academicJournals

Vol. 8(6), pp. 277-288, 23 March, 2013
DOI: 10.5897/ERR2012.1109
ISSN 1996-0816 © 2013 Academic Journals
http://www.academicjournals.org/ERR

Educational Research and Reviews

Full Length Research Paper

A comparison of metacognitive awareness levels of future elementary teachers in Turkey and USA

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Accepted 18 January, 2013

The aim of this research is to examine and compare metacognitive awareness levels or dimensions related to the metacognitive awareness of students who were studying in undergraduate programs about elementary education at Georgia State and Uludag University. In addition, it is aimed to explore the differences between the metacognitive awareness levels of the American and Turkish students. Data were collected by utilizing the metacognitive awareness inventory to 215 students. 104 students were studying at Georgia State University and 111 students were studying at Uludag University. Statistical analysis results revealed that the metacognitive awareness of American and Turkish students for every level was similar, and that very few of these have low levels of metacognitive awareness. Significant differences appeared in dimensions and sub-dimensions of metacognitive awareness. Therefore, in order to develop pre-service teachers' metacognitive awareness, effective activities for courses that develop and support metacognitive knowledge and skills could be organised by academicians in USA and Turkey.

Key words: Metacognitive awareness, knowledge about cognition, regulation of cognition, teacher education.

INTRODUCTION

Metacognition plays an important role in learning. Metacognition is the ability of an individual to gain information about herself through self-reflection, to control her decision-making during a cognitive performance, and to make necessary regulations (Alci and Altun, 2007; Schraw and Graham, 1997). It allows individuals to become aware of and regulate thinking, and decision-making in the course of learning and problem solving. Lack of metacognitive awareness affects problem solving behavior and learning. High levels of metacognitive awareness facilitate the use of more efficient strategies and better attention to performance, and increase learning (Schraw and Graham, 1997). Metacognition has an important role in self-regulation, which is also necessary for successful learning (Lucangeli and Cornoldi, 1997). When learning something for the first time, metacognition makes it easier for the individual to control their own learning. It supports life-long reflective thought, improves self-esteem, enhances quick decision-making, and produces feelings of responsibility (Kuiper, 2002; Schraw and Graham, 1997). In most research, it is suggested that metacognition is crucial in individuals' education (Kapa, 2001; Kramarski et al., 2002; Mevarech, 1999; Schoenfeld, 1985; Teong, 2002).

Metacognition provides advantages for learning. Individuals who are aware of their metacognitive ability are more strategic in problem-solving than those who are not. Individuals who have highly metacognitive aware-

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ness are aware of their performances and typically perform better (Swanson, 1990). These individuals regard themselves as life-long students (Öz, 2005). They plan their work, sequence and obtain information about their cognitive processes, and therefore increase their performance and success (Schraw and Sperling-Dennison, 1994). High metacognitive awareness results in high performance. Therefore, metacognition affects academic success in a positive way (Cardelle-Elawar, 1992; Kuiper, 2002; O'Neil and Abedi, 1996; Özcan, 2000).

Flavell (1979) defines metacognition as thinking about thinking and cognition about cognitive phenomena. Metacognition is generally thought of as thinking about thinking, in adherence to this original meaning (Akin et al., 2007; Blakey and Spence, 1990; Brown, 1981 cited in Williamson, 1996; Livingston, 1997), although it is defined from different perspectives by some researchers. Brown (1981), for example, defines metacognition as "one's ability to understand and control the cognitive processes, to think about thinking and making necessary changes in how we think during cognitive processes" (cited in Williamson, 1996). Cross and Paris (1988) define metacognition as "the knowledge and control children have over their own thinking and learning activities". Martinez (2006), meanwhile, defines metacognition as "the monitoring and control of thought". Accordingly, Alci and Altun (2007) define metacognition as an "individual's having knowledge about himself controlling the knowledge in the process and making the necessary arrangements".

Basic dimensions of metacognition

Knowledge about cognition and regulation of cognition could be defined as two basic dimensions of metacognition based on the findings of many researchers (Brown, 1987; Cross and Paris, 1988; Flavell, 1979; Pintrich, 2002; Schraw et al., 2006; Schraw and Moshman, 1995; Schraw and Sperling-Dennison, 1994).

Knowledge about cognition refers to acquired knowledge about cognitive processes, knowledge that could be used to control cognitive processes (Livingston, 1997), the knowledge learners have of their own learning methods (Sperling et al., 2004) and what they know about their cognition (Schraw et al., 2006). Knowledge about cognition has three sub-dimensions; declarative, procedural and conditional knowledge (Artzt and Armour-Thomas, 1992; Schraw et al., 2006). Declarative knowledge means knowing about things (Schraw and Graham, 1997). Accordingly, it could be explained as beliefs related to events and viewpoints, cognitive aims and individual abilities (Montgomery, 1992; Thomas and Mee, 2005). Schraw et al. (2006) define it as "the knowledge about oneself as a learner and what factors might influence one's performance". Procedural knowledge is related to awareness and management of cognition (Cross and Paris, 1988). It refers to the knowledge about the execution of procedural skills, strategies and other procedures (Schraw et al., 2006; Schraw and Graham, 1997). It is related to which strategy learners will use and how it will be used for cognitive work (Jacobs and Paris, 1987; Pintrich, 2002; Schraw, 1998; Sperling et al., 2004). Conditional knowledge includes knowledge of when and why to use a particular strategy (Schraw et al., 2006). It helps the learner to remember when it is effective (Jacobs and Paris, 1987; Schraw, 1998; Thomas and McRobbie, 2001; Thomas and Mee, 2005). Knowledge about cognition is formed by the interaction of person, task and strategy (Flavell, 1979, 1993).

