PRE-SERVICE SCIENCE TEACHERS' SELF-EFFICACY IN RELATION TO
PERSONALITY TRAITS AND ACADEMIC SELF-REGULATION

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ABSTRACT

PRE-SERVICE SCIENCE TEACHERS' SELF-EFFICACY IN RELATION TO PERSONALITY TRAITS AND ACADEMIC SELF-REGULATION

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The aim of this study was to examine the relationships among pre-service science teachers' personality, self-regulation, and teaching self-efficacy by proposing and testing a comprehensive conceptual model. In the model, it was hypothesized that personality traits are directly linked to pre-service science teachers' self-efficacy and academic self-regulation, and pre-service science teachers' academic self-regulation is directly related to their self-efficacy. A total of 1794 pre-service science teachers (876 males and 905 females) from 27 education faculty participated in the study. Self-efficacy (i.e. self-efficacy for student engagement, for instructional strategies,

and for classroom management), academic self-regulation (i.e. achievement goals, task value, control of learning beliefs, test anxiety, metacognitive self-regulation, effort regulation, and peer learning), and personality trait (i.e. Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness) were assessed by self-report instruments.

The results of the path analysis revealed that agreeableness, neuroticism, performance approach goals, and use of metacognitive strategies were positively linked to different dimensions of self-efficacy, namely self-efficacy for student engagement, instructional strategies, and classroom management. In general, while agreeableness and neuroticism were found to be positively associated with different facets of academic self-regulation and self-efficacy, openness was found to be negatively linked to these adaptive outcomes.

ÖZ

İLKÖĞRETİM FEN BİLGİSİ ÖĞRETMEN ADAYLARININ ÖZ-YETERLİK İNANÇLARI İLE KİŞİLİK ÖZELLİKLERİ VE AKADEMİK ÖZ-DÜZENLEME BECERİLERİ ARASINDAKİ İLİŞKİ

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Bu çalışmanın amacı öğretmen adaylarının öz-yeterlik inançları, akademik öz-düzenleme becerileri ve kişilik özellikleri arasındaki ilişkiyi belirlemektir. Bu amaç doğrultusunda değişkenler arasındaki olası ilişkileri içeren bir model önerilmiş ve yol analizi yapılmıştır. Çalışmanın başlangıcında (a) Kişilik özelliklerinin, fen bilgisi öğretmen adaylarının öz-yeterlik inançları ve akademik öz-düzenleme becerilerine doğrudan etki edeceği, ve (b) fen bilgisi öğretmen adaylarının akademik öz-düzenleme becerilerinin öz-yeterlik inançlarıyla ilişkili olduğu ileri sürülmüştür. 27 devlet üniversitesinden seçilen 1794 (876 erkek, 905 kız) son sınıf fen bilgisi

öğretmen adayı çalışmaya katılmıştır. Öz-yeterlik inançları (öğrenci katılımını sağlama, öğretim stratejilerini kullanma ve sınıf yönetimi), akademik öz-düzenleme becerileri (hedef yönelimi, içsel değer, öğrenmeyi kontrol etme, kaygı, bilişötesi öz-düzenleme, çaba gösterme ve akranla öğrenme) ile öz-yeterlik inançları (öğrenci katılımını sağlama, öğretim stratejilerini kullanma ve sınıf yönetimi) ve kişilik özellikleri (Duygusal Dengesizlik, Dışadönüklük, Açıklık, Geçimlilik, Sorumluluk) ölçme araçlarıyla ölçülmüştür.

Yol analizi sonucunda geçimlilik, duygusal dengesizlik, performans yaklaşma ve bilişötesi öz-düzenleme ile öğrenci katılımını sağlama, öğretim stratejilerini kullanma ve sınıf yönetimi boyutlarındaki öz-yeterlik inançları arasında pozitif bir ilişki tespit edilmiştir. Geçimlilik ve duygusal dengesizlik ile akademik öz-düzenleme becerilerinin farklı boyutları arasında pozitif bir ilişki olmasına karşın, açıklık ile bu özgü çıktılar arasında negatif bir ilişki saptanmıştır.

Anahtar Kelimeler: Fen Bilgisi Öğretmen Adayları, Öz-Yeterlik İnançları, Akademik Öz-Düzenleme Becerileri, Kişilik Özellikleri

To my beloved family,
for their endless love, and encouragement

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LIST OF ABBREVIATIONS

A: Agreeableness

AGFI: Adjusted goodness-of-fit index

AGQ: Achievement goal questionnaire

C: Conscientiousness

CFA: Confirmatory factor analysis

CFI: Comparative fit Index

CLB: Control of learning beliefs

E: Extraversion

ER: Effort regulation

GFI: Goodness-of-fit index

MA: Mastery approach

META: Metacognitive self-regulation

N: Neuroticism

NEO-FFI: NEO five-factor inventory

NEO-FFI-TR: Turkish NEO five-factor inventory

NFI: Normed fit fndex

MSLQ: Motivated strategies for learning questionnaire

MV: Mastery avoidance

O: Openness

PA: Performance approach

PV: Performance avoidance

RMR: Root-mean-square residual

RMSEA: Root-mean-square error of approximation

SECM: Self-efficacy for classroom management

SEINS: Self-efficacy for instructional strategies

SEST: Self-efficacy for student engagement

SRL: Self-regulated learning

SRMR: Standardized RMR

TANX: Test anxiety

TSES: Teachers' sense of efficacy scale

TTSES: Turkish teachers' sense of efficacy scale

TV: Task value

CHAPTER I

INTRODUCTION

"If I have the belief that I can do it, I shall surely acquire the capacity to do it even if I may not have it at the beginning."

Mahatma Gandhi

Compelling evidence suggests that having both pedagogical knowledge and content knowledge is not sufficient for teachers to be effective. Teachers' beliefs about their abilities to positively influence student learning have been shown to have a substantial impact on teaching effectiveness (Knoblauch & Hoy, 2008). In fact, teacher self-efficacy –teacher's judgment of their capabilities to organize and carry out strategies necessary for successfully accomplishing a specific teaching task in a particular context- is found to be significantly related to their classroom behavior and to student outcomes such as achievement (Ashton & Webb, 1986) and motivation (Midgley, Feldlaufer, & Eccles, 1989). In other words, teacher self-efficacy has a vital role in meeting the educational, social, and emotional needs of his/her students (Eiserman, Shisler, & Healey, 1995).

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Rooted in Bandura's Social Cognitive Theory, Tschannen-Moran and Woolfolk Hoy, and Hoy (1998) outlined teacher efficacy as an integrated model. In this model, teacher self- efficacy occurs as consequences of the interaction between the evaluation of the factors that make teaching difficult (analysis of teaching task and its context) and the evaluation of self-perceptions of personal teaching capabilities (analysis of teaching competence). Therefore, teacher self-efficacy determines teachers' goals and effort. In general, teacher self-efficacy has a powerful effect on teacher performance and ultimately student achievement (Bandura, 1993; Goddard, Hoy, & Woolfolk Hoy, 2000; Hoy, Sweetland, & Smith, 2002). In addition, it is also found to be related to teaching behavior and performance (Riggs, Diaz, Riggs, Jesunathadas, Brasch, Torer, Shamansky, Crowell, & Pelletier, 1994). For instance, teacher self-efficacy is linked to teachers' instruction since it influences teachers' desire to try different materials and approaches, their willingness to improve their teaching, and their implementation of various teaching methods (Weiner, 2003). Indeed, teachers with high levels of self-efficacy are likely to try new strategies and methods (Cousins & Walker, 2000), address students' needs better (Ashton & Webb, 1986), and show greater commitment to teaching (Coladarci, 1992). They do not give up easily in the face of difficulties and setbacks. They persist longer with struggling students and are less critical of students' errors (Gibson & Dembo, 1984; Ashton & Webb, 1986; Fuchs, Fuchs, & Bishop, 1992).

On the other hand, teachers with low levels of self-efficacy tend to be less willing to work with students experiencing difficulties and tend to instruct the class as a whole. They are found to be less optimistic about student learning and to experience lower levels of job-satisfaction (Caprara, Barbaranelli, Steca, & Malone, 2006; Klassen, Bong, Usher, Chong, Huan, Wong, & Georgiou, 2009; Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998). Therefore, since teacher sense of efficacy is found to be significantly related to their instructional practices and student related outcomes such as motivation and achievement, the factors influencing the development of teacher self-efficacy beliefs needs to be examined starting with pre-service years. A few studies in the relevant literature demonstrated that how pre-service teachers' approach to their own learning (i.e. their own academic self-regulation) and personality are among the factors closely associated with their sense of efficacy (Bembenutty, 2007; Henson & Chambers, 2003; Roberts, Harlin, & Briers, 2007). Among these factors academic self-regulation refers to the process whereby students activate and sustain cognitions, behaviors, and affects, which are oriented toward the attainment of their goals, and involves cognitive processing, motivational beliefs, and metacognitive thinking (Zimmerman, 1989; Pintrich & Linnenbrink, 2000; Schunk & Zimmerman, 1997). Therefore, academic self-regulation is more than metacognition, it involves motivational and behavioral components as well as cognitive and metacognitive components (Zimmerman, 2000). In other words, recent models of self-regulation based on the social-cognitive theory suggest that use of cognitive and

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metacognitive strategies are of little value if individuals cannot motivate themselves to use them. Numerous self-motivational beliefs establish a base for goal setting and strategic planning, which are crucial aspects of student self-regulation. These self-motivational beliefs include beliefs about control over the learning process, task value perceptions, achievement goals, and test anxiety. Individuals' beliefs that they can control their own academic performance are called *control of learning beliefs*. *Task value* perceptions and *achievement goals*, on the other hand, basically involves individuals' reasons for engaging in a task (Pintrich & DeGroot, 1990; VanderStoep, Pintrich, & Fagerlin, 1996; Zimmerman, 2000). Recent research has focused on four *achievement goals*, namely mastery approach goals, mastery avoidance goals, performance approach goals, and performance avoidance goals. While *mastery approach goals* emphasize learning and deep understanding, *mastery avoidance goals* aim at avoiding not learning and misunderstanding. *Performance approach goals* emphasize looking smart and getting the highest grades, whereas *performance avoidance goals* aim at avoiding being inferior and getting the worst grades (Elliot & Church, 1997; Elliot & McGregor, 2001; Elliot & Reis, 2003; Pintrich & Schunk, 2002). Within the motivational component of self-regulation, *test anxiety* refers to worry and concerns over taking exams. Relevant research has demonstrated that approach goals, the beliefs that the task is interesting and important, and effort are the main determinants of success, which are positively related to use of metacognitive strategies like planning, monitoring, and regulating learning (Ames &

Archer, 1988; Meece, Blumenfeld, & Hoyle, 1988; Neber & Schommer-Aikins, 2002; Pintich & DeGroot, 1990, Sungur, 2007).

Cognitive and metacognitive components, on the other hand, involve individuals' use of various *cognitive* and *metacognitive strategies* such as planning, monitoring, and regulating strategies and their cognition. Concerning the behavioral component, self-regulated learning involves *effort regulation* (e.g., persisting in the face of a difficult or boring task) and *peer learning* (e.g., working with peers to complete the assignments). Efforts to define self-regulation resulted in the description of self-regulated learning as the degree to which individuals are metacognitively, motivationally, and behaviorally active participants in their learning process. Thus, it can be said that self-regulated learners initiate learning tasks, determine their own goals, use appropriate strategies to achieve these goals, and then monitor and evaluate their own learning. They are motivated to use the strategies as well as regulate their cognition and effort (Pintrich & DeGroot, 1990, McCoach, & Siegle, 2003). Therefore, self-regulated learners are likely to achieve at higher levels than individuals who are passive in their learning and depend on teachers for performing these same functions (Risemberg & Zimmerman, 1992).

