

# Meta-cognitive Strategy Usage and Epistemological Beliefs of Primary School Teacher Trainees\*

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## Abstract

This study was designed as a descriptive survey study in order to determine primary education teacher trainees' epistemological beliefs; the use of metacognitive strategies; and the relationship between epistemological beliefs and metacognitive strategies. 820 primary education teacher trainees were selected from the department of primary education at seven education faculties. The Epistemological Beliefs Scale and the Metacognition Inventory were used to collect the data. In data analysis, means and standard deviations were used. In order to determine the differences between the groups, in pair sample comparisons independent t-test was used. For multiple sample comparisons, one-way ANOVA analysis was used with Tukey HSD test and Games Howell. In order to determine the relationship between the variables, Pearson correlation analysis was conducted. The results revealed that the beliefs of primary education teacher trainees on 'learning depends on effort' were developed/matured more in comparison to the beliefs on 'learning depends on skills' and the beliefs on 'there is a single truth.' Significant differences were found among their beliefs in terms of gender, grade, and the university they attend; while no significant relationship was found between their academic achievement and beliefs. Results also revealed that among the metacognitive strategies they used the most, primary education teacher trainees used 'self control', 'cognitive strategy', 'self evaluation' and 'self-awareness' respectively. Significant differences were found among metacognitive strategies they used in terms of gender, grade, and the university they attend while no significant relationship was found between their academic achievement and metacognitive strategies they used. Furthermore, the results indicated that there was a significant relationship between primary education teacher trainees' epistemological beliefs and metacognitive strategy use. In order to improve their epistemological beliefs and to increase the level of metacognitive strategy use, instructional activities could be improved. For researchers; different research methodologies (experimental and qualitative) could be employed, besides study could be conducted with different evaluation instruments and parameters. Additionally, it could be suggested that various examples could be presented in class, especially in the professional knowledge courses to develop the primary education pre-service teachers' beliefs about "there is only one truth". Moreover, it could be emphasized that the strategy use is important not only in planning, arranging and evaluating own learning but also making teaching activities guided, particularly for 3rd year pre-service teachers whose meta-cognitive strategy use was obtained as low. Thus, the activities to increase the strategy use could be designed. Lastly, indirect and direct teaching activities could be carried out to enhance the male students' strategy use as the level of class increases.

## Key Words

Epistemological Beliefs, The Metacognitive Strategies, Primary School Teacher Trainees.

Epistemological beliefs and metacognitive competencies, which are explained in relation to the constructivist learning theory and accepted as important components of self-regulation based learning, have received considerable interest in the studies on the students' success (Braten & Stromso, 2004; Schommer, 1993; Sperling, Howard, Miller & Murphy, 2002 cited in Topçu & Yılmaz-Tüzün, 2009, p. 693). Thus, researchers have discussed the significance of the research on the relation-

ship between these two concepts, which could enable to understand the nature of students' learning (Schommer-Aikins, 2004). In recent years, metacognitive research and more specifically, the interest in so called 'epistemological beliefs' have grown (Clarebout, Alan, Luyten, & Bamps, 2001, p. 53). Perry who was the pioneer in this research area defined that the epistemological beliefs as the beliefs reflecting the individuals' perspectives related to what the information means, what criterion and limitations are used for the definition of information, and how it is acquired (Perry, 1981). In other words, in current literature, there has been an expansion of the framework of epistemological beliefs to include beliefs about the nature of knowledge and knowledge acquisition (Cheng, Chan, Tang, & Cheng, 2009, p. 1). Also, in the current studies, the intention was to improve learning gen-

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erally for pre-service teacher education students by engaging them in a teaching program focused on developing their epistemological beliefs (Brownlee, Purdie, & Boulton-Lewis, 2001).

Research interest in these beliefs is based on the theoretical assumption that learners have identifiable conceptions and beliefs about the nature (and development) of knowledge and these conceptions and beliefs actually affect the interpretation of learning tasks, the engagement in particular learning activities, and even more strongly, “epistemological beliefs affect comprehension in important ways (Schommer, 1990 cited in Clarebout et al., 2001, p. 53). As cited from Perry (1981), Brownlee (2003) defined four different features related to the epistemological beliefs of the pre-service teachers throughout their education as dualism, multiplism, relativism, and commitment.