Regulation of cognition has five sub-dimensions, identified as planning, information management, monitoring, debugging strategies and evaluation of learning (Artzt and Armour-Thomas, 1992; Schraw and Sperling-Dennison, 1994). Planning involves determining purpose, activating relevant background knowledge, identification and selection of appropriate strategies, providing and organizing related materials/cognitive sources, and budgeting time (Schraw et al., 2006; Schraw and Moshman, 1995; Zimmerman, 1989). Information management includes strategies such as regulation, detailing, summing, and focusing on the successful use and effective management of information (Schraw and Sperling-Dennison, 1994). Monitoring involves the self-testing skills necessary to control learning such as goal setting, self-questioning, paraphrasing, and making connections between new and past content. Accordingly, it embraces awareness of learners' own performance as they tackle a problem, their analysis of whether their performance is effective or not, and predictions about their performances in the future (Nietfeld et al., 2005; Schraw et al., 2006; Zimmerman and Paulsen, 1995). Debugging strategies are related to the identification of mistakes in a performance, evaluation of the effectiveness of learning strategies, and rejection of strategies that are not appropriate (Schraw and Sperling-Dennison, 1994). Evaluation of learning includes learners' evaluation of the effectiveness of their own learning and regulation processes (Everson and Tobias, 1998; Schraw and Moshman, 1995).

Importance and aim of the research

A high level of metacognitive awareness is critical not only for students but also for teachers. An effective teacher understands cognitive processes and features of the processes and structures; and, how to increase students' awareness of how those structures and processes can be used more effectively (Livingston, 1997). Accordingly, high metacognitive awareness enables teachers to be personally successful in learning in their

professional lives and to support students' learning by providing opportunities for them to form and increase their metacognitive awareness. When students engage in metacognitive activities such as evaluating, following and regulating themselves, their learning increases (Lin, 2001). Teachers can use different methods to improve students' metacognitive abilities and awareness. They could use their metacognitive abilities in practices, analyzing and evaluating and comparing these with ideal practices and looking for alternatives (Ekiz and Yigit, 2007; Marshall, 2003; Tüysüz et al., 2008). Teachers could attract students' attention to *thinking about thinking* and make them aware of the importance of this ability by presenting their own experiences (Butler and Winne, 1995; Thomas and McRobbie, 2001). As a result, they increase the learning capacity of students.

It is clear that the teachers who educate the next generations and lay the groundwork for the future benefit from high metacognitive awareness. A lack of meta-cognitive awareness limits teachers' ability to be effective in the classroom (Tüysüz et al., 2008). But, what are the metacognitive awareness levels of students in under-graduate programs? Could knowledge of these students' metacognitive awareness predict their effectiveness in the classroom? Our review of the literature on meta-cognition shows that many different studies have been carried out with pre-service teachers studying in different teacher education programs in universities. Some of these (Baykara, 2011; Güven and Belet, 2010; Kiremitçi, 2011; Okçu and Kahyaoğlu, 2007; Özsoy and Günindi, 2011; Sungur and Şenler, 2009; Topçu and Ubuz, 2008; Tüysüz et al., 2008; Yavuz and Memiş, 2010) investigate and examine the metacognitive knowledge, skill, strate-gies and awareness levels of pre-service teachers studying in different areas. Some of these studies (Abd-El-Khalick and Akerson, 2009; Arsal, 2010; Bendixen and Hartley, 2003; Erskine, 2009; Kramarski and Michalsky, 2009; Lee, 2011; Liang and Richardson, 2004; Metallidou, 2009; Pope, 2011) are about the relationship between metacognition and different education areas or problem-solving. Others (Güven and Belet, 2010; İflazoğlu-Saban and Saban, 2008; Okçu and Kahyaoğlu, 2007; Tüysüz et al., 2008; Yavuz and Memiş, 2010) are related to the metacognitive awareness levels that could have been reached by pre-service teachers in elementary education undergraduate programs. All of these studies were carried out in Turkey.

Güven and Belet (2010) determined primary school teacher trainees' opinions on metacognition and their epistemological beliefs, examined the relationship bet-ween those epistemological beliefs and meta-cognition. The results of the research indicated that most of the primary school teacher trainees used learning strategies, and some of them even used planning and monitoring strategies for learning. Teacher trainees who explained learning as effort rather than ability had metacognitive awareness. İflazoğlu-Saban and Saban (2008) examined the metacognition and motivation levels of elementary pre-service teachers. They explored the differentiation of metacognition and motivation according to some socio-demographic variables. Therefore, they and investigated the relationship between metacognition and motivation. Regarding metacognition scores, a significant difference was found in favor of female students, and students from middle and high socio-economic classes. Okçu and Kahyaoğlu (2007) determined the metacognitive strate-gies of elementary pre-service teachers and investigated the differentiation of these strategies according to gender, priority, major and duty variables. The results indicated that metacognitive strategies did not differ according to these variables, and the points related to organization and inspection strategies were higher than planning and the evaluation strategies. Tüysüz et al. (2008) examined metacognitive skills according to gender and grades. It has been understood that the metacog-nitive skills of pre-service teachers increased according to grades while these skills did not differ according to gender. Yavuz and Memiş (2010) investigated the self-efficacy perceptions and the metacognitive awareness of prospective teachers including elementary pre-service teachers through the inventory developed by Schraw and Sperling-Dennison. Arithmetical average values for the general of the inventory and sub-dimensions of metacog-nitive awareness were in the range of 3.61 and 4.02 points. The average points proved that the pre-service teachers had high levels of awareness.