Although there is considerable research on student self-regulation at different grade levels, there has been little research focusing on pre-service or in-service teachers' use of self-regulatory strategies in their own learning. The studies of pre-service or

in-service teachers have demonstrated that they often do not use self-regulatory strategies as effectively as students and it was suggested that if teachers become self-regulated in their own learning, their experience in self-regulatory processes can help them to develop strategies for teaching self-regulation to their students (Gordon, Dembo, & Hocevar, 2007). In addition, it was proposed that pre-service teachers who value self-regulatory skills and teach them to their students are likely to create learning environments supporting student autonomy. In fact, according to Dembo (2001), learning how to teach is not sufficient; rather teachers should learn how to learn to improve their classroom practices. Furthermore, studies on teachers' effectiveness demonstrated that self-regulatory skills are important determinants of teachers self-efficacy beliefs which are significantly associated with their behavior and practices in the classroom (Bembenutty, 2006; Dembo, 2001).

In addition, relevant literature suggested personality as another factor related to teacher self-efficacy. The Five-Factor Model of personality, which is the most well-known model of personality, proposes that the Big Five traits (Neuroticism, Extraversion, Openness, Conscientiousness, and Agreeableness) display fundamental aspects of personality and greatly influences human behavior (Costa & McCrae, 1992a). In the field of education, two of the five traits have been of particular interest: Openness and Conscientiousness. Open individuals are curious, creative and have a wide range of interest. Conscientiousness involves characteristics like being diligent, purposeful, well-organized, and self-disciplined. Therefore, it was predicted

that these personality traits may have strong impact on students' motivation, cognition, and behavior in their learning (Costa & McCrae, 1992a). What is more, because personality types are related to performance motivation and job performance (Barrick, & Mount, 1991; Judge, & Ilies, 2002), certain personality types may display better teacher self-efficacy. Indeed, Erdle, Murray, and Rushton's (1985) study revealed a significant relationship between personality traits and teaching effectiveness, which was mediated through the teachers' use of a variety of strategies and materials. Supporting this finding, Katz (1992) suggested that extraverted teachers are more likely to receptive to new ideas. In addition, Knoblauch and Hoy (2008) demonstrated that self-efficacy beliefs have a strong influence on pre-service teachers' teaching effectiveness, which is found to be associated with personality traits.

Overall, the specific purpose of this study is to explore the possible relationships among pre-service science teachers' self-efficacy, their academic self-regulation, and their personality. Three main assumptions are provided in the light of the extensive literature review. First, personality is assumed to be linked to academic self-regulation. Second, it is assumed that, personality is associated with teacher self-efficacy not only directly but also indirectly through their effect on academic self-regulation. Finally, academic self-regulation is assumed to influence teacher self-efficacy. In order to test these assumptions, a path model defining the relationships among the variables of the study was developed (see Figure 1.1).

1.1 Purpose of the Study

The current study aims at examining the relationship among Turkish pre-service science teachers' self-efficacy, their academic self-regulation, and their personality. More specifically, the present study addresses the following research questions:

1)   What is the relationship between Turkish pre-service science teachers' academic self-regulation (i.e. achievement goals, task value, control of learning beliefs, test anxiety, metacognitive self-regulation, effort regulation, and peer learning) and their self-efficacy (i.e. self-efficacy for student engagement, for instructional strategies, and for classroom management)?

2)   What is the relationship between Turkish pre-service science teachers' personality (i.e. Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness) and their self-efficacy?

3)   What is the relationship between Turkish pre-service science teachers' personality and their academic self-regulation?

1.2 Overview of the Proposal Model

The possible relationships between pre-service science teachers' self-efficacy, their academic self-regulation, and their personality are displayed in Figure 1.1. This general model was developed based on the related literature and theory.

The model contains three main components, namely teacher self-efficacy, academic self-regulation, and personality. All three components are represented by a number of subcomponents in the model. Teacher self-efficacy is examined in three dimension namely, self-efficacy for *student engagement*, self-efficacy for *instructional strategies*, and self-efficacy for *classroom management*. Academic self-regulation, on the other hand, encompasses achievement *goals, task value, control of learning beliefs, test anxiety, metacognitive self-regulation, effort regulation,* and *peer learning.* Finally, personality includes *Neuroticism, Extraversion, Openness, Agreeableness,* and *Conscientiousness.*
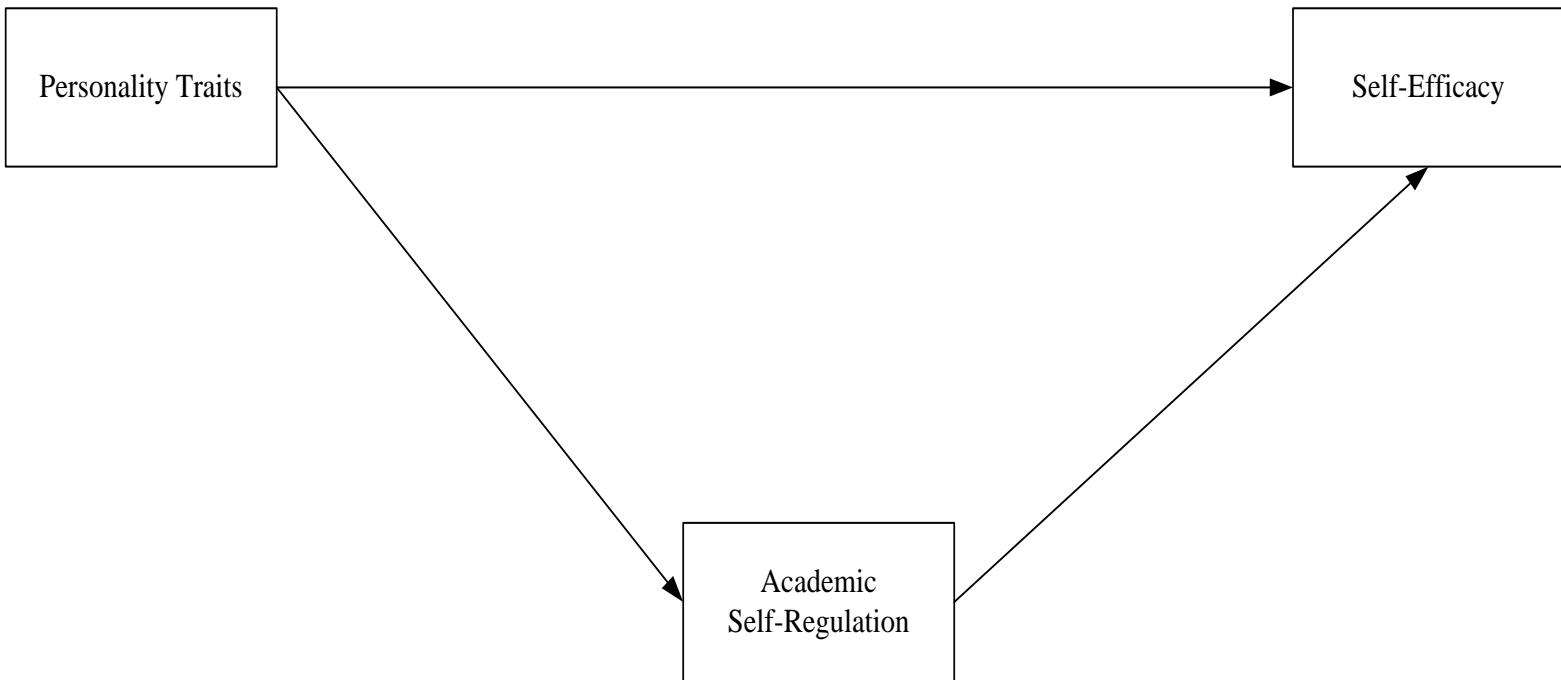
Figure 1.1 Model of the proposed relationships between self-efficacy, academic self-regulation, and personality traits

1.3 Proposed Relations in the Model

In the model, it is hypothesized that personality variables and academic self-regulation variables are related to the pre-service science teachers' teaching self-efficacy variables. In addition, the model suggested links between personality variables and academic self-regulation variables.

