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The factors that affect the preservice mathematics teachers' self regulation strategies

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Abstract

The process whereby an individual regulates his/her own learning objectives, controls his/her own emotions and thoughts and develops strategies is described as self-regulation process (Zimmerman, 1990). Within this process the individual adapts to his/her environment and develops appropriate strategies. The purpose of this study is to determine pre-service elementary mathematics teachers' opinions regarding factors affecting their self-regulation strategies as they study courses related to mathematics education that have pedagogical contents. Within the scope of the study, semi-structured interviews were conducted with two pre-service teachers enrolled in the elementary mathematics education department in a large scale university in Ankara. Results revealed that the two pre-service teachers consider that the amount of time available for studying, the characteristics of the instructor (e.g., his/ her attitude, his/her expectations from the students) and requirements of the course play important roles in determining what kinds of strategies they use when studying for the course.
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1. Problem Statement

   Zimmerman (1990) describes self-regulation as a process whereby an individual regulates and manages his or her learning goals and develops strategies to achieve these goals. Likewise, Pintrich (2000) describes self-regulated learning as the process where an individual actively takes part in setting learning goals and monitors, manages and regulates his or her cognition, motivation and behaviors toward achieving these goals. On the other hand, Butler (1989) argues that a self-regulated learner examines the goal to be achieved and develops appropriate strategies and monitors his/her learning behaviors over the course of the process to determine whether the strategies work or not. All descriptions of self-regulation stated above imply that self-regulated learning involves knowing and using strategies. Strategies are tools used by the individual within his or her self-regulation process (Zimmerman, 1989, 1990). Self-regulation strategies have been grouped into three as metacognitive strategies, cognitive strategies and effort regulation-management strategies (Pintrich et. Groot, 1990). Cognitive strategies contain three forms of strategies: repetitive learning, elaboration and organization. Metacognitive strategies are critical thinking, planning, monitoring and regulating the study process. Management strategies include students' management of time, and

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environment, effort regulation, peer learning and help-seeking strategies (Pintrich, 2000). Research has shown that successful learners are the ones who are able to self-regulate themselves by using strategies and proceeding systemically (Zimmerman, Bonner, Kovach; 1996). In other words, when, the individuals use self-regulation strategies, their academic success increases.

Zimmerman and Martinez Pons (1986) examined the study strategies of 80 tenth grade students, 40 successful 40 unsuccessful. Interviews conducted with the students resulted in 14 categories of self-regulated study strategies: self-evaluation, organizing, goal setting and planning, seeking resources, keeping records and monitoring, environmental structuring, self-consequences, memorizing, seeking assistance from others, reviewing records. Pintrich et. al. (1991) also examined the strategies used by the students through Motivated Strategies for Learning Questionnaire (MSLQ). The questionnaire assesses motivation, cognitive and metacognitive self-regulation strategies and resource management strategies. Self-regulated learning strategies involve strategies enhancing rehearsing, elaboration, critical thinking, and organizing, metacognitive self-regulation, time/environment regulation, exerting effort, and learning from peers and seeking assistance. LASSI (The Learning and Study Strategies Inventory) developed by Weinstein in 1987 is another inventory used for measuring study strategies for college students. LASSI comprises 10 subcategories: attitude, motivation, time management, anxiety, concentration, information processing, selecting main ideas, study aids, self-tests and test strategies.

Bandura (1986) argues that three main processes affect individuals' self-regulation: personal, behavioral and environmental processes. Personal processes involve individual's knowledge, metacognition processes and goals, whereas behavioral processes include individual's self-observation, self-judgment and self-reaction processes. Environmental processes, on the other hand, include enactive outcomes, modeling and verbal persuasion. These processes influence each other (Schunk, 2001). As an example, consider a typical instructional sequence in which the teacher presents information and asks students to direct their attention to an overhead. Environmental influence on behavior occurs when students turn their heads without much conscious deliberation. In turn, students' behaviors often alter the instructional environment. For instance, when students give incorrect answers, the teacher may review the previous topic rather than beginning to a new topic.