Limited international studies (Cardelle-Elawar et al., 2007; Çakiroğlu, 2012; Çakiroğlu et al., 2005; Youn et al., 2001) have been conducted into affective variables such as beliefs, motivation and metacognition. These are including a comparison of the pre-service teachers stu-dying in different education areas in different countries, especially in Turkey and the United States.

Cardelle-Elawar et al. (2007) described the outcomes of teachers from three different countries – Ghana, Spain and the USA – enrolled in a graduate educational psy-chology class. Participants engaged in a metacognitive, self-regulated, narrative-inquiry process that allowed them to situate themselves within educational, historical and political contexts in this class. The cross-cultural comparison illustrated differences in motivations to teach from personal, historical, political, and economic points of view. The comparison of the outcomes of the theme analysis indicated the important role of teacher educators in eliciting the voices of in-service teachers. Meta-cognitive reflective thinking and self-regulation are essential skills in developing teachers' perception of their competence. Çakiroğlu (2012) compared pre-service elementary teachers' sense of mathematics teaching efficacy beliefs in a Turkish university and in a major American university located in the Midwest. The results of the study indicated that Turkish pre-service teachers

tended to have a stronger belief that teaching could influence student learning compared with their counterparts in the United States, while a similar difference was not observed for personal mathematics teaching efficacy. Çakiroğlu et al. (2005) compared the efficacy beliefs of American and Turkish pre-service teachers. The results indicated that pre-service elementary teachers in these two countries may have different science teaching efficacy beliefs. According to the results, American pre-service teachers had stronger personal science teaching efficacy beliefs than Turkish pre-service elementary teachers, while the science teaching outcome expectancy beliefs of the pre-service teachers of both countries were similar. In addition, a comparison based on individual items such as the idea that low science achievement could be blamed on teachers and that the inadequacy of a student's science background could be overcome by good teaching indicated no significant differences between American and Turkish students. Youn et al. (2001) examined the epistemological beliefs of highschool students. The epistemological beliefs variable exhibited a culture-specific structure. Korean high school students' learning beliefs related just to academic success, while those of American high school students' beliefs related to age, educational level and academic success.

The review of the literature did not reveal research into metacognition that included comparison of elementary pre-service teachers' metacognitive awareness levels studying in different countries such as Turkey and the United States. Besides, in order to the fact that the United States education system is relatively more developed than the education system in Turkey is an encouraging factor of this study to figure out the differences between the metacognitive awareness levels of the students from two different countries. Therefore, we report on the metacognitive awareness levels of students studying in undergraduate programs on elementary education as freshmen or sophomores at Georgia State University and Uludag University, which are typical universities in large cities in two different countries. Fistly, we measured the metacognitive awareness levels of these Turkish and American students. Then we compared not only awareness levels but also sub-dimensions and dimensions related to their metacognitive awareness levels. Therefore, we explored the differences between their awareness. In addition, we identify limitations to metacognitive awareness in the context of two dimensions and eight sub-dimensions of metacognitive awareness.

Comparison of teacher education systems in Georgia State and Uludag Universities

There are many differences between the teacher education systems in Turkey and the USA. The American programs and requirements for certification are developed by each state, and prepared by colleges of education in universities. In Turkey, in contrast, all teacher education programs are suggested by Higher Education Council (YÖK). These programs have been developed as a part of the education reform efforts taking place in Turkey and updated in 2006 as a result of changes to the Elementary Education Curriculum organized by Ministry of National Education. Accordingly, Elementary Education Departments are required to offer these education programs. Students studying in the Early Childhood Education Department of Georgia State University, which prepares teachers to work in classrooms with children in pre-kindergarten through elementary grades, complete a total of 129 semester hours during the four year program. On the other hand, students studying in the Elementary Education Department at Uludag University, which prepares teachers to work in classrooms with children in first through fifth grades, complete a total of 158 semester hours.

The American and Turkish teacher education systems have many similarities. Both education programs evaluated in this research are 4-year programs, despite the differences in the number of semester hours required. Students in both Turkey and the USA attend academic courses in subjects such as science, mathematics, languages, arts and social studies. Social skills courses such as gym, music and arts; professional education courses such as the psychology of education, instructional technology, material design and subject-specific teaching methods in mathematics or science including teaching experience; and elective courses. All in all, the teaching of social skills and teaching courses related to these skills are given more importance in Turkish programs. This is thought to be appropriate if we consider that the universities and schools in the United States could provide more opportunity for social activities. Besides, elementary teachers generally give all courses, especially in first three grades, unlike in the United States. This situation indicates that it is important that elementary teachers know all the details of all the courses and teaching of these courses. This project is distinct from earlier research in that it examines and compares the metacognitive awareness of students studying elementary education in Turkey and the United States. Specifically, we raise the following questions:

1. What are the metacognitive awareness levels and the average points related to the main dimensions (knowledge about cognition and regulation of cognition) of metacognitive awareness of students studying in undergraduate programs of elementary education at Uludag or Georgia State universities?
2. Are there any significant differences between the average points related to metacognitive awareness or the main dimensions of the metacognitive awareness of

Turkish and American students?
3. What are the average points related to sub-dimensions (declarative knowledge, procedural knowledge, conditional knowledge, planning, information management, monitoring, debugging strategies, evaluating of learning) of the metacognitive awareness of Turkish and American students?
4. Are there any significant differences between the metacognitive awareness average points related to the main dimensions or sub-dimensions of metacognitive awareness of these students?