More specifically, the model proposed that Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness are directly linked to senior pre-service science teachers' self-efficacy for student engagement, instructional strategies, and classroom management, achievement goals (i.e. master approach goals, mastery avoidance goals, performance approach goals, and performance avoidance goals), metacognitive self-regulation, and effort regulation (see Figure 1.2 and Figure 1.3). Besides it was proposed that effects of Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness on teacher self-efficacy variables are mediated through their effect on achievement goals, metacognitive self-regulation, and effort regulation.
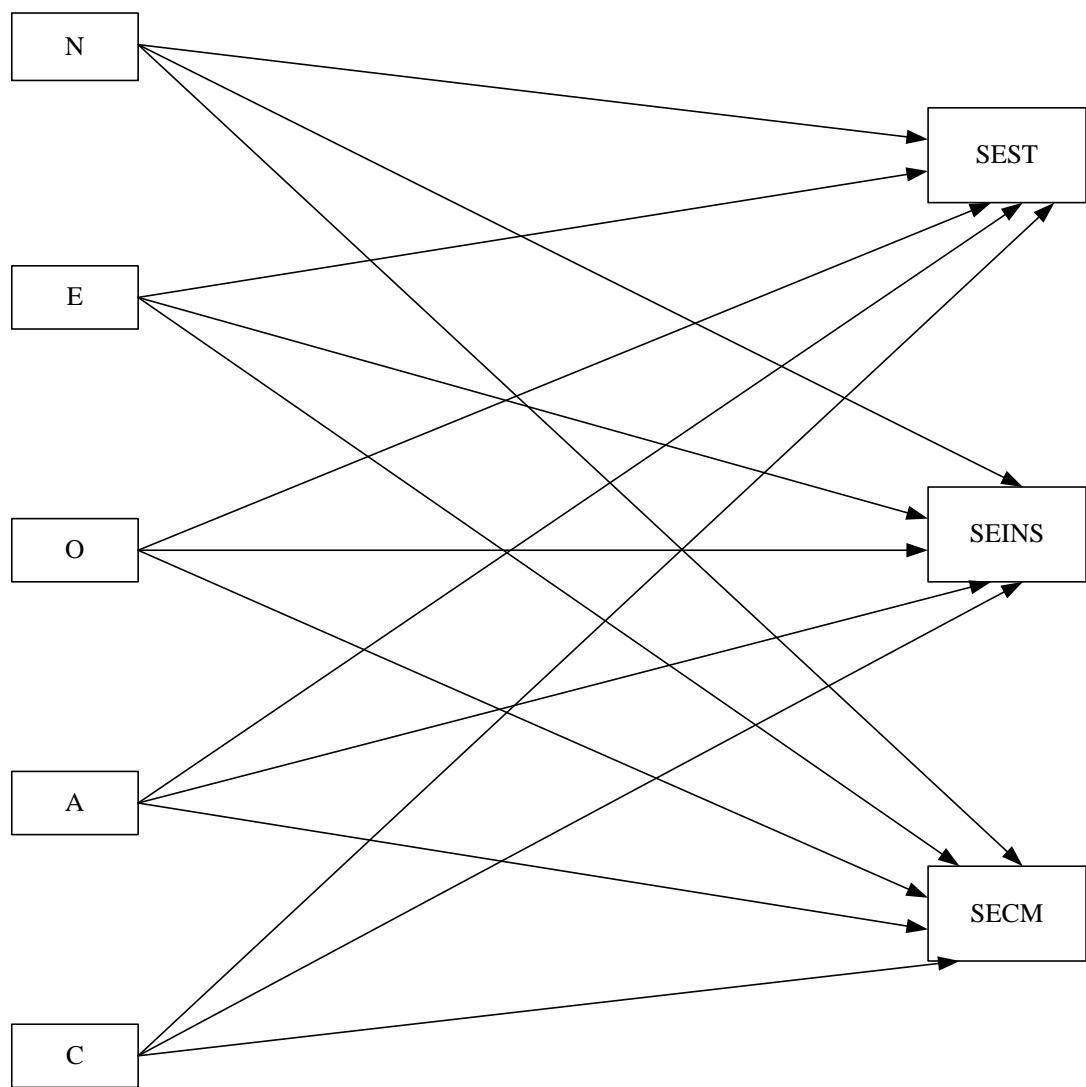
Figure 1.2 Model of the proposed relationships between personality variables and self-efficacy variables
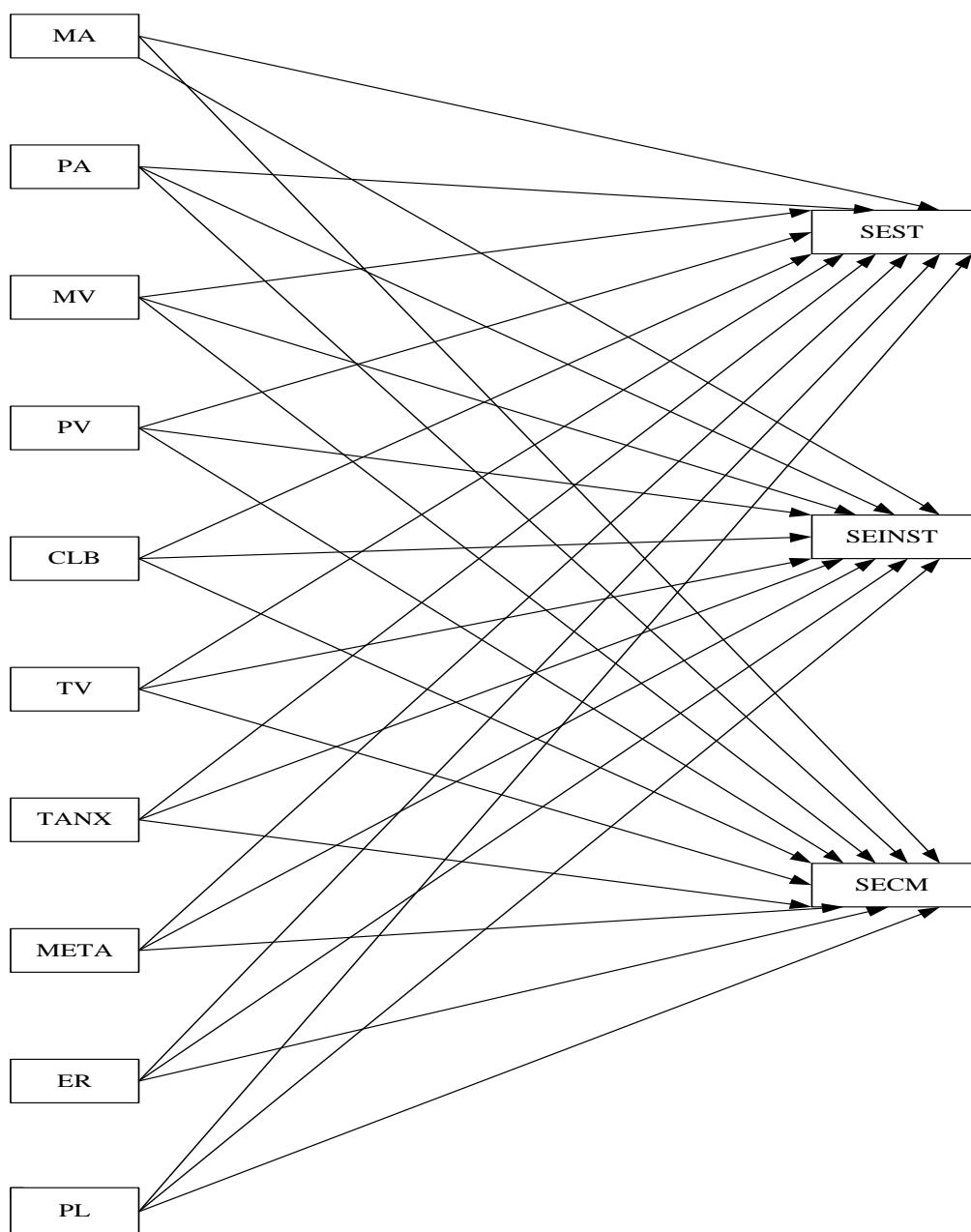
Figure 1.3 Model of the proposed relationships between academic self-regulation variables and self-efficacy variables

Moreover, direct links were specified from task value, control of learning beliefs, and peer learning to self-efficacy variables. In addition, in the model, achievement goals, task value, and control of learning beliefs were indirectly linked to teacher self-efficacy variables through their effects on metacognitive self-regulation. Further it was hypothesized that effect of task value and control of learning beliefs on teacher self-efficacy   were mediated through their effects on achievement goals. Additionally, in the model, metacognitive self-regulation, task value and control of learning beliefs were indirectly linked science teaching self-efficacy through their effect on effort regulation. Finally, a linked will be specified between Neuroticism and test anxiety (See Figure 1.4).
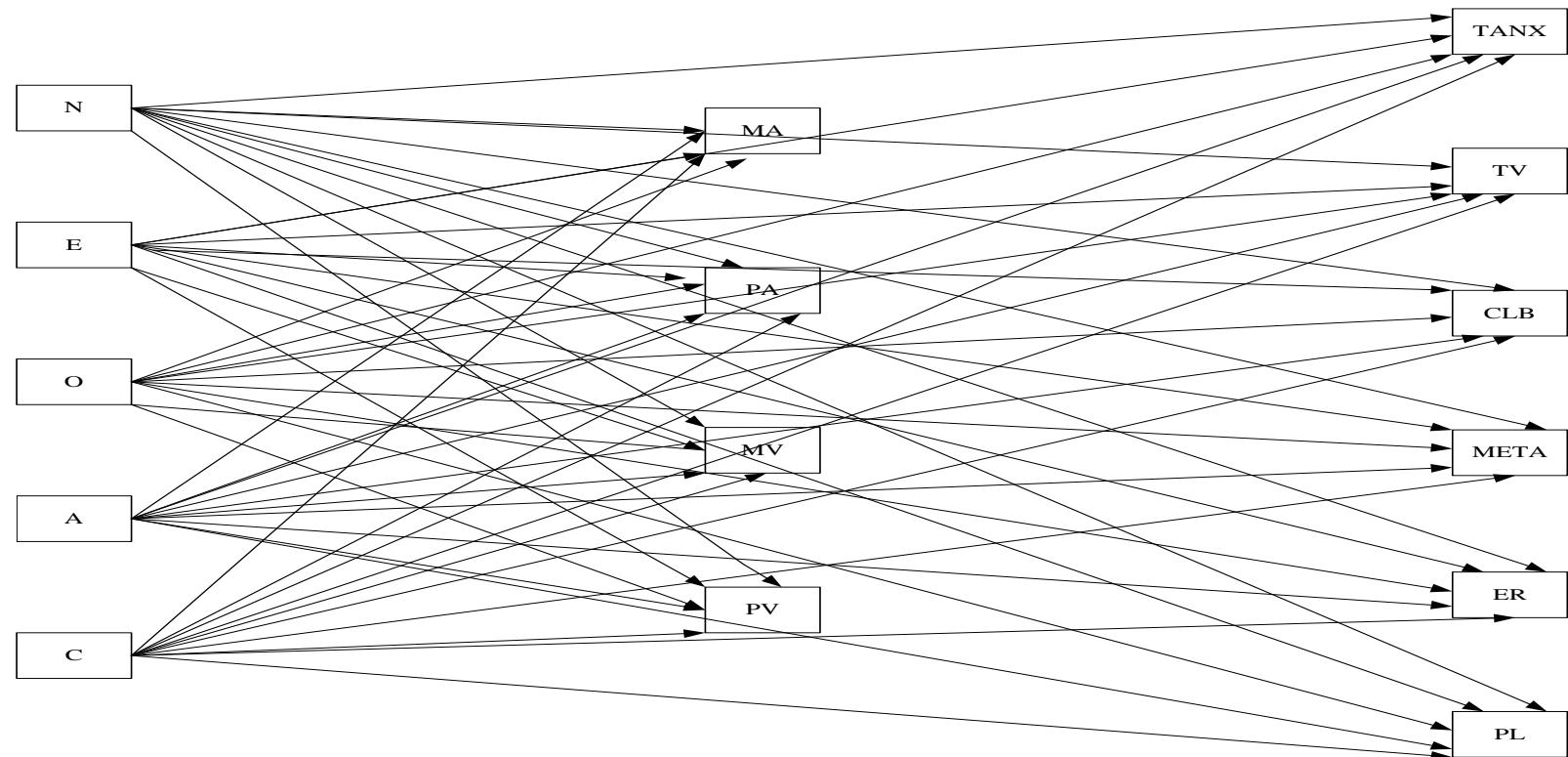
Figure 1.4 Model of the proposed relationships between personality variables and academic self-regulation variables

1.4 Significance of the Study

Although there has been considerable research on teacher self-efficacy in other countries (e.g. Anderson, Greene & Loewen, 1988; Greenwood, Olejnik, & Parkay, 1990; Woolfolk & Hoy, 1990; Pajares, 1997, Goddard, Hoy, & Woolfolk Hoy, 2000; Klassen & Chiu, 2010) and in Turkey (e.g. Tekkaya, Cakiroglu, & Ozkan, 2004, Cakiroglu, Cakiroglu, & Boone, 2005; Gencer & Cakiroglu, 2007; Isiksal & Cakiroglu, 2005; Koc, 2011), there is limited information in the relevant literature concerning the relationship among teacher self-efficacy, personality, and academic self-regulation. However, since teachers' sense of efficacy is found to be significantly associated with their instructional practices and with student motivation and achievement, there is a need to investigate the factors influencing the development of teacher self-efficacy beliefs starting with pre-service years. Indeed, the development of self-efficacy beliefs among pre-service teachers has attracted a great deal of research interest, as once efficacy beliefs are established; they tend to be resistant to change (Hoy & Spero, 2005).

A limited number of studies found in the relevant literature demonstrated that how pre-service teachers' approach to their own learning and personality are among the factors closely linked to their sense of efficacy. Actually, there are three lines of related research in the literature. The first line of related research examines the relationship between teachers' self-efficacy and academic self-regulation. The second line of research investigates the relationship between teachers' academic self-

regulation and personality. Finally, the third line of the research explores the relationship between teacher self-efficacy and personality. By combining these three lines of research, the present study aims at examining the relationships among pre-service science teachers' self-efficacy, academic self-regulation, and personality by proposing and testing a comprehensive conceptual model. Therefore, this study has a potential to make a unique contribution to teaching and teacher education literature since it is the first time a structural model with these variables is investigated. Moreover, the study was conducted specifically with pre-service science teachers in Turkey because, within the science domain, Turkish students are found to have low achievement scores on several international studies such as PISA 2006, TIMSS 1999 (Eğitimi Araştırma ve Geliştirme Dairesi, 2010) and PISA 2003 (Ministry of Education, 2010). In addition, science is one of the fundamental subjects in the Turkish curriculum which has been recently revised. Compared to previous curriculum implemented countrywide, the revised science curriculum gives more emphasis on student centered activities, encouraging students to use various self-regulatory strategies in their learning. Since teacher self-efficacy is found to be significantly linked to teachers' classroom practices, investigation of the factors related to the teacher self-efficacy, such as their own strategy use and personality, can be invaluable to support the recent reform efforts in science education and teacher education. Thus, findings can be used to improve the current status of science education in Turkey. In addition, the related literature on teacher education is based mainly on the studies conducted in Western countries. Turkey, bridging Asia and Europe, on the other hand, has traditionally been influenced by the East and the

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West. Thus, it has some unique and interesting characteristics. Since personality and the level of academic self-regulation and teacher self-efficacy can be influenced by culture (Cakiroglu, Cakiroglu, & Boone, 2005; Mclnerney, 2008), the observed relationship between these variables may show differences from culture to culture. Considering the fact that Turkey has some unique characteristics, results obtained from this study can provide better explanations for the findings obtained from other countries with different cultures.