Epistemological beliefs, which are individual features, are defined as “individuals’ subjective beliefs about what information is and how knowing and learning happens” (Schommer, 1990 cited in Deryakulu & Büyüköztürk, 2002). On the other hand, as Deryakulu and Büyüköztürk (2002) explained that in the literature, some researchers argued that the epistemological beliefs should contain only the beliefs related to information and it is not right to handle the beliefs related to learning within the epistemological beliefs (Brownlee et al., 2002; Chang, 2005; Clarebout et al., 2001; Hofer & Pintrich, 1997). Eroğlu and Güven (2006) examined university students’ epistemological beliefs in terms of some variables and obtained that female students believed in that *learning depends on effort* more than male students while male students’ beliefs about *learning depends on ability* were more. Moreover, they drew the conclusion that the epistemological beliefs differed in terms of class. Similarly, Deryakulu and Büyüköztürk (2005), Oğuz (2007), Öngen (2003), Vural and Gömleksiz (2007) found that female students had more developed beliefs about *learning depends on effort and learning is related to beliefs*. Meral and Çolak (2009) drew the conclusion that there was no significant difference on university students’ epistemological beliefs in terms of class levels.

Chai, Khine and Teo (2006) conducted a study to determine the epistemological beliefs and learning levels of 537 pre-service teachers in Singapore and determined a difference in the epistemological beliefs in favor of female pre-service teachers.

The assumption that students who are aware of how they study and learn also who can behave

consciously to increase the efficiency of studying/learning, are more successful than students who are aware of all these processes is one of the main principles of effective learning (Eggen & Kauchak, 2001). Metacognition is the individual’s structure of cognition, awareness of learning features and controlling them (Flavell, 1979; Gage & Berliner, 1988; Hacker & Dunlosky, 2003; Huit, 1997). According to Stenberg (1988), meta-cognition could be defined as a high level administrative process in which individuals use planning, monitoring, and evaluation in solving of the problems. Cognitive knowledge is defined as what an individual knows and realizes about own cognition as well as arranging the cognition, planning the learning process, monitoring and evaluating for its sustainability (Pintrich, 2002; Schraw & Moshman, 1995; Yıldız & Ergin, 2007 cited in Nietfeld, Cao, & Osborne, 2005). The significance of metacognition which is explained in relation to the self-regulation concept is accepted in the literature, yet there are controversies that self-regulation is a component of metacognition or metacognition is the sub-component of self-regulation (Veenman, Hout-Wolters, & Af-flerbach, 2006)

Metacognition is one of the theories which completes the constructivist learning theory that enables learners relate their old information with the new information, and get aware of their own learning and internalize what they learn (Victor, 2004). In other words, according to Drmrod (1990), the students, who have metacognitive skills, are aware of how to accomplish the learning process, memory and which learning tasks realistically.

There have been many studies on metacognition and the use of metacognitive strategies. In these studies, it has been observed that metacognitive strategies help students know their own metacognitive structures, and thus the effectiveness in learning process is enhanced (Blank, 2000; Beeth, 1998; Paris & Myers, 1981). While in Gürşimşek, Çetingöz and Yoleri’s (2009) study with the pre-service teachers at the department of pre-school education, it was found that depending on the class level, there were significant differences at the exploratory and procedural sub-dimensions in terms of metacognitive awareness, Bayrak and Erkoç (2008) ascertained that the Computer Education pre-service teachers’ levels of metacognitive strategy use did not differ in terms of the class levels; that is, there was no significant differences among the group, on the other hand, they detected that their levels of metacognitive strategy use increased

at the final years. When the literature was reviewed, it could be seen that there was a linear relationship between metacognitive strategies and academic success (Chye, Walker and Smith, 1997; Vanders-toep, Pintrich, & Fagerlin, 1996).