METHODOLOGY

In this cross-cultural research, we examined the metacognitive awareness levels of the students at the undergraduate programs of elementary education at USA and Turkish Universities, compared their awareness levels and explored the differences between their awareness.

Research model

We utilized the general screening model of descriptive research methods in this research.

Participants

A total of 215 freshmen and sophomore students enrolled in undergraduate programs of elementary teaching at two different universities (Georgia State University in Atlanta, USA and Uludag University in Bursa, Turkey) participated in this research. In the US sample there were 104 students (48.4%) and in the Turkish sample 111 students (51.6%).

Data collection instrument

Data for this study were collected by utilizing the Metacognitive Awareness Inventory, which was developed by Schraw and Sperling-Dennison (1994) at Georgia State University in the USA, and the version of this inventory, adapted into Turkish by Akin et al. (2007) at Uludag University in Turkey. The Metacognitive Awareness Inventory is a 52-item inventory, which uses a 5-point Likert scale, constituting eight sub-dimensions, grouped under two main dimensions, *knowledge about cognition and regulation of cognition*. Three of these sub-dimensions *declarative knowledge*, *procedural knowledge* and *conditional knowledge*, came within the *knowledge about cognition* dimension, while five, *planning, information management, monitoring, debugging strategies* and *evaluation of learning,* feel under the *regulation of cognition* dimension (Schraw and Sperling-Dennison, 1994). The factor loading of the 52 items contained within the inventory has a range of 0.32 to 0.70. The internal consistency reliability coefficients have been found to be 0.95 for the whole of the inventory. In additionally, the internal consistency reliability coefficients have been found to be 0.96 and 0.93, relatively for the low/very low and high/very high metacognitive awareness in this study. Besides, they have been calculated as 0.88 and 0.93 for the two main scales (Akın et al., 2007). The structure and consistency validity of the inventory was examined for its Turkish form by Akın et al. (2007). A different Metacognitive Awareness Inventory, which was developed by Yurdakul (2004), was also given to the students, for consistency validity after the application of the Turkish version of the inventory to these students. The correlation between these two applications was determined as the consistency validity, and the correlation result has been calculated as 0.95. Exploratory factor analysis has been applied in order to study the structural validity of the inventory. The presence of eight sub-dimensions those are included under the main dimensions *knowledge about cognition* and *regulation of cognition* of the original form of the inventory. Test specimen/ substance correlation and the lower-upper group comparison with 27% have been included for substance separation of the inventory. The Pearson correlation coefficient has been determined according to total points of the correlation coefficient for the calculation of the test specimen/substance correlation and the t-test was used for the comparison of the substance points of the lower-upper group with 27%. The internal consistency and test-retest reliability coefficients have been calculated for reliability studies of the inventory. The internal consistency reliability coefficient of the inventory has been determined as 0.95 and the internal consistency coefficient of the inventory has been determined as 0.93.

Written as a 5-point Likert scale, the highest point value that could be obtained for this inventory is 260 and the lowest is 52. Higher scores on the inventory, which does not contain negative points, show high levels of awareness. This awareness level of the students could be found by dividing the total points obtained from the inventory by the number of the substances. It can be said that teacher trainees, who obtained points lower than 2.50 had a *low metacognitive awareness level,* and the trainees with points over 2.50 had a *high awareness level* (Akın, Abacı & Çetin, 2007). In this study, it has been assumed that teacher trainees obtained points lower than 2.50 had a *low metacognitive awareness level*, the trainees with points between 2.50 and 3.74 had a *high metacognitive awareness level* and those with points over 3.75 had a *very high awareness level*.

Procedures

This study was conducted at Georgia State and Uludag Universities. Data was obtained as a result of the different applications in the freshmen and sophomore classes in the 2011 to 2012 spring semester. Students from both countries participated voluntarily in answering questionnaires, and completed the Metacognitive Awareness Inventory within 35 min.

Data collection and analysis

The data were analyzed using the Microsoft Office Excel 2010 and SPSS 14.0 programs. Descriptive statistics methods, independent two-samples t-tests, were applied for analysis of data. Cronbach's Alpha coefficient for the inventory was calculated as .945 for the data obtained from this research. For all of the statistical decoding, 0.05 signifigance levels were taken as the base.

FINDINGS

To examine the metacognitive awareness levels of students, to compare mean, standard deviation, minimum and maximum scores about the average points related to the awareness levels, sub-dimensions and dimension related to awareness of these students were computed for both of the universities separately. The descriptive statistical results of these average points have been included in Table 1, Figures 1 and 2.

Table 1. Descriptive statistical results of students about awareness and dimensions average points.