Considering the positive effects of self-regulation on learning and academic achievement, researchers have focused on investigating the factors affecting strategy use. Research has investigated how factors such as motivation, gender, and attitudes of the parents are related to self-regulated learning strategies at elementary school level (Ablard and Lipschultz, 1998; Karakaş, 2009; Üredi and Erden, 2009).

Research has also shown that students' goal orientation influences their use of self regulated learning strategies (Alao & Guthrie, 1999; Somuncuoğlu & Yildirim, 1999). Mastery goal-oriented students strive to gain understanding of a concept, whereas performance oriented students aim to outperform their peers and display their competence (Ames, 1992) Mastery oriented students have been found to exhibit higher levels of effort and persistence, are more likely to engage in challenging tasks and use more effective self-regulated learning strategies whereas performance orientated students are found to engage in less achievement-supporting behaviors and strategies (Middleton & Migley, 1997; Zimmerman & Schunk, 2008)

Suk and Konstantinos (2002) compared successful and unsuccessful preservice teachers' schools in terms of using self-regulation strategies. They found that successful preservice teachers' successful teachers use more self-regulated learning strategies than the unsuccessful teachers. Dembo (2001) proposed that preservice teachers need to learn how to self regulate their learning process. These studies support that teachers as well as pre-service teachers need to know and use self-regulation strategies. Even though research has shown positive relationships between strategy use and academic achievement on pure mathematics courses at the undergraduate levels (Altun, 2005; Canca 2005), we do not know much about the self-regulation process of pre-service elementary mathematics teachers. In particular, little is known about their opinions regarding factors that impact their strategy use while studying courses related to mathematics education that have pedagogical contents.

2. Purpose of Study

The purpose of this study is to determine pre-service elementary mathematics teachers' opinions regarding factors affecting their self-regulation strategies as they study courses related to mathematics education. Because the study was conducted with the pre-service teachers, findings could improve our understandings on designing courses related to self-regulated learning and integrating self-regulation into the pre-service mathematics education program.

3. Method

Qualitative research methods enable in-depth analysis of the research subject in order to find out how and why a certain behavior occurs (Büyüköztürk et. al., 2008). In order to explore pre-service elementary mathematics teachers' opinions about the factors affecting their self-regulation strategies, we employed semi-structured interviews with two pre-service teachers.

3.1. Participants and Data Collection

The participants were enrolled in a large public university in Ankara during the 2009-2010 academic year. Both participants are high achieving male students in their coursework. One of the participants was a senior student (in the last year of university) and the other pre-service teacher was a junior (in the third year of university). Both participants were selected among five volunteer pre-service teachers who want to participate the research based on their answers to an adapted Self-Regulated Learning Interview Schedule-SRLIS (Zimmerman an Martinez-Pons 1986). Those are the participants who gave more detailed information their study process related to the given questions. Then semi-structured interviews were conducted with individual participants in a class at the university. During the interviews 16 open ended questions were asked to each participant and during the interviews researchers want participants describe their process during the study from the beginning to the end. Each interview lasted about 25 minutes.

3.2. Data analysis

In this study, data collected through semi-structured interviews were analyzed to describe factors impacting pre-service elementary teachers' strategy use. After reading and reviewing the transcripts of interview data, researchers searched for the statements of two participants that may indicate personal, behavioral, and environmental factors impacting their strategy use. These codes were grouped into three themes: the amount of time available for studying, the characteristics of the instructor, and the requirements of the course.

4. Findings

The results of the interviews reveal that the two pre-service teachers consider that the amount of time available for studying, the characteristics of the instructor and requirements of the course play important roles in developing the strategies they use when studying for the mathematics education courses. These factors are explained in detail below.

4.1. Amount of time available for studying

Amount of time available for studying was considered as the most highlighted factor that impact strategy use by the participants. Both pre-service teachers reported that they change their strategies depending on whether they have enough time for studying. Both participants consider amount of time as a factor when studying particularly for the exams. For example one of the pre-service teachers explained how the amount of time influences his study strategies as follows:

> ...'If I think that there is not enough time, I review the subject more roughly, look up to the important points. If my study requires summarizing and I have a limited time, then I just take notes on key points without cramming."