1.5 Definitions of the Important Terms

Teacher self-efficacy

Teacher's belief in his or her own capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context (Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998).

Self-efficacy for student engagement reflects teachers' beliefs about their ability to engage of all students. Self-efficacy for instructional strategies refers to teachers' beliefs about their ability to apply many of the instructional strategies. Self-efficacy for classroom management refers to teachers' beliefs about their ability to manage classroom effectively.

Neuroticism (N)

Neuroticism takes into account individual differences in the inclination to construct, perceive, and feel reality as being problematic, threatening, and difficult; and to feel negative emotions (such as fear, shame, and anger) (Rolland, 2002, p.8).

Extraversion (E)

Extraversion refers to a tendency to seek contacts with the environment with energy, spirit, enthusiasm, and confidence, and to live out experiences positively (Rolland, 2002, p.8).

Openness (O)

Openness is manifested in a wide range of interests and an eagerness to seek out and live new and unusual experiences without anxiety and even with pleasure (Rolland, 2002, p.8).

Agreeableness (A)

Agreeableness is characterized by interpersonal tendencies, including eagerness to help others, altruism, sympathy, and a belief that others will be helpful in return (Costa & McCrae, 1991a, b).

Conscientiousness (C)

Conscientiousness is an individual's ability to control impulses, plan and organize active processes, carry out tasks, and be harder-working than other people (Costa & McCrae, 1991a, b).

Control of learning beliefs

Student's belief that s(he) has control over her/his learning. It concerns the belief that outcomes are contingent on one's own effort, in contrast to external factors such as the teacher (Garcia, McKeachie, Pintrich, & Smith, 1991).

Task value

Task value is defined as student's perception of the relative value of the learning task in terms of its interest, importance or utility, and costs (Eccles & Wigfield, 2002).

Mastery Approach Goals

Mastery approach goals focus on mastering task, learning, and understanding. Self-improvement, progress and deep understanding of task are the targets of mastery approach goal oriented students (Pintrich & Schunk, 2002).

Mastery Avoidance Goals

Mastery avoidance goals focus on avoiding misunderstanding or avoiding not learning and misunderstanding. Mastery avoidance goal oriented students avoid being erroneous and doing incorrectly relative to task (Pintrich & Schunk, 2002).

Performance Approach Goals

Performance approach goals focus on being superior, besting others, being the smartest, best at task in comparison to others. Getting the best grades, being best performer in the class are the aims of performance approach goal oriented students (Pintrich & Schunk, 2002).

Performance Avoidance Goals

Performance avoidance goals focus on avoiding inferiority, not looking stupid or dumb in comparison to others. Performance avoidance goal oriented students avoid obtaining the worst grades and being the lowest performer in the class (Pintrich & Schunk, 2002).

Test anxiety

Test anxiety includes two components namely cognitive component (i.e. worry) and emotionality component. Worry refers to students' negative thoughts that disrupt performance and the emotionality refers to affective and physiological arousal aspects of anxiety (Garcia et al., 1991).

Metacognitive self-regulation

Metacognitive self-regulation involves a deep processing strategies including planning, monitoring and regulating that assist students in control and regulation of the cognition (Pintrich, Smith, Garcia & McKeachie, 1993).

Effort regulation

Effort regulation or effort management refers to students' persistence and resilience in the face of a difficult or challenging task (Pintrich & Johnson, 1990).

Peer learning

Peer learning involves collaborative interactions by working with other participants.

1.6 Organization of the Dissertation

This dissertation is organized into five main chapters. The first chapter begins with background information of the study. This is followed by introducing readers to the research questions and the hypothetical model. The chapter also includes the significance of the study and definitions of the important terms. Chapter two provides a theoretical background of the constructs and empirical investigations about the relationships between teacher self-efficacy, academic self-regulation, and personality. Chapter three presents the research design, population and sampling, instrumentation, procedure, internal validity threats, assumptions, data collection, data analysis utilized in this study. Chapter four reveals the results of the current investigation. Finally, chapter five gives discussion of the findings with respect to the related literature, conclusions, implications, limitations and recommendations for further research.

CHAPTER II

LITERATURE REVIEW

Chapter two presents social cognitive theory, self-efficacy, and teachers' sense of efficacy. Because self-efficacy is considered within the larger social cognitive theory, the chapter begins with this more general framework before presenting self-efficacy theory in detail. These theories construct the theoretical framework of the teachers' sense of efficacy research and of this study. The following section provides a comprehensive review of the studies on teachers' sense of efficacy including measurement and correlates of efficacy. In addition, the integrated model of teachers' sense of efficacy, which is a key component of this study, is described with a summary of empirical studies of the model. Overall, this chapter provides background and context for understanding teacher efficacy studies, documents the importance of the efficacy construct, and stresses the need for studies exploring efficacy beliefs of pre-service science teachers.

2.1 Social Cognitive Theory

Social cognitive theory is based on human agency. According to Bandura (2001) "agency embodies the endowments, belief systems, self-regulatory capabilities and distributed structures and functions through which personal influence exercised, rather than residing as a discrete entity in a particular place" (p.2). Human agency occurs through intentionality (plans to action), forethought, self-reactiveness (motivation and self-regulation), and self-reflection. Social cognitive theory explains human agency in terms of triadic reciprocity which happens between person, their environment, and their behavior. In triadic reciprocity three determinants (a) personal in the form of cognition, affect, and biological events, (b) behavioral, and (c) environmental operate interactively. These determinants act mutually reciprocal ways and influence each other (presented in Figure 2.1). However, these interactions do not operate at the same time. In addition, activities, individuals, and circumstances affect the strength of interaction (Bandura, 1986).
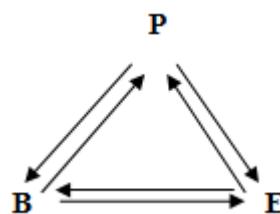
Figure 2.1 Theoretical model of triadic reciprocal determinism
Source: Bandura, 1997, p. 6

The interactive relation between behavior and personal factors occurs in the sense that people's beliefs, expectations, intentions and goals shape and direct their behavior, the consequences of their behavior, in turn, influence their thought patterns and affective reactions (Bandura, 1986).

The interaction of reciprocality between the person and the environment determinism occurs when environmental influences affect people's expectations, beliefs, and cognitive competencies and also environmental influence are affected by these personal factors (Bandura, 1986).

Finally, the reciprocal relationship between behavior and environment suggests that people are not only producers but also products of their environment (Bandura, 1986).

2.1.1 Fundamental Capabilities of Human Agency

Social cognitive theory assumes that human beings have a number of basic capabilities (Bandura, 1986; 1989):

- People have *symbolizing* capabilities which provide them with a powerful means of altering and adapting to their environment. According to Bandura (1989), "symbols serve as the vehicle of thought" (p. 9). Through symbols people can transform permanent experience into internal models that guide future action. In

addition, by the help of symbols people can communicate with others. The following human characteristics depend on symbolizing capability;

- People possess *forethought* capability that they can plan their actions, set goals and expect the likely consequences of these actions. Forethought provides motivation and guidance for actions.

- People can learn *vicariously* by observing other people's actions and its consequences for them. Vicarious capability enable people to attain appropriate behaviors without spending time on trial error process.

- People have *self-regulation* capability that they motivate and regulate their behaviors by internal standards. Based on their self-evaluation, people change their behaviors self-directly.

- People are *self-reflective*, in other words, they monitor their thoughts, act on them, evaluate the consequences and change them accordingly. Self-efficacy is one of the most significant types of self-reflection.

2.1.2 The Concept of Self-Efficacy

Self-efficacy beliefs are center of social cognitive theory. Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designed types of performances" (Bandura, 1986, p.391). Self-

efficacy beliefs determine how individuals feel, think, motivate themselves, and behave (Pajares, 1997) that self-efficacy is an important mediator of all types of behavior. Hence, self-efficacy has been covered in several fields' research such as psychology, health, and career choice (Pajares, 1996).

Self-efficacy beliefs influence selection of activities, effort, and persistence (Pintrich & Schunk 2002). People select and participate in an activity based on their belief that they are able to accomplish it. In addition, people with high self-efficacy expend more effort and persist longer than those with low self-efficacy.

Bandura (1977) proposed that self-efficacy beliefs are shaped by four sources of information: performance accomplishment, vicarious experience, verbal persuasion, and emotional arousal. Performance accomplishment which is the primary source of information refers one's own performance experiences. Based on the early experiences, one may think that s/he is proficient to do or not to do a task. Vicarious experiences provided by social models involve observation of the behavior of others and the results of that behavior. Verbal persuasion occurs when people provide messages of "if I can do it so can you". Emotional arousal, the fourth source of self-efficacy information, can influence a person's feels about their personal abilities in a particular situation (Bandura, 1977; 1997).

2.1.3 Teachers Sense of Efficacy

Tschannen-Moran, Woolfolk-Hoy and Hoy (1998) defined teacher efficacy as "teacher's belief in his or her own capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context" (p. 233). Hence, science teaching self-efficacy is ones perceived capabilities to teach science effectively and to provide meaningful science learning for students.

Based on the research on teacher efficacy, Tschannen-Moran, Woolfolk-Hoy and Hoy (1998) proposed a theoretical model (see Figure 2.2). This model pictures conceptional strands by considering the previous research on teacher efficacy and suggests new sources of information. The components of this model are explained in the following sections.
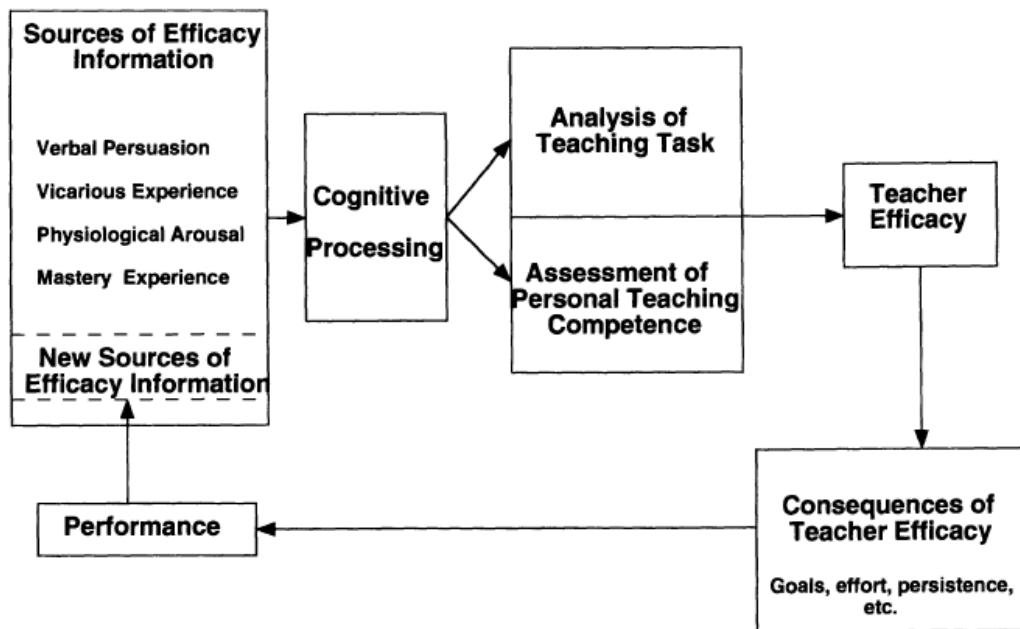
Figure 2.2 The cyclical nature of teacher efficacy

Source: Tschannen-Moran, Woolfolk-Hoy & Hoy, 1998, p.228

In the model, consistent with Bandura's contention (1997), the major factor influencing teacher efficacy is assumed to be the interpretation of four sources of information namely, mastery experience, vicarious experiences, verbal persuasion, and physiological arousal. *Mastery experience* (i.e. enactive experience) involves interpretation of past performance and is suggested to be the most powerful source of efficacy beliefs. The perception that a performance was successful raises efficacy beliefs while the perception that a performance was a failure lowers efficacy beliefs (Bandura, 1997). *Vicarious experience,* observing others teach in a real classroom setting, help individuals make judgments about their own capabilities to succeed at

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teaching. The failures or successes of models can either undermine or enhance the development of self-efficacy beliefs If the model is similar to the observer, the impact on efficacy will be stronger. *Verbal persuasion* involves receiving judgments from others about one's capabilities to teach. Verbal persuasion provides information about the nature of teaching and feedback about a teacher's performance. The level and type of *physiological arousal* differs in a teaching situation. Experiencing positive emotions indicates self assurance and the expecting of future success (Bandura, 1996). The other component in the model is c*ognitive processes* which determines how the sources of information will influence the analysis of the teaching task, its context, and the assessment of personal teaching competence (Tschannen-Moran, Woolfolk-Hoy & Hoy, 1998; p. 230). *Analysis of the teaching task and its context* involves making judgments about efficacy in terms of the difficulty of task, the students' motivation, the availability and quality of instructional materials, teaching methods, the physical conditions and climate of the teaching environment, etc. lead to beliefs about how to succeed in that particular setting. *Self-perception of teaching* refers to teachers' judgements about their current functioning. According to the model interaction between, analysis of the teaching task and its context and self-perception of teaching gives rise to personal teaching self-efficacy.