Variables	Metacognitive awareness		Knowledge about cognition		Regulation of cognition	
	GSU	Uludag	GSU	Uludag	GSU	Uludag
N	104	111	104	111	104	111
Minimum	2.49	1.94	2.61	1.89	2.61	1.97
Maximum	5.00	4.56	5.00	4.72	5.00	4.65
Mean	3.66	3.60	3.78	3.64	3.78	3.58
SD	0.52	0.49	0.50	0.51	0.50	0.51

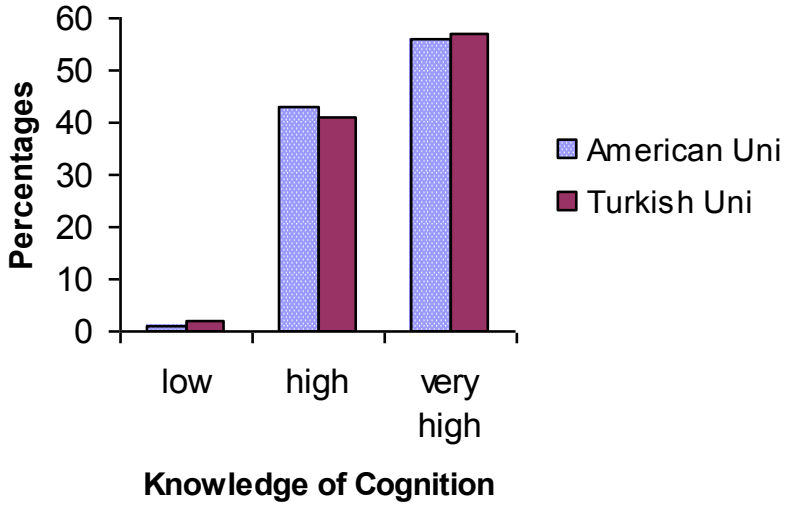

Figure 1. The relationship between the metacognitive awareness levels of American and Turkish students.

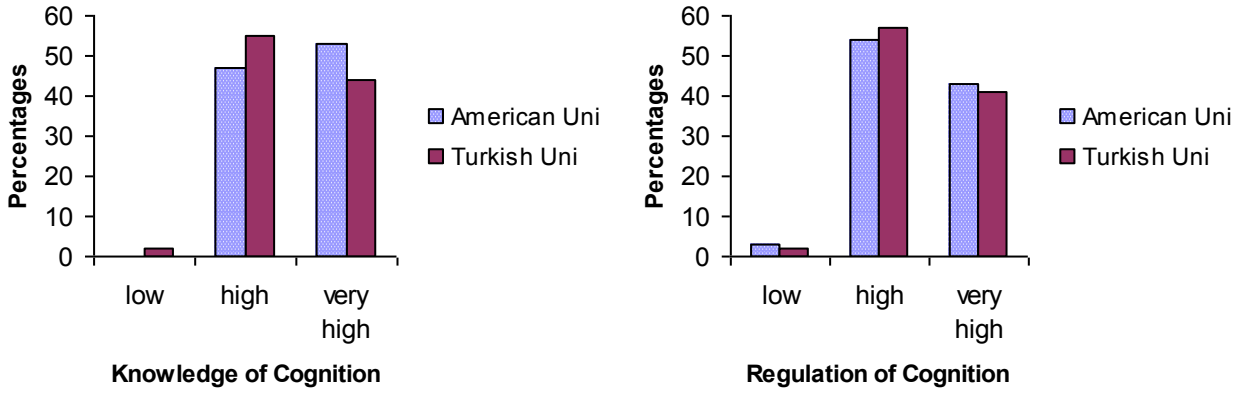

Figure 2. The relationship between the dimensions related to awareness of American and Turkish students.

Georgia State and Uludag University students for every level are very close. Almost all of the students at both universities (99% at Georgia State and 98.2% at Uludag) have high and very high levels of awareness. Nevertheless, the percentage values for the high level of metacognitive awareness are striking. In addition, average metacognitive awareness points in the low awareness range are lower for Uludag University than for Georgia State. In terms of dimensions related to metacognitive awareness in Figure 2, it can be seen that regulation of cognition dimension levels of American and Turkish students are very close to each other, while

Table 2. T-test results in relation to differentiation of awareness according to universities.

Average point	University	N	Mean	SD	t	p
Metacognitive awareness	Georgia State	104	3.66	0.52	0.840	0.425
	Uludag	111	3.60	0.49		
Knowledge about cognition	Georgia State	104	3.78	0.50	2.026	0.044
	Uludag	111	3.64	0.51		
Regulation of cognition	Georgia State	104	3.60	0.58	0.210	0.834
	Uludag	111	3.58	0.51		