Researchers and educationists often discuss the concepts regarding teachers' beliefs; value systems; and learning strategies they use and class applications (Cheng et al., 2009). Pre-service teachers' beliefs, on learning are important factors that influence their classroom performances (Lawrance, 1992; Pajares, 1992; Renne, 1992; Richardson, Anders, Tidwell, & Lloyd, 1991; Shaver, 1992; Wilson, 1990). The findings of the studies related to epistemological beliefs also emphasized that students' metacognitive activities and motivation for learning are related to their epistemological beliefs (Chan, 2003; Paulsen & Feldman, 1999). Probing the relationship between epistemological beliefs and metacognitive strategies which are defined as important components of learning based on self-regulation is emphasized in the study. In this respect, Dahls, Bals and Turi (2005) carried out a study on the relationship between the university students' epistemological beliefs and learning strategies and concluded that the students, who stated that information is simple and learning is innate, used repetition strategies more but the metacognitive less. Likewise, Kardash and Howell (2000) concluded that students with developed epistemological beliefs use many different metacognitive strategies. In spite of different perspectives, researchers focused on defining the personal epistemological beliefs in their qualitative and quantitative studies about the pre-service teachers' epistemological beliefs (Deryakulu, 2004), besides, they emphasized that as the epistemological beliefs get developed, the students gain effective learning habits and their academic success increases, also their problem solving skills are developed while it could contribute them to achieve their goals and get successful (Dweck & Leggett, 1988; Ryan, 1984; Qian & Alvermann, 2000; Schommer, 1990, 1993).

Thus, it is quite crucial to focus on epistemological beliefs and use of metacognitive strategies on the purpose of learning improvement in teacher education programs (Brownlee, 2001; Öztürk, 1995).

The aim of this study is to determine the relationship between the primary education pre-service teachers' epistemological beliefs and their level of metacognitive strategy use. In line with this aim, the following research questions were addressed:

1. What are the primary education pre-service teachers' levels of metacognitive strategy use?
2. Do the primary education pre-service teachers' epistemological beliefs
  - a. differ in terms of gender?
  - b. differ in terms of the year they attend?
  - c. relate with their academic achievement level?
  - d. differ in terms of the university they are enrolled?
3. At what level do the primary education pre-service teachers use the metacognitive strategies?
4. Do the primary education pre-service teachers' level of metacognitive strategy use
  - a. differ in terms of gender?
  - b. differ in terms of the year they attend?
  - c. relate with their academic achievement level?
  - d. differ in terms of the university they are enrolled?
5. Is there a relationship between the primary education pre-service teachers' epistemological beliefs and level of metacognitive strategy use?

### Method

This study is designed as a general review model descriptive study to determine the significance of difference between meta-cognitive strategy use and epistemological beliefs of primary school teacher trainees. The population of the study comprises primary school teacher trainees attending to faculty of education in Turkey within the 2008-2009 academic year. 812 primary school teacher trainees attending to seven education faculties were chosen through convenient sampling method (Balci, 1997, p. 104).

In the study, along with 'personal information' section concerning variables such as gender, the grades of students, academic achievement scores (GPA) and the university, the Epistemological Belief Questionnaire (EBQ) and the Meta-cognition Inventory (MI) were used to collect data. The Epistemological Belief Questionnaire (EBQ) which serves as an effective tool to assess students' beliefs regarding learning and the nature of knowledge was developed by Schommer (1990). The original questionnaire was in English and had four factors, totaling 63 items. Its adaptation, reliability and validity process were conducted by Deryakulu and Büyüköztürk (2002). Unlike the original form, the

results of factor analysis indicated that the Turkish version had three factors and consisted of 35 items using a 5-point Likert-type scale. In the *EBQ*, low mean scores obtained from the factors were interpreted as developed/matured epistemological beliefs, high means were explained as undeveloped/immature epistemological beliefs (Deryakulu, 2004; Schommer-Aikins, Mau, Brookhart, & Hutter, 2000). The Meta-cognition Inventory (MI) was developed by Cetinkaya and Erkin (2002) to determine the use of meta-cognitive strategies and revised by Yıldız, Akpınar and Ergin (2006). The results of factor analysis indicated that the Meta-cognition Inventory has four factors and consisted of 20 items using a 4-point scale (1-Never, 2-sometimes, 3-often, 4-Always). In order to evaluate whether distribution of both scales' factor scores are normal, skewness and kurtosis were checked and was found that values were between the range of -1 and 1. Thus distribution of data accepted as normal (Tabachnick & Fidell, 2000, p. 74). In data analysis procedure, mean, standard deviation values were used to determine the primary school teacher trainees' epistemological beliefs and meta-cognitive strategy use, besides to examine whether there is a significant relationship between them, Pearson Correlation Coefficient was applied additionally, to find the differences between the groups, paired group comparisons, "independent t-test" was used. In order to find out the source of difference in the comparison\ Tukey HSD test was employed in case of homogeneous variances, yet for inhomogeneous cases, Games Howell test was applied.