In line with the cyclical nature of teacher efficacy, the ability of a performance constructs a new mastery experience. Then, this experience shapes future efficacy beliefs via new information. The level of efficacy beliefs determine the level of effort

and persistence which leads to performance, in turn leads to efficacy. Thus, a teaching performance becomes the past and a source of future efficacy beliefs. As a result of this cyclical process, teacher performance and self-efficacy beliefs enhance mutually.

Many studies have examined the relationship between teacher self-efficacy and various teacher and student outcomes. However, researchers in the field have had difficulty in constructing an assessment tool to portray the relationship because there has been no consensus on conceptualization of teacher self-efficacy and there has been an uncertainty about the appropriate level of specificity in the measure of teacher self-efficacy. Thus, the researchers tried to capture the meaning of this construct and to develop scales based on different theories. For instance, based on Rotter's social learning theory, RAND organization added two efficacy items to their questionnaire. After their studies, three instruments namely Responsibility for Student Achievement, Teacher Locus of Control, and The Webb scale were developed. These instruments were built on Rotter's theory as well which define teacher efficacy as "teachers' beliefs that factors under their control ultimately have greater impact on the results of teaching than factors in the environment or in the student factors beyond the influence of teachers" (Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998, p. 206). On the other hand, several instruments were developed rooting in Bandura's social cognitive theory such as Gibson and Dembo instrument, Bandura's teacher self-efficacy scale and Teachers' Sense of Efficacy Scale (TSES).

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Tschannen-Moran and Hoy (2001) suggested that instruments used to measure teacher self-efficacy should include two dimensions of self-efficacy to be useful, valid and generalizable. These two dimensions are personal competence and an analysis of the task in relation to the constrictions and resources in a particular context. Therefore, they proposed that self-efficacy instruments should involve teachers' assessment of their competence across various tasks and activities they are supposed to perform. In line with this proposition, Tschannen-Moran and Hoy (2001) developed a 24-item long form and a 12-item short form of the Teachers' Sense of Efficacy Scale to measure teacher self-efficacy. The scale has three dimensions: self-efficacy for student engagement, self-efficacy for instructional strategies, and self-efficacy for classroom management. It is considered to be better than previously developed measures of teacher self-efficacy due to its unified and stable factor structure. Moreover, the three dimensions of the scale include items that represent a wide range of teaching tasks, the richness of teachers' occupational lives, and requirements of good teaching (Hoy & Spero, 2005; Tschannen-Moran & Woolfolk-Hoy, 2001).

2.2 Academic Self-Regulation

Although there is no simple and straight forward definition of self-regulation, it emphasizes autonomy and control by the individual who monitors, directs and regulates actions towards goals of information acquisition, expanding expertise and

self-improvement (Paris, & Paris, 2001). Self-regulation refers to the process whereby students activate and sustain cognitions, behaviors, and affects, which are oriented toward the attainment of their goals, and involves cognitive processing, motivational beliefs, and metacognitive thinking (Zimmerman, 1989; Pintrich & Linnenbrink, 2000; Schunk & Zimmerman, 1997).

Over the past decade academic self-regulation has been heavily researched. Although, there are different models of academic self-regulation proposed by different researchers with different conceptualizations, they are common in that all emphasize importance of cognitive, metacognitive, motivational, and behavioral processes of self-regulation in academic performance. Indeed, the theoretical models proposed by many educational psychologists aim to describe how cognitive, motivational, and contextual factors influence the learning process (Pintrich, 2005; Winne, 2001; Winne & Hadwin, 1998; Zimmerman, 2005).

2.2.1 Models of Self-Regulated Learning

The following sections provide an overview of different models of self-regulated learning (SRL) based on information processing theory and social-cognitive theory.

2.2.1.1 Winne's Four-Stage Model of Self-Regulated Learning

According to Winne and Hadwin (1998), SRL is described by information processing theory. Their model defines SRL as an aptitude and an event. An 'aptitude' refers a relatively stable personal attribute. An 'event' involves three, sometimes four necessary phases. Using the acronym COPES, Winne (2001) described each of the four phases in terms of the interaction of a person's conditions, operations, products, evaluations, and standards. All of these aspects, except operations, are types of information that a person uses or generates during learning. As it is shown in Figure 2.2, there are two events critical to SRL: metacognitive monitoring and metacognitive control.
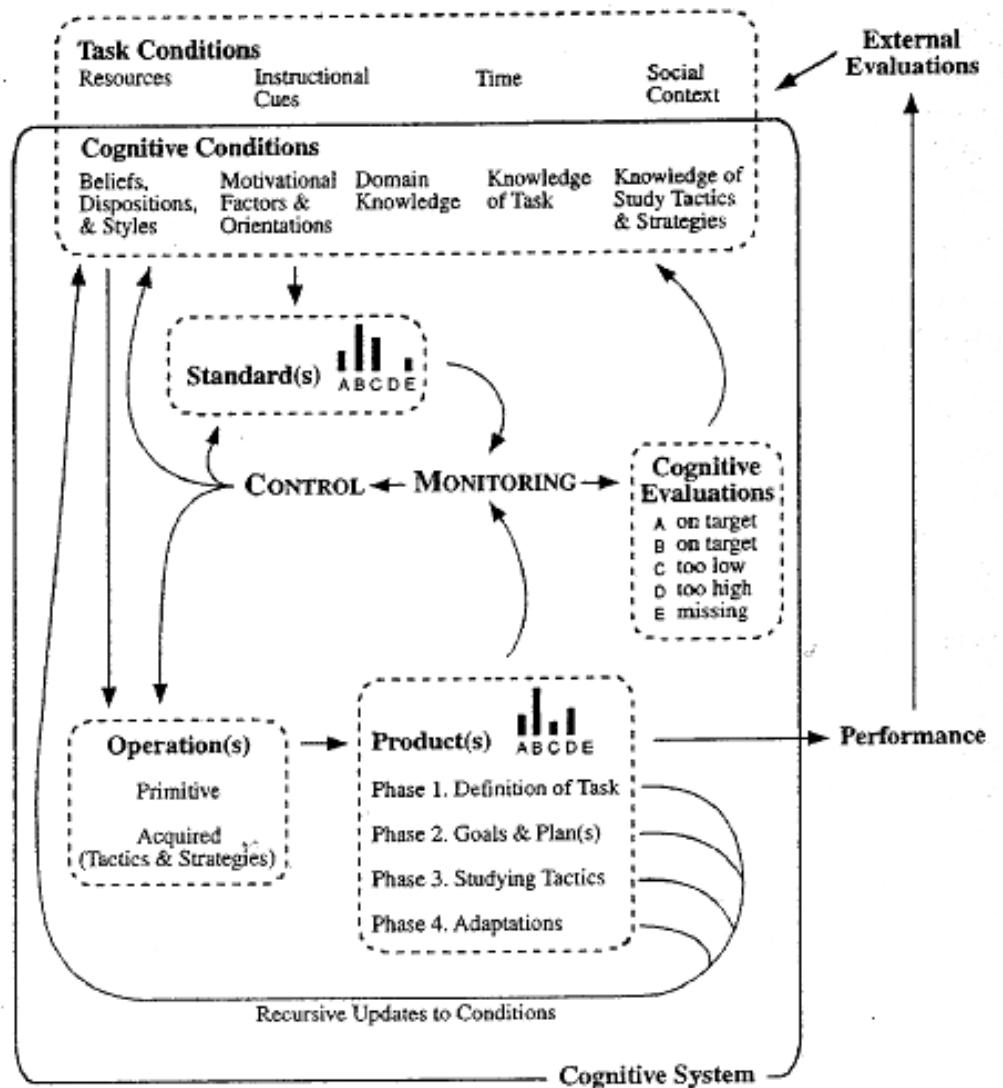
Figure 2.3 A four-stage model of self-regulated learning

Sorce: Winne & Perry, 2005, p.531

In Phase 1, task definition is characterized by the perceptions of students generated for the task. Two main sources of information, namely task and cognitive condition, contribute to definitions of a task. Task conditions provide information about the task in the environment (e.g. a teacher's directions for a homework assignment, or presence of worked out examples in a book chapter). Cognitive conditions, on the other hand, refer to information the learner retrieves from long term memory. Such information might include knowledge of the domain of the task (e.g. spelling, searching the internet), memories about self in relation to the task (e.g. interest), and memories about tactics and strategies used in previous encounters with the same or similar tasks (Winne & Hadwin, 1998; Winne, 2001).

Phase 2 is devoted to setting goals and planning how to reach them. Goals are reached by using a deductive or inductive plan. Phase 3 is labeled as enacting tactics and strategies planned in the previous phase. In this phase, tactics copy information into or construct information in working memory. Phase 4, adapting metacognition, is optional (Winne, 2001). It refers to a process by which students critically examine the things they came up with in the preceding phases, in the light of their meta-level knowledge (Winne & Perry, 2005).