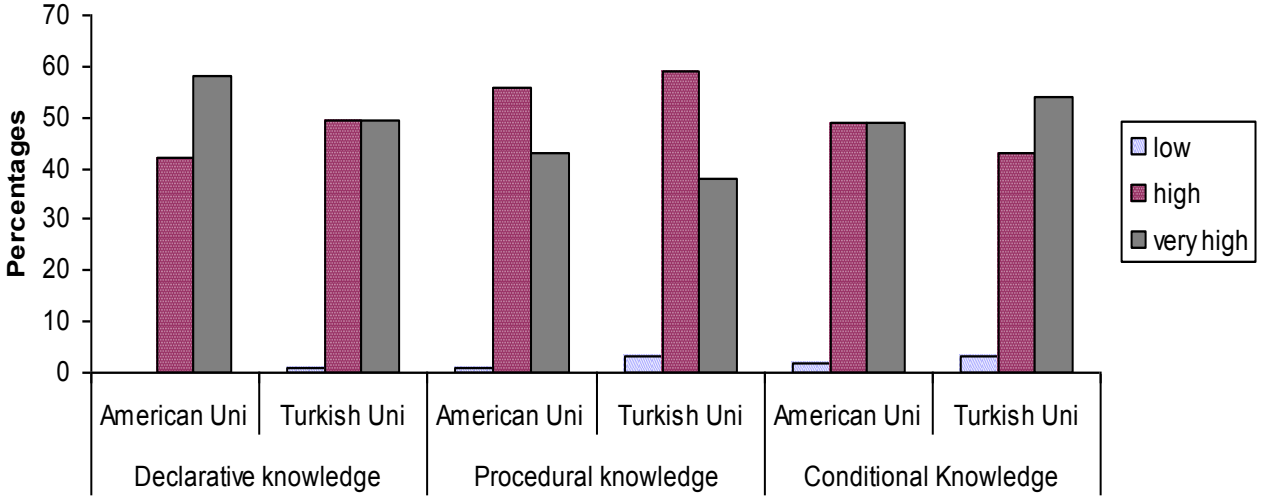

Figure 3. The relationship between the sub-dimensions related to knowledge about cognition.

knowledge about cognition dimension levels are not. For example, the average points of some Turkish students (1.8%) related to knowledge about cognition dimension was low. Results revealed that very high percentage values of American students (52.9%) related to the knowledge about cognition dimension are higher than those of Turkish students (44.1%). In order to test the differences between the American and Turkish students' average points related to metacognitive awareness or dimensions of metacognitive awareness, a t-test for independent groups was run, and the results are presented in Table 2.

The result of the t-test revealed that there was no significant difference between American and Turkish students' metacognitive awareness or regulation of cognition dimension average points ($t_{M(215)} = 0.840$; $t_{R(215)} = 0.210$; $p>0.05$). In contrast, it has been understood that there was a significant difference between American and Turkish students' knowledge about cognition dimension average points ($t_{K(215)} = 2.026$; $p<.05$). We could say that the average score for this dimension of American students ($\bar{x}$ = 3.78) and that of Turkish students ($\bar{x}$ = 3.64) are not similar. It has been understood that the average points of students related to the knowledge about cognition dimension change significantly according to universities at which they are educated. Because of this, we computed the average points related to sub-dimensions (declarative, procedural and conditional knowledge) in relation to the knowledge about cognition dimension of American and Turkish students. We identify the limitations in knowledge about cognition in the context of three sub-dimensions of Turkish students. After that, we computed mean, standard deviation, minimum and maximum scores for these sub-dimensions for both of the universities and compared the scores using t-test. Descriptive statistics and t-test results have been included in Figure 3, Tables 3 and 4.

The average points of American students on the declarative knowledge dimension were between 2.63 and 5.00, whereas those of Turkish students on awareness were between 2.00 and 4.88. Similar results were obtained for the procedural knowledge and conditional

Table 3. Descriptive statistical results about the average points related to the sub-dimensions of the knowledge of cognition dimension of students.

Variables	Declarative knowledge		Procedural knowledge		Conditional knowledge	
	GSU	Uludag	GSU	Uludag	GSU	Uludag
N	104	111	104	111	104	111
Minimum	2.63	2.00	2.40	1.80	2.40	1.80
Maximum	5.00	4.88	5.00	4.80	5.00	5.00
Mean	3.84	3.69	3.71	3.49	3.75	3.72
SD	0.50	0.57	0.72	0.56	0.57	0.58

Table 4. Independent groups t-test results related to differentiation of declarative, procedural and conditional knowledge according to universities.

Average point	University	N	Mean	SD	t	p
Declarative knowledge	Georgia State	104	3.84	0.50	2.087	0.038
	Uludag	111	3.69	0.57		
Procedural knowledge	Georgia State	104	3.71	0.57	2.809	0.005
	Uludag	111	3.49	0.56		
Conditional knowledge	Georgia State	104	3.75	0.57	0.417	0.677
	Uludag	111	3.72	0.58		

Table 5. Descriptive statistical results about the average points related to the planning and monitoring sub-dimensions of students.

Variables	Regulation of cognition			
	Planning		Monitoring	
	GSU	Uludag	GSU	Uludag
N	104	111	104	111
Minimum	1.71	1.57	1.86	1.57
Maximum	5.00	4.86	5.00	4.86
Mean	3.51	3.54	3.54	3.52
SD	0.66	0.60	0.73	0.63

knowledge sub-dimensions. Accordingly, it could be said that many of the Turkish students had a high level of awareness while some had a low level of knowledge. In contrast, almost all of the American students had a high level of knowledge.

The percentage values in Figure 3 show that American and Turkish students demonstrate some differences in the sub-dimensions of knowledge about cognition. To test the differences between the American and Turkish students' average points in the sub-dimensions of knowledge about cognition dimension, a t-test for independent groups was run; the results are shown in Table 4.