### Results

When the primary education pre-service teachers' scores on epistemological beliefs were examined in terms of factors considering the means of scores (Deryakulu, 2004), the pre-service teachers received lower scores from Factor 1 "Learning depend on effort" in comparison with the two other factors. Accordingly, the pre-service teachers had more developed/matured beliefs about *learning depends on effort*. On the other hand, the pre-service teachers' scores from Factor 2 "Learning depend on ability" were higher than Factor 1 "Learning depends on effort". This finding indicated that the pre-service teachers had less developed/matured beliefs about *learning depends on ability* than the other belief dimension and these beliefs were developed/matured at average level. Furthermore, it was obtained that the female pre-service teachers

had more developed/matured epistemological beliefs related to Factor 1 "Learning depends on effort" and factor 2 "Learning depends on ability" in comparison with the male pre-service teachers. On the other hand, for Factor 3 "There is single truth", the female and male pre-service teachers had similar epistemological beliefs. Moreover, it was obtained that there was no relationship between the pre-service teachers' epistemological beliefs and their academic success. When the primary education pre-service teachers' epistemological beliefs were examined in terms of the year they attend, it was revealed that 3<sup>rd</sup> and 4<sup>th</sup> year students had more developed/matured beliefs than 1<sup>st</sup> and 2<sup>nd</sup> year students, besides, in terms of the universities they attend, their epistemological beliefs differed significantly.

Regarding metacognitive strategies, it could be stated that the primary education pre-service applied awareness strategies less than cognitive strategies, self-control and self-evaluation. When overall scale was examined, it was seen that the primary education pre-service teachers used the metacognitive strategies a bit more than average level according to the total scores from the scale. Female pre-service teachers used cognitive strategies, awareness strategies, self-control and self-evaluation more than the male pre-service teachers. At the same time, it was deduced that the pre-service teachers' metacognitive strategy uses differed in terms of year and university they attend, however, their metacognitive strategy uses were not related to their academic achievement significantly. Moreover, another important finding of the present study is that there was low but significant relationship between the primary education pre-service teachers' epistemological beliefs and metacognitive strategy uses.

### Discussion

The findings about the primary education pre-service teachers' epistemological beliefs indicated that the pre-service teachers had more developed/matured beliefs about *learning depends on effort*; however, their beliefs about *learning depends on ability* and *there is single truth* were less developed/matured that their beliefs about *learning depends on effort*. In the literature, constructivist approach is highlighted as one of the factors influencing development and change of epistemological beliefs in teacher training programs (Howard et al., 2003 cited in Öngen, 2003). In this sense, it is considered that in the courses for professional and content knowledge of the pre-service teachers, individual

effort to construct the new information on the old one regarding what learning is, how it is occurred and what factors influence learning, is emphasized and related teaching activities age carried out while developing the primary education pre-service teachers' beliefs about *learning depends on effort*, in line with the fundamental emphasis of constructivist approach and taking into account the new primary education programs. Thus, it could be claimed that this approach which is generally adopted at education faculties can influence the primary education pre-service teachers' beliefs about "*learning depends on effort*". However, it can also be considered that in teacher-centered approach. However, the adaptation of constructivist theory and appreciation of the significance of this theory in learning and teaching activities can cause to develop and mature the pre-service teachers' beliefs about "*there is single truth*" at least level and to adopt teacher-centered approach.