2.2.1.2 Boekaerts' Model of Adaptable Learning

The Model of Adaptable Learning (MAL) is a holistic framework explaining the interaction between interwined aspects of SRL. An important assumption of the model is that based on two basic priorities, individuals self-regulate their behavior inherently. These two priorities are extending their knowledge and skills to expand their personal sources, and maintaining their available resources by preventing loss, damage, and distortions of well-being. It is also assumed that the information processing modes of these two priorities already exist. However, their power in the individual's goal hierarchy might differ. The appraisal construct is at the center in this model. Each learning situation triggers a network that affects individual's efforts and vulnerabilities. Appraisal process is linked to the contents of a dynamic internal working model (WM) influenced by three main sources of information (See Figure 2.3). The first source of information is the perception of the learning situation in the physical and social context. The second source of information is the knowledge and skills entail declarative and procedural knowledge, cognitive strategies, and metacognitive knowledge related with he learning situation. The third source is about the aspects of learners' self-system including their goal hierarchy, values, and motivational beliefs (Boekaerts & Niemivirta, 2005).
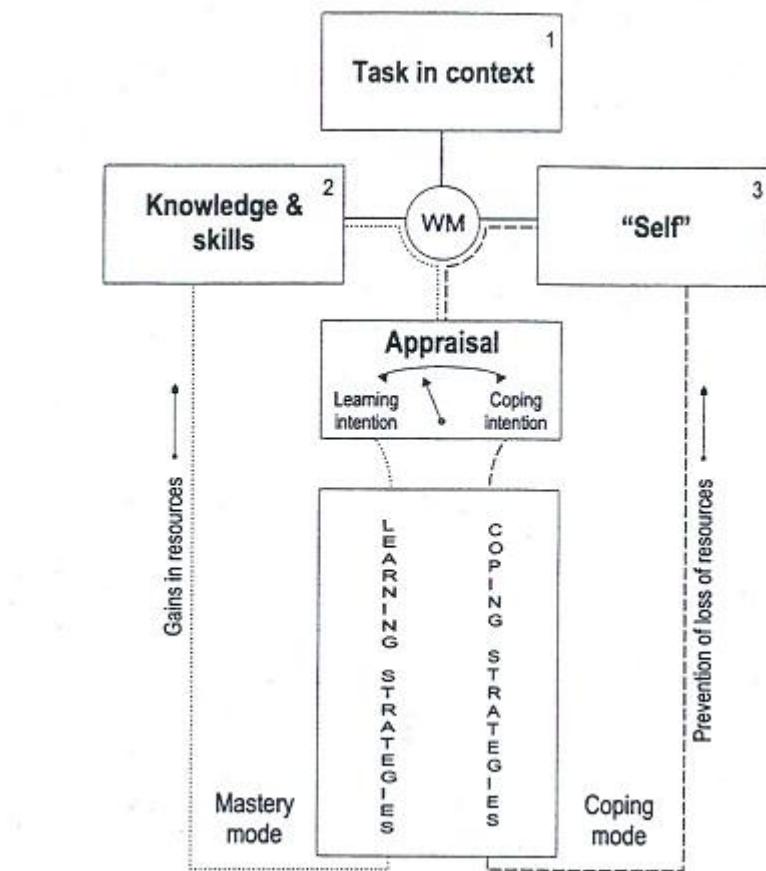
Figure 2.4 The model of adaptable learning

Boekaerts & Niemivirta, 2005, p. 429

The MAL is similar to the other models since it also emphasizes that both situation variables and person variables affect students' expectancies and their goal settings. However the MAL differs from similar models in some aspects. The MAL distinguishes two types of person variables which are the individual's metacognition and interaction with the content of the task (component 2) and individual's self and

motivational beliefs (component 3). This distinction provides to separate metacognitive control and motivational control (Boekaerts & Niemivirta, 2005).

2.2.1.3 Zimmerman's Social Cognitive Model of Self-Regulation

Zimmerman's cyclical model is based on Bandura's social cognitive theory that self-regulation is viewed as the interaction of personal, behavioral, and environmental processes. Any change in behavior leads changes in person and environment. Social cognitive theory views self-regulation as comprising three processes: self-observation, self-judgment, and self-reaction (Bandura, 1986). Self-observation provides information about how well one is progressing towards one's goal and also motivates behavioral change. Self-judgment refers to comparing the present performance with one's goal affected by the type of standards employed, the properties of the goal, the importance of goal attainment, and the attributions made for outcomes. Self-reactions are behavioral, cognitive, and affective responses to self-judgments. Self-reactions motivate individuals to complete the task who make acceptable progress of accomplishing the goal along with enhancing self-efficacy (Schunk, 2001).

According to Zimmerman's model, covert self-regulation includes monitoring and adjusting cognitive and affective strategies (i.e. imagery for remembering) whereas behavioral self-regulation includes self-observing and strategically adjusting performance process (i.e. one's method of learning). Environmental self-regulation,

on the other hand, involves monitoring and adjusting environmental conditions or outcomes (Zimmerman, 2005). Changes in learner's self-beliefs, overt behavior, and environment occur due to operation of the cyclical feedbacks and adaptation of loops (Zimmerman & Schunk, 2004) (see Figure 2.4).
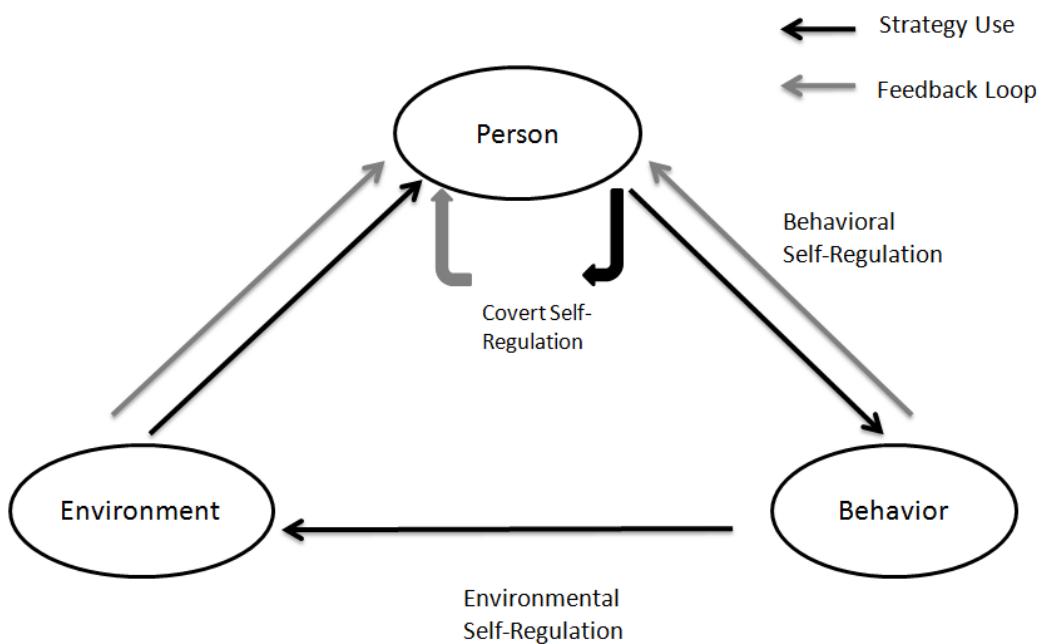
Figure 2.5 Triadic forms of self-regulation
Source: Zimmerman, 2005, p.15

Further expanding on Bandura's triadic forms of self-regulation, as it is shown in Figure 2.5, self-regulatory processes were suggested to happen through three phases: forethought, performance or volitional control, and self-reflection phases.

Performance Phase

Self-Control
Self-instruction
Imagery
Attention focusing
Task strategies

Self-Observation
Metacognitive monitoring
Self-recording

Forethought Phase

Task Analysis
Goal setting
Strategic planning

Self-Motivation Beliefs
Self-efficacy
Outcome expectations
task interest/value
Goal orientation

Self-Reflection Phase

Self-Judgment
Self-evaluation
Causal attribution

Self-Reaction
Self-satisfaction/affect
Adaptive/defensive

Figure 2.6 Phases and sub-processes of self-regulation
Source: Zimmerman &. Campillo, 2003, p. 239

The forethought phase refers to processes and beliefs that occur before efforts to act and prepare actions. Two distinctive categories are identified in this phase: *task analysis* and *self-motivational beliefs*. While the category of task analysis includes

goal setting and strategic planning, the category of self-motivational beliefs includes self-efficacy, outcome expectations, intrinsic interest, and goal orientation. Performance or volitional control phase refers to processes which occur during learning and action. This phase has two types of processes namely *self-control* and *self-observation*. Self-control includes self-instruction, imagery, attention focusing, task strategies, which helps learners to concentrate on the task and optimize their efforts. Self-observation, on the other hand, includes self-recording and self-experimentation, which refers to tracing specific aspects of one's own performance. The last phase, self-reflection involves processes that occur after performance efforts and affect an individual's response to that experience. Self-reflection includes two processes closely related to self-observation: *self-judgment* and *self-reactions*. Self-judgment refers to self-evaluations of individual's own performance and to causal attributions to the results. Self-reaction involves self-satisfaction and adaptive or defensive inferences. Since self-regulation is a cyclical process, self-reflection influences forethought processes (Zimmerman, 2005).

2.2.1.4 Pintrich's General Framework for Self-Regulated Learning

Pintrich (2005) organized SRL research using a taxonomy focusing on the phases and areas of self-regulation. The conceptual framework of self-regulation by Pintrich integrates motivational constructs in SRL. As it is seen in Table 2.1, unlike other

authors using a figurative representation of self-regulation models, Pintrich (2004)

presented his work in a table format.

Table 2.1 Phases and areas for self-regulated learning

	Areas for regulation			
Phases	Cognition	Motivation/Affect	Behavior	Context
Phase 1 Forethought, planning, and activation	Target goal setting	Goal orientation adoption	Time and effort planning	Perceptions of task
	Prior content knowledge activation	Efficacy judgments	Planning for self-observations of behavior	Perceptions of context
	Metacognitive knowledge activation	Perceptions of task difficulty		
		Task value activation		
Phase 2 Monitoring	Metacognitive awareness and monitoring of cognition	Awareness and monitoring of motivation and affect	Awareness and monitoring of effort, time use, need for help	Monitoring changing task and context conditions
			Self-observation of behavior	

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Table 2.1 (Continued)

		Areas for regulation		
Phases	Cognition	Motivation/Affect	Behavior	Context
Phase 3	Selection and adaptation of cognitive strategies for learning, thinking	Selection and adaptation of strategies for managing, motivation, and affect	Increase/ decrease effort	Change or renegotiate task
Control			Persist, give up Help-seeking behavior	Change or leave context
Phase 4	Cognitive judgments	Affective reactions	Choice behavior	Evaluation of task
Reaction and reflection	Attributions	Attributions		

Source: Pintrich, 2004, p.390

In Pintrich's model of self-regulated learning there are four phases. The first phase refers forethought, planning, and activation, the second phase refers monitoring, the third phase refers control, and the fourth phase refers reaction and reflection. For each phase, four separate self-regulatory areas are listed as cognition, motivation/affect, behavior, and context. In Phase 1, cognition area consists of goal setting, prior content knowledge and metacognitive knowledge activations. Motivation/affect area contains goal orientation adoption, efficacy judgments, ease of learning and perceptions of difficulty, task value activation, and interest activation. Behaviors that can be self-regulated are stated as time and effort planning, and planning for self-observations of behavior. Contextual regulation factors, finally, include students' perceptions of task and context. In Phase 2, cognitive monitoring consists of metacognitive awareness and cognition. Motivational monitoring refers to awareness and monitoring of motivation and affect. Behavioral monitoring includes awareness and monitoring of effort, using time, and need for help. Contextual monitoring refers to monitoring changing task and context conditions. In Phase 3, cognitive control comprises selection and adaptation of cognitive strategies for learning and thinking. Motivational control includes selection and adaptation of strategies for managing motivation and affect. Behavioral control embraces expending effort, persisting and seeking help when needed. Contextual control consists of attempts to change or renegotiate task and context. In Phase 4, cognitive reaction and reflection contains judgments and attributions. Motivational reactions include affective reactions and attributions. Behavioral reaction and reflection takes

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in one's choice of behavior. Contextual reaction and reflection comprises evaluations of task and context (Pintrich, 2004; 2005).

2.2.2 Discussion of Reviewed Self-Regulated Learning Models

There are many SRL models exist in the literature. However, Winne's (Winne & Hadwin, 1998), Boekaerts' (Boekaerts & Niemivirta, 2005), Zimmerman's (2005) and Pintrich's (2005) model of SRL are the latest models supported by a number of empirical studies. While, in one hand, these four models share some features, on the other hand, there are some differences in terms of their perspective and conceptualization of self-regulated learning. The models were compared on three criteria: the background theories, the definitions of SRL and the components included in the models.

Zimmerman's and Pintrich's models are derived from Bandura's social cognitive theory, emphasizing social foundation of thinking and behavior. Zimmerman, Pintrich and Boekaerts define SRL as a goal-oriented process that monitoring, regulating and controlling one's own learning entail not only cognitive but also motivational, emotional and social factors. On the other hand, Winne defines SRL as a metacognitive process including cognitive tactics and strategies to tasks. Yet, self-regulated learners are assumed to be intrinsically motivated and goal-oriented in his model (Puustinen & Pulkkinen, 2001). Finally, all models propose that SRL process starts with a preparatory or preliminary phase, continues with the actual performance

or task completion phase and ends with an appraisal or adaptation phase (See Table 2.2).