Result of the t-test revealed no significant differences between American and Turkish students' conditional p>0.05). We could say that average conditional knowledge scores of American ($\bar{x}$ = 3.75) and Turkish students ($\bar{x}$ = 3.72) are similar. On declarative and procedural knowledge, however there were significant differences between American and Turkish students' average points ($t_{D(215)}$ = 2.087; $t_{P(215)}$ = 2.809; p<0.05). Because of this, we can say that the points of American and Turkish students on the declarative and procedural knowledge sub-dimensions differ significantly according to universities in which they are educated. In order to test the differences between the American and Turkish students' sub-dimension average points related to the regulation of cognition dimension (planning, information management, monitoring, debugging strategies, evaluation of learning), a t-test was run, the results of which are shown in Tables 5 and 6.

The average points of American students for the planning, monitoring, information management and evaluation of learning sub-dimensions were between 1.67 and 5.00, while those of Uludag University students forawareness were between 1.33 and 5.00. Similar results were obtained for these sub-dimensions. Different results have been obtained for the debugging strategies sub-dimension. In other words, the main difference across these five sub-dimensions was knowledge sub-dimension average points ($t_{C(215)}$ = 0.417; between the debugging strategies sub-dimension of American and Turkish students. The minimum average for the debugging strategies sub-dimension was 2.60 for American students whereas the minimum average point was 1.60 for Turkish students. Frequency and percentage values for these

Table 6. Descriptive statistical results about the average points related to the debugging strategies, information management and evaluation of learning sub-dimensions of students.

Variables	Information management		Debugging strategies		Evaluation of learning	
	GSU	Uludag	GSU	Uludag	GSU	Uludag
N	104	111	104	111	104	111
Minimum	2.33	2.44	2.60	1.60	1.67	1.33
Maximum	5.00	4.89	5.00	5.00	5.00	4.83
Mean	3.74	3.62	3.93	3.73	3.28	3.52
SD	0.56	0.54	0.64	0.64	0.72	0.61

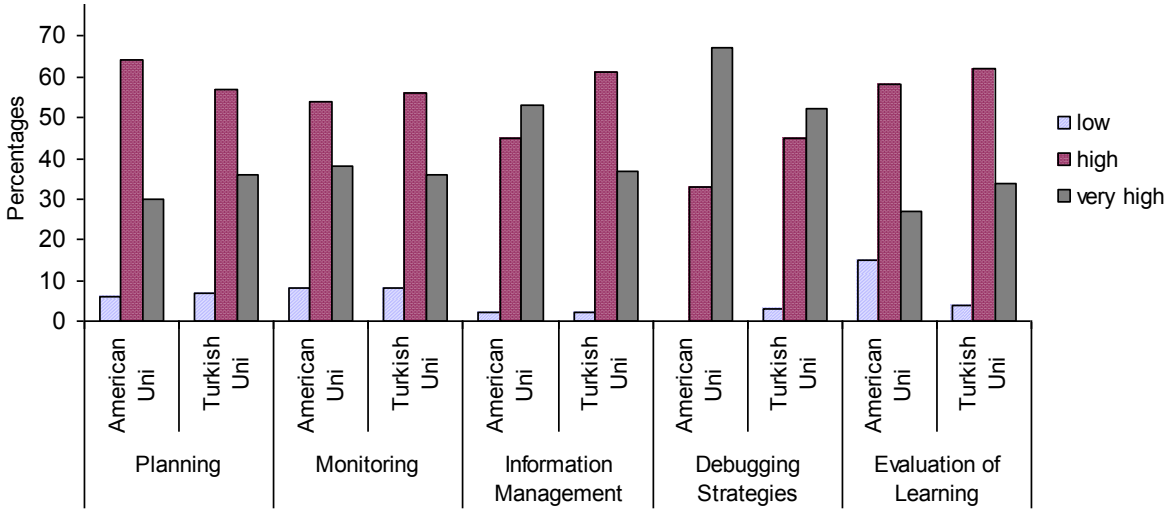

Figure 4. The relationship between the average points related to knowledge about cognition of students.

Table 7. Independent groups t-test results related to differentiation of sub-dimensions about regulation of cognition according to universities.

Average point	University	N	Mean	SD	t	p
Planning	Georgia State	104	3.51	0.66	0.38	0.702
	Uludag	111	3.54	0.60		
Information management	Georgia State	104	3.74	0.56	1.51	0.132
	Uludag	111	3.62	0.54		
Monitoring	Georgia State	104	3.54	0.73	0.23	0.821
	Uludag	111	3.52	0.63		
Debugging strategies	Georgia State	104	3.93	0.64	2.30	0.023
	Uludag	111	3.73	0.64		
Evaluation of learning	Georgia State	104	3.28	0.72	2.65	0.009
	Uludag	111	3.52	0.61		

sub-dimensions are given in Figure 4.

The percentage values indicate that American and Turkish students show some differences in the sub-dimensions of regulation of cognition whereas they have

Table 7. Independent groups t-test results related to differentiation of sub-dimensions about regulation of cognition according to universities.