Additionally, it was obtained that the primary education pre-service teachers' epistemological beliefs about *learning depends on effort* and *learning depends on ability* differed in terms of gender while their beliefs about *there is single truth* did not differ. This situation is interpreted as "related to the fact that female students believe to spend effort for the success" by Deryakulu in literature. On the other hand, for the finding that the pre-service teachers' beliefs did not differ in terms of the years they attend, it can suggested to conducted studies with the pre-service teachers selected through different sampling methods and carry out qualitative studies to determine the reasons of such finding.

Furthermore, it was detected that there was no relationship between the pre-service teachers' epistemological beliefs and their academic achievement. This finding is compatible with the results of many studies in the literature. Schommer (1993), Qian and Alvermann (2000), Deryakulu (2002), Schommer (1990), Ryan (1984), Schommer, Crouse and Rhodes (1992) concluded in their studies that students with developed epistemological beliefs had higher academic achievement. The reason underlying this finding can be related to the sampling method or academic achievement scores obtained through questionnaires. On the other hand, it should be emphasized that this finding is important to contribute to the literature and encourage making such studies widespread, yet for further studies, it could be suggested to apply different sampling methods.

Furthermore, it was determined that out of meta-cognitive strategies, the pre-service teachers used self-control strategies the most, then respectively cognitive strategies, self-evaluation, yet the awareness strategy was the least frequently used strategy. In other words, the pre-service teachers participated to this study mostly used self-control strategy which indicates how to increase their academic achievement, however, the pre-service teachers least frequently preferred the awareness strategies, which are for thinking in learning process. According to Yıldız, Akpınar et al (2006) cited from Chittleborough (2004), many variables such as age, and individual development can influence metacognitive strategy use. Thus, it is considered that the reasons of the primary education pre-service teachers' preference for the metacognitive strategies should be investigated through qualitative study in detail.

Another finding of the study pointed out that the pre-service teachers' metacognitive strategy usage differed in terms of gender. Gürşimşek (2002) determined that female pre-service teachers used more strategies than males and they became prominent for planning and rearranging the learning process. This finding can be interpreted in a way that female pre-service teachers focused on the strategy use more in order to be successful during pre-service training since they think that it is the only way for academic achievement.

Additionally, it was obtained that the pre-service teachers' metacognitive strategy usage differed significantly in terms of the year they attend. Although it was an expected finding that the pre-service teachers' metacognitive outcomes would increase as the year they attend raised up, in the study, it was noticed that some findings were different. It was considered that this situation is related with the courses they took during their pre-service education at their departments. Likewise, it was determined that the self-evaluation strategies were used more as the year they attend rose up. This finding was explained that the students could do more evaluation on themselves in accordance with their education. Regarding the use of other strategies, 2<sup>nd</sup> year students performed well. This could be explained with the fact that the students at 2<sup>nd</sup> year take the courses on learning more while at 3<sup>rd</sup> year they have more content courses so their level of strategy uses tend to decrease.

Besides, it was found that there was low but positive relationship between the primary education pre-service teachers' metacognitive strategy uses and their academic achievement, considering all

sub-scales on strategies. On the other hand, it was revealed that there was no significant relationship between the pre-service teachers' metacognitive strategy uses and total academic achievement scores. The possible reason of this finding can be the way to select the participants and thus sampling method.

In terms of the universities they attend, there was significant differences between metacognitive strategy uses. This could be explained with the students' individual preferences or university culture and instructors' support for strategy use. Occasionally, the results of the study regarding metacognition vary with literature. In the literature, this situation is explained as the main reason of difficulties measuring metacognition, differences in the step of comparing results of the studies depending on diversity and efficiency of tools which are used to measure metacognition (Veenman, 2005).

Lastly, it was determined that there was low but significant relationship between the primary education preservice teachers' epistemological beliefs and metacognitive strategy uses. This finding is consistent with the results of some studies in literature. In that sense, Schommer (1993) stated that students' epistemological beliefs have direct effect on learning approaches and metacognitive strategies used in learning process and thus this influences academic achievement indirectly (Cano, 2005; Deryakulu, 2004). In this context, it is considered that the metacognitive strategies will increase depending on how much epistemological beliefs develop, and as a result student will be successful in learning.

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