugging awareness can generate certain strategies to deal with detected learning errors. The findings suggest that learners graduated from Anatolian high schools might be more tended to debug errors in learning performance. Students in these kinds of schools have to pass an elimination exam. Moreover, provided education in these schools seem more directed to improvement of critical thinking skills when compared to other types of schools. Because of these reasons, graduates are more successful to find their mistakes in learning. They are also considerably successful in university entrance exam. Although there is a relationship among school types and regulation of cognition, in Turkey, there is not a formally applied approach to improve metacognitive awareness. As Kuhn (2000) suggested, it should be an educational goal.

This study can be considered as a contribution for the confirmation of MAI (Schraw & Dennison, 1994), but the sample size was limited. Therefore, the results might not be generalized. On the other hand, the findings are valuable to shed light on for further studies about detailed analysis of the relations among subscales. Moreover, this study emphasizes the importance of metacognitive training. There seems to be an urgent need for improvement of metacognitive awareness even at higher education level.

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