Average point	University	N	Mean	SD	t	p
Planning	Georgia State	104	3.51	0.66	0.38	0.702
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Information management	Georgia State	104	3.74	0.56	1.51	0.132
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Debugging strategies	Georgia State	104	3.93	0.64	2.30	0.023
	Uludag	111	3.73	0.64		
Evaluation of learning	Georgia State	104	3.28	0.72	2.65	0.009
	Uludag	111	3.52	0.61		

some similarities in others. In order to test the differences between the American and Turkish students' average points related to the sub-dimensions of regulation of cognition dimension, a t-test for independent groups was run (Table 7). The result of the t-test revealed that there were no significant differences between American and Turkish students' sub-dimension average points related to regulation of cognition ($t_{PL}(215) = 0.38$; $t_{IM}(215) = 0.132$; $t_{MO}(215) = 0.23$; $p>0.05$). In contrast, there were significant differences between American and Turkish students' debugging strategies and evaluation of learning sub-dimension average points ($t_{DS}(215) = 2.30$; $t_{EL}(215) = 2.65$; $p<0.05$). We could say that average scores for the debugging strategies and evaluation of learning sub-dimensions of American students ($1_A = 3.93$ and $2_A = 3.28$) and those of Turkish students ($1_T = 3.73$ and $2_T = 3.52$) are not similar.

It is apparent that the debugging strategies and evaluation of learning sub-dimensions average points of students vary significantly according to universities in which they are educated.

Conclusion

This study has examined and compared the meta-cognitive awareness levels of pre-service teachers studying in two different universities in different countries (the United States and Turkey). In addition, it has examined the differences between the metacognitive awareness of American and Turkish elementary pre-service teachers.

The results of this study indicate that the metacognitive awareness of Georgia State and Uludag University students at every level was similar, and that almost all of the American and Turkish students did not have low levels of metacognitive awareness. Similar results have been found in the research carried out by Yavuz and Memiş (2010). However, many of the American and Turkish students' metacognitive awareness needs to develop, as can be seen from the percentage values related to metacognitive awareness levels. This finding is supported by the research of Özsoy and Günindi (2011) and Yavuz and Memiş (2010). In addition, arithmetical values for the general metacognitive awareness ınventory dimensions and sub-dimensions are in a range of 3.49 to 3.73 points, which corresponds to a high metacognitive awareness level for Turkish students. This range is a little bit lower than that in the study that was carried out by Yavuz and Memiş (2010). For American students, the arithmetical values of metacognitive awareness are in a wide range from 3.28 to 3.93 points. These average points indicate the necessity of developing metacognitive awareness to be very high levels in both American and Turkish students.

Results related to metacognitive awareness dimensions have shown that the regulation of cognition dimension levels of Georgia State and Uludag University students at every level were similar. Nevertheless, the statistical analysis indicates that American students' knowledge about cognition dimension levels were higher than those of the Turkish students for this dimension.

The statistical analysis carried out in order to explore the difference between Turkish and American students' knowledge about cognition dimension levels has demonstrated that the American students' declarative knowledge and procedural knowledge levels are higher than those of the Turkish students. This indicates that American students' knowledge of cognitive processes is stronger than that of Turkish students. It could be said that not only are American students' beliefs related to

events and viewpoints, cognitive aims and individual abilities are stronger than those of their Turkish counterparts, but so too is their knowledge about the execution of procedural skills and strategies. This is consistent with the result obtained from research carried out by Youn et al. (2001) that epistemological beliefs exhibited a culture-specific structure. Similarly, the result is supported by research carried out by Cardelle-Elawar et al. (2007). They illustrated differences in teaching from personal, historical, political and economic points of view in a metacognitive and self-regulated learning environment.

Analysis of the difference between Turkish and American students' regulation of cognition dimension levels has shown that the American students' debugging strategy levels are higher than those of their Turkish counterparts, while Turkish students' evaluation of learning levels are higher than those of American students. This situation is similar to that revealed in research carried out by Çakiroğlu (2012) and Çakiroğlu et al. (2005), which aimed to examine elementary pre-service teachers' efficacy beliefs. It is indicated in these researches that elementary pre-service teachers in these two countries may have different science or mathematics teaching efficacy beliefs. This means that American students' recognition of mistakes in a performance, identification of strategies that are not appropriate, and evaluation of their own effectiveness by giving value related to their own learning strategies, are stronger than those of Turkish students. As with the results for declarative and procedural knowledge, the initial reason for the difference between the debugging strategies of American and Turkish students lies with the education systems in these two countries. Conversely, Turkish students' higher evaluation of learning levels may indicate that their evaluation of their own effectiveness, by giving value related to their own learning and regulation processes, is stronger than that of American students. The university entrance exam and teacher-centered education may be effective for these abilities of Turkish students, because teacher-centered education focuses on the result instead of the process, and the university entrance exam may assist Turkish students in developing their evaluation abilities for themselves. Accordingly, it may be said that the differences between Turkish and American students' learning experiences in courses they attended in their school lives may be important for high evaluation of learning levels.

It is clear that elementary pre-service teachers' metacognitive awareness skills affect not only their individual success in their educational and professional lives but also the success of their students. Because of this, the development of pre-service teachers' metacognitive awareness skills is a very important issue, and their awareness skills increase through university education (Tüysüz et al., 2008). In order to develop pre-service teachers' metacognitive awareness, effective activities for courses that develop and support metacognitive knowledge and skills could be organised by academicians in the USA and Turkey. Future research is needed into activities and courses to affect these variables. Different cross-cultural studies about different affective variables, and especially metacognition, could be carried out by researchers from different countries. Such cross-cultural studies may help to improve education programs for pre-service teachers across cultures.

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