Table 2.2 The components of the models of four authors as a function of the three phases of the SRL process

| Author | SRL process | | |
	Preparatory phase	Performance phase	Appraisal phase
Winne	Task definition, goal setting, planning	Applying tactics and strategies	Adapting metacognition
Boekaerts	Identification, interpretation primary and secondary appraisal, goal setting	Goal striving	Performance feedback
Zimmerman	Forethought (task analysis, self-motivation)	Performance (self-control, self-observation)	Self-reflection (self-judgement, self-reaction)
Pintrich	Forethought, planning, activation	Monitoring, control	Reaction and reflection

Adapted from Puustinen & Pulkkinen, 2001, p.281

Since this study is based on social-cognitive theory, motivation is important as well as the cognition and metacognition in self-regulation process. Motivational aspect of self-regulation includes students' beliefs about their control over the learning process, task value perceptions, achievement goals, and test anxiety.

Control of learning beliefs refers the student's belief that he or she has control over their learning. It concerns the belief that outcomes are contingent on one's own

effort, in contrast to external factors such as the teacher (Garcia et al., 1991). In other words, if learning does not occur, they perceive their efforts affect their learning instead of blaming someone or something else.

Task value is a crucial component of the social cognitive model (Pintrich, 1999; Zimmerman & Kitsantas, 2005; Zimmerman, 2006). It is also central to the expectancy-value model of achievement motivation. Task value is defined as student's perception of the relative value of the learning task in terms of its interest, importance or utility, and costs (Eccles & Wigfield, 2002). As such it consists of four components namely attainment value, utility value, intrinsic value, and cost (Wigfield & Eccles, 1992, 2002). The attainment value of a task describes the perception of how important to be successful at a task. Utility value refers to perception whether a given task serves a useful purpose. Intrinsic value refers to enjoyment of engaging in a task. Cost value of a task references effort needed to complete a task.

Achievement goals involve student's perception of his or her reasoning for engaging in learning tasks. Although achievement goals were distinguished into two general achievement goals in early researches, they were labeled with different names (Pintrich & Schunk, 2002): learning and performance goals (Dweck & Leggett, 1988; Elliott & Dweck, 1988), task-involved and ego-involved goals (Nicholls, 1984), mastery and performance goals (Ames, 1992; Ames & Archer, 1987, 1988), task-focused and ability-focused goals (Maehr & Midgley, 1991). While the former one, mostly known as mastery, based on competence beliefs and focuses one's

attention on processes and strategies that can improve one's competence; the latter one, mostly known as performance, based on control beliefs, focuses on controlling one's success and failure experiences via selective exposure to socially competitive events (Schunk &Zimmerman, 2006).

Performance goals were separated as performance approach and performance avoidance in more recent researches (Elliott & Church 1997; Skaalvik 1997; Midgley, Kaplan, Middleton, Maehr, Urdan, Anderman, Anderman, & Roeser, 1998). Latest researches made distinction also within mastery goals between mastery approach and mastery avoidance goals (e.g. Elliot, 1999; Pintrich, 2000, 2005). Performance approach goal involves besting others, being superior whereas performance avoidance goal involves avoiding inferiority, looking stupid. Mastery approach goals emphasize learning and deep understanding while mastery avoidance goals emphasize avoiding not learning and misunderstanding (Elliot & Church, 1997; Elliot & McGregor, 2001; Elliot & Reis, 2003; Pintrich & Schunk, 2002) (see Table 2.3).

Table 2.3 Two goal orientations and their approach and avoidance forms

	Approach Focus	Avoidance Focus
Mastery Orientation	Focus on mastering task, learning understanding Use of standards of self-improvement, progress, deep understanding of task (learning goal, task goal, task involved goal)	Focus on avoiding misunderstanding, avoiding not learning or not mastering task Use of standards of not being wrong, not doing it incorrectly relative to task
Performance Orientation	Focus on being superior, besting others, being the smartest, best at task in comparison to others Use of normative standards such as getting the best or highest grades being top or best performer in class (performance goal, ego-involved goal self-enhancing ego orientation, relative ability goal)	Focus on avoiding inferiority, not looking stupid or dumb in comparison to others Use of normative standards of not getting the worst grades, being lowest performer in class (performance goal, ego-involved goal, self-defeating ego orientation)

Source: Pintrich & Schunk, 2002, p.219

Test anxiety has two components, namely cognitive component (i.e. worry) and emotionality component. While worry refers to students' negative thoughts that disrupt performance, the emotionality refers to affective and physiological arousal aspects of anxiety (Garcia et al., 1991). In other words, worry is the concern of negative consequences of poor performance, and emotionality is the autonomic nervous system responses to the stressful situation.

There are number of definitions of the metacognition in the literature. The term of metacognition was used at the first time by Flavell and defined as "knowledge and cognition about cognitive objects, that is, about anything cognitive" (Flavell, 1987, p.21). Metacognition is the process of thinking about one's own actions. More specifically it references "one's knowledge and control of own cognitive system" (Brown, 1987, p.66) or "awareness and management of one's own thought" (Kuhn & Dean, 2004, p.270). Hence, cognitive and metacognitive aspects involve using various cognitive and metacognitive strategies which are essential to be effective metacognitive thinkers. These strategies are identified as planning, monitoring, controlling, and regulating of one's cognitive activities and actual behavior (Pintrich & Schrauben, 1992; Pintrich, Marx, & Boyle, 1993). Planning activities include goal setting, task analysis, strategy choosing and decision making. Monitoring refers comparing improvement against set goals. Regulating stands for making adjustments on cognitive activities based on monitoring stage. Metacognitive strategies lead learners to "coordinate their own learning process" (Oxford, 1990, p.136). Moreover, these strategies provide self-check and regulate one's own cognition (Sungur, 2007).

Finally, behavioral aspect involves effort regulation and peer learning. Effort regulation refers to managing effort and attention to persist in the face of a difficult or boring task. Effort regulation is dependent on the task value and commitment to goal. Peer learning involves collaborative interactions by working with other participants. Mutual goals, rewards, and resources promote peer learning (Colbeck, Campbell, & Bjorklund, 2000).

According to relevant literature the aspects of SRL are related to each other. For example, in a recent study, Al-Harthy, Was and Isaacson (2010) investigated the relationship among motivational beliefs, goal orientations, and use of self-regulated learning strategies. A total of 265 university students enrolling in an educational psychology course were surveyed. Motivational beliefs and use of self-regulated strategies were assessed by Motivated Strategies for Learning Questionnaire (MSLQ) and goal orientations of mastery, performance-approach, and performance-avoidant were measured using Elliot's (1999) measure. The results of the path analysis revealed that task value positively was related to performance-avoid and mastery goal orientation. Performance-approach goals were not a significant predictor of any variables while mastery goal orientation was positively linked to metacognitive self-regulation. Moreover, positive direct effect of metacognitive self-regulation on effort regulation was found.

Similarly, Sungur (2007) examined the relationships among motivational beliefs, metacognitive self-regulation and effort regulation in science courses. A total of 391 (222 males, 169 females) high school students with a mean age of 16.69 years participated in the study by responding an adapted version of the MSLQ. The results demonstrated that students who focus on learning and believe that course material is important, useful, and interesting and their efforts to study are influential in mastering the course material were more likely to employ metacognitive strategies more often. In addition, the effect of all motivational beliefs on effort regulation was found to be mediated by metacognitive self-regulation in the model.

Wolters, Yu, and Pintrich (1996) conducted another study about relations among motivational beliefs, goal orientations, and use of self-regulated learning strategies. The participants of the study were 434 (225 females and 209 males) 7th and 8th grade students with an overall mean age of 12.6 years. The Patterns of Adaptive Learning (PALS) was utilized to measure students' goal orientations and the MSLQ was utilized to measure students' motivational beliefs and strategy use. Data were collected twice, at the beginning and at the end of the school year. The results showed that learning goal orientation which focuses on mastering task was positively linked to students' task value and self-regulated learning whereas there was no relationship between learning goal orientation and test anxiety. Relative ability goal orientation which refers social comparisons, competing with other students and desiring not to seem as less competent than others was also found to be positively related to students' task value and self-regulated learning. What is more, extrinsic goal orientation which focuses on getting external rewards such as grades and praise from teachers, parents as well as avoiding external sanctions as punishment was negatively related to students' task value, their self-regulated learning while positively linked to students' test anxiety.

Further evidence for the relationship between motivational beliefs and self-regulation was provided by Pintrich and De Groot (1990). The participants of the study were 173 (100 girls, 73 boys) seventh grade students were administered the subscales of MSLQ. The zero-order correlations among motivational and self-regulation components revealed that intrinsic value ($r = .73$) were associated with higher levels of self-

regulation. Test anxiety was found to be negatively correlated with self-regulation (r = -.13). Students who were less anxious and highly-motivated to learn the material and believed that their school work was interesting and important appeared to use self-regulation strategies more.

Overall, the aforementioned studies revealed that there are relationships among academic self-regulation aspects. More specifically, task value and goal orientation affect each other as well as goal orientation also affect metacognitive self-regulation and general self-regulation. What is more, metacognitive self-regulation influences effort regulation directly. Students who are highly motivated, less anxious and focus on mastering task tend to use metacognitive strategies more often that they persist longer on a given task.

2.3 Personality

Personality plays important role in learning and education in terms of academic behavior, performance, and motivation. There have been a large number of studies conducted that found meaningful relationship between personality traits and several variables such as achievement, academic motivation, and self-efficacy (e.g. Musgrave-Marquart, Bromley, & Dalley, 1997; Hart, Stasson, Mahoney, & Story, 2007; Thomas, Moore, & Scott, 1996). Personality can be defined as individual difference characteristics (Hogan, Hogan, & Roberts, 1996). Another widely quoted definition is that "dynamic organization, inside the person, of psychophysical systems that create a person's characteristic patterns of behavior, thoughts, and

feelings" (Carver & Scheier, 2000, p. 5). Over the past century numbers of taxonomies of personality traits have been established by different researchers. Among these taxonomies, Cattell's sixteen-factor and Eysenck's three-factor models received considerable attention of the researchers in different fields (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). Recently, five-factor model of personality also gained attention of the researchers (Barbaranelli, Caprara, Rabasca & Pastorelli, 2003).

Cattell (1943) proposed his sixteen factor personality model based on Allport and Odbert's (1936) list of about 4500 trait terms and the lexical hypothesis which assumes that every aspect of an individual's personality can be described by existing words. During the development of his model, he identified 16 personality traits of the 4500 trait terms by using semantic and empirical clustering procedures and conducting several factor analyses (Chamorro-Premuzic, 2007; John, Naumann, & Soto, 2008). These 16 personality traits were also called "source traits" and grouped into 3 categories namely ability traits, temperament traits, and dynamic traits. Ability traits involve skills and abilities to perform a task effectively. Intelligence is such an ability trait. Temperament traits involve emotional life and style of behaving such as acting slowly or quickly. Finally, dynamic traits involve motivational life and interest (Cattell, 1965). Based on these source traits, 16 Personality Factors (16PF) questionnaire was developed (see Table 2.4).