For an effective study process, pre-service teachers reported that they make a study plan and timetable before beginning to study according to the amount of time available for studying.

4.2. The characteristics of the instructor

Pre-service teachers also reported that the enthusiasm of the instructor, his or her expectations from the students, and his or her teaching styles may affect their strategy use. Both pre-service teachers pointed out that the attitude of the instructor and his or her expectations from the students may affect their motivation, which in turn affects their strategy use. As an example one of the pre-service teachers stated that:

> ....'The enthusiasm of the instructor increases my motivation. If the teacher is reluctant and his or her expectations and instructions are ambiguous then I would be at a loss of what to do.'

As it can be understood from the above statement, the pre-service teachers' usages of their study strategies according to the attitude and expectations of the instructor.

4.3. Requirements of the course

Another factor reported by the pre-service teachers as affecting their study strategies is the requirements of the course. One of the pre-service teachers stated on this as follows:

> ....'Before beginning to study, I try to understand the requirements of the assignments , I try to understand what is asked and expected from me then I start doing research on it. Then I share my work with the instructor to receive feedback related to the process of my study.'

As it is clear from these explanations, the pre-service teacher took into account the requirements of the course. He shared his work with the instructor over the course of the process. He altered his study in accordance with the feedback from the instructor. If he received positive feedback, this would signify that the strategy he used was correct. If the feedback was not positive this would cause him to think he followed a wrong strategy and it is quite likely that he would review and change this strategy.

Participants also stated that they used different strategies if the content of the course involves pure mathematics or teaching methods for elementary school mathematics. They also pointed out that based on the content of the course, the requirements (e.g., working as a group, preparing a course plan, completing weekly assignments etc.) and type of assessments (multiple-choice exams, open-ended exams, preparing a group presentation, etc.), the

strategies they used also changes. They reported that these factors affect their strategy use. One of the participants stated that:

> *...'The first factor affecting my strategy use is the nature of the subject I study. If I am studying for an exam, my study depends on whether the questions are open ended or multiple-choice. If the questions are open ended, I study in more detail and try to build sentences in my mind as answers to the possible questions. If the questions are multiple choice, after reading through my notes a few times I find it sufficient to look for simple relationships among concepts and do superficial correlations.'*

The other pre-service teacher explained how the nature of the course affects the study strategies as follows:

> *...'If the course requirements include so much readings, I underline while reading and I can not do so in my notebook as much. Then, it is quite useful to write down a summary of what I read on a blank paper.'*

In addition to that, the pre-service teacher indicated that:

> *...I determine my strategies according to the type of my work. For example if am supposed to prepare a homework, I set up my strategies depending on whether it is just a research paper, preparation of a material, setting up activities or a computer assisted activity setting.'*

As it can be understood from the statements above, it is seen that the nature of the course/subject highly affects the self-regulated strategies of the pre-service teachers.

5. Conclusion and Recommendations

Results showed that the two pre-service teachers participated in this study considered three main factors that affect their strategies when they study courses. These factors are the amount of time available for studying, the characteristics of the instructor (e.g., his/ her attitude, his/her expectations from the students), and the requirements of the course (e.g., course content, requirements). Among these factors, the requirements of the course were determined as the most important factor affecting the self-regulated learning strategies they use. That is, content and the requirements of the course are important determinants for the selection and use of strategies. The two participants also pointed out that the amount of time available for studying is another factor impacting their strategy use.

To this end, teacher education programs could include courses related to self-regulated learning in order to inform pre-service teachers about the strategies to become self-regulated learners and factors influencing these strategies. Future research could examine the effectiveness of these courses. Moreover, repeating the longitudinal studies could be conducted with the pre-service teachers in order to explore whether and how they could apply their knowledge on self-regulation when they become professional teachers.

In this study, semi-structured interviews were made with two pre-service teachers. To gain further information, the number of the participants should be increased.

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