Table 2.4 16PF scale names and descriptions

Descriptors of Low Range	Primary Scales	Descriptors of High Range
Reserved, impersonal, distant	Warmth	Warm-hearted, caring, attentive to others
Concrete, lower mental capacity	Reasoning	Abstract, bright, fast-learner
Reactive, affected by feelings	Emotional stability	Emotionally stable, adaptive, mature
Deferential, cooperative, avoids conflict	Dominance	Dominant, forceful, assertive
Serious, restrained, careful	Liveliness	Enthusiastic, animated, spontaneous
Expedient, nonconforming	Rule-consciousness	Rule-conscious, dutiful
Shy, timid, threat-sensitive	Social boldness	Socially bold, venturesome, thick-skinned
Tough, objective, unsentimental	Sensitivity	Sensitive, aesthetic, tender-minded
Trusting, unsuspecting, accepting	Vigilance	Vigilant, suspicious, skeptical, wary
Practical, grounded, down-to-earth	Abstractedness	Abstracted, imaginative, idea-oriented
Forthright, genuine, artless	Privateness	Private, discreet, non-disclosing
Self-assured, unworried, complacent	Apprehension	Apprehensive, self-doubting, worried
Traditional, attached to familiar	Openness to change	Open to change, experimenting

Table 2.4 (Continued)

Descriptors of Low Range	Primary Scales	Descriptors of High Range
Group-oriented, affiliative	Self-reliance	Self-reliant, solitary, individualistic
Tolerates disorder, unexacting, flexible	Perfectionism	Perfectionistic, organized, self-disciplined
Relaxed, placid, patient	Tension	Tense, high energy, driven
	Global Scales	
Introverted, socially inhibited	Extraversion	Extraverted, socially participating
Low anxiety, unperturbable	Anxiety Neuroticism	High anxiety, perturbable
Receptive, open-minded, intuitive	Tough-mindedness	Tough-minded, resolute, unempathic
Accommodating, agreeable, selfless	Independence	Independent, persuasive, willful
Unrestrained, follows urges	Self-control	Self-controlled, inhibits urges

Source: Conn & Rieke, 1994 as cited in Cattell &Mead, 2008, p.136

Despite the fact that Cattell contributed greatly to personality research, due to complexity of factor analytic approach, his model has been criticized about lack the ability of replication.

Later, Eysenck proposed a simpler personality trait structure. According to Eysenck, biology and genetics (inherident) underlie personality traits (Pervin & John, 1997). In order to develop his theory, Eysenck conducted secondary factor analyses and identified 3 factors (Cervone & Pervin, 2008). These three factors was named as the Big-Three (i.e. the three-factor) dimensions of Neuroticism (N), Extraversion-Introversion (E), and Psychoticism (P). The three factor model has a hierarchical structure in which each three factor sit at the top of its own hierarchy. For instance, Neuroticism subsumes of anxious, depressed, guilt feelings, low self-esteem, tense, irrational, shy, moody, emotional. In other words, the high scorer on Neuroticism tends to be a worrier and feels emotional arousal. Extraversion consists of sociable, lively, active, assertive, sensation seeking, carefree, dominant, surgent, venturesome. While extraverts like having many friends, introverts like spending time alone. Lastly, psychoticism consists of aggressive, cold, egocentric, impersonal, impulsive, antisocial, unempathetic, creative, tough-minded. The high scorer on psychoticism tends to be unable of empathy and of acting with thinking (Matthews, Deary & Whiteman, 2003; Larsen & Buss, 2005). Figure 2.6 displays the hierarchical structure of Eysenck's model.

(a)   The hierarchical structure of Psychoticism (P)
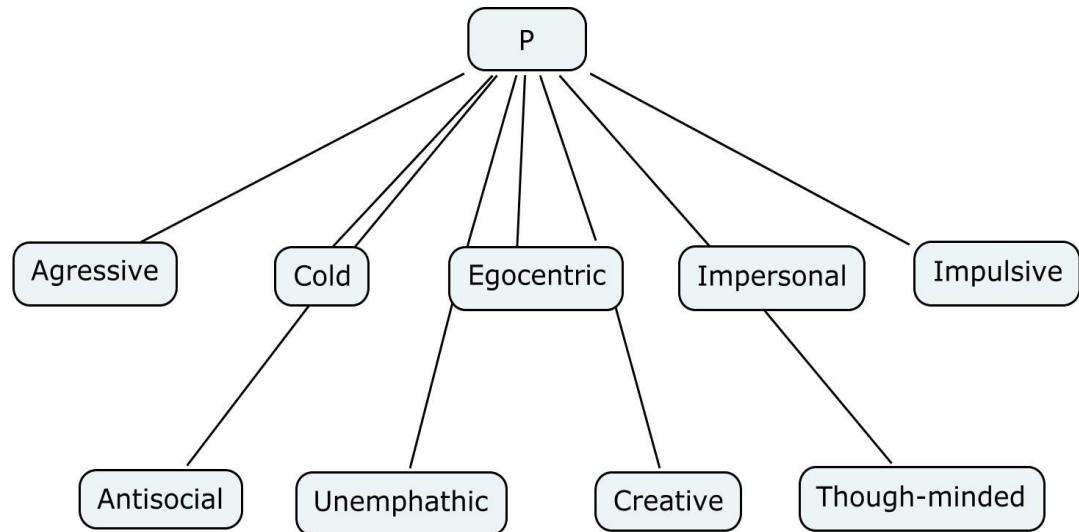
(b)   The hierarchical structure of Extraversion-Introversion (E)
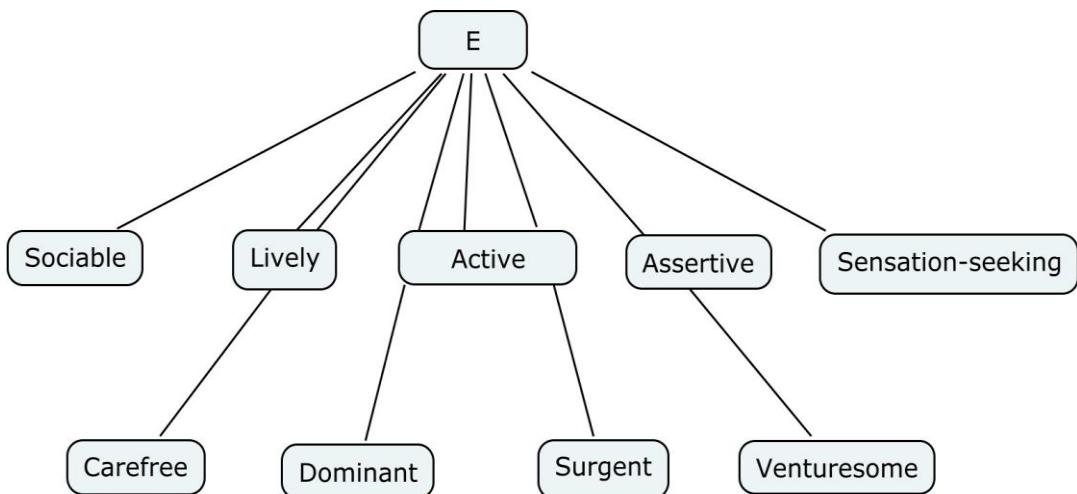
(c)   The hierarchical structure of Neuroticism (N)
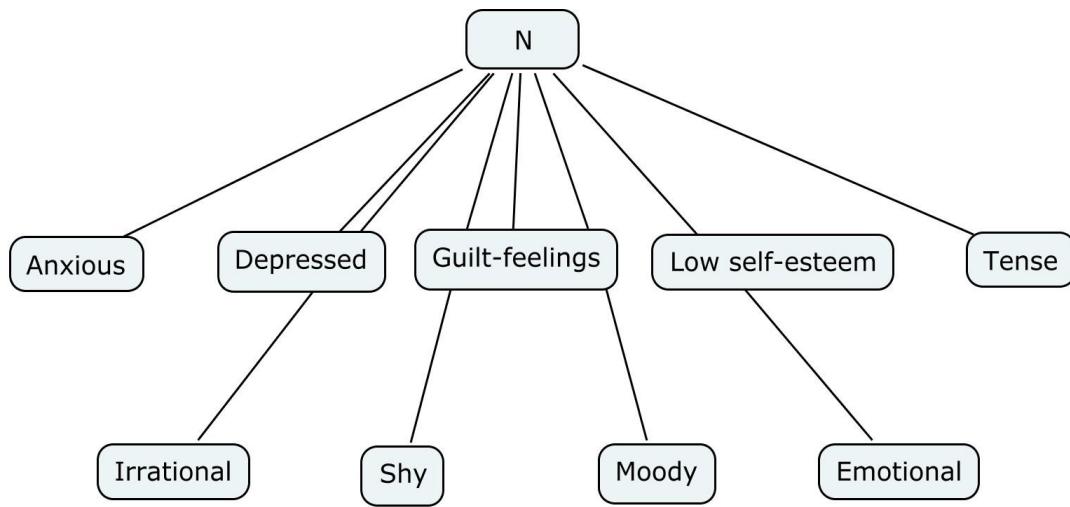
Figure 2.7 Eysenck's hierarchical structure of major personality traits

Source: Larsen & Buss, 2005, p.76

Eysenck's model is hierarchical and the traits are moderately heritable. Despite these features, it has some limitations. The first limitation is that in order to describe personality, more factors are needed. The second limitation is other personality traits also show moderate heritability (Larsen & Buss, 2005; Cervone & Pervin, 2008).

On the other hand Big Five dimensions were discovered by several researchers examining Cattell's work. Indeed, validation studies of the Catell's model led researchers to discover Big Five Factor (Larsen & Buss, 2005). Fiske (1949) was the first researcher who studied on Cattell's work and he constructed 22 simplified description. Later, Tupes and Christal (1961) reanalyzed the factor structure of these descriptions and purposed the five-factor model (John, Naumann, & Soto, 2008).

This five-factor structure was replicated by Norman (1963) and the factors were labeled as surgency, Agreeableness, Conscientiousness, emotional stability, and culture. Goldberg (1981) reviewed the existing studies and named the factors as "Big Five" meaning that each factor is extremely broad which encompasses large number of distinct, more specific personality characteristics (John, Naumann, & Soto, 2008). The Big Five is based on lexical hypothesis and statistical approach (Larsen & Buss, 2005). The recent definitions and explication of the Big Five is displayed in Table 2.5.

Table 2.5 Big Five Domains

Factor	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Verbal labels	Energy	Alturism	Constraint	Negative Emotionality	Originality
	Enthusiasm	Affection	Control of impulse	Nervousness	Open-mindedness
Conceptual definition	Implies an energetic approach toward the social and material world and includes traits such as sociability, activity, assertiveness, and positive emotionality.	Contrast a prosocial and communal orientation toward others with antagonism and includes traits such as altruism, tender-mindedness, trust, and modesty.	Describes socially prescribed impulse control that facilitates task – and goal-directed behavior, such as thinking before acting, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks.	Contrasts emotional stability and even-temperedness with negative emotionality, such as feeling anxious, nervous, sad, and tense.	Describes the breadth, depth, originality, and complexity of an individual's mental and experiential life.

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Table 2.5 (Continued)

Factor	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Behavioral examples	Approach strangers as at a party and introduce myself; Take the lead in organizing a project; Keep quiet when I disagree with others (R[*])	Emphasize the good qualities of other people when I talk about them; Lend things to people I know (e.g. class notes, books, milk); Console a friend who is upset.	Arrive early or on time for appointments; Study hard in order to get the highest grad in class; Double-check a term paper for typing and spelling errors: Let dirty dishes stack up for more than one day (R)	Accept the good and the bad in my lie without complaining or bragging (R); Get upset when somebody is angry with me; Take it easy and relax (R)	Take the time to learn something simply for the joy of learning; Watch documentaries or educational TV; Come up with novel set-ups for my living space; Look for stimulating activities that break up my routine.

[*] R: Reverse

Table 2.5 (Cont.)

Factor	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Examples of external criteria predicted	High pole: Social status in groups and leadership positions; selection as jury foreperson; positive emotion expression; number of friends and sex partners	High pole: Better performance in work groups	High pole: Higher academic grade-point averages; better job performance; adherence to their treatment regimens; longer lives	High pole: Poorer coping and reactions to illness; experience of burnout and job changes	High pole: Years of education completed; better performance on creativity tests; success in artistic jobs; create distinctive-looking work and home environments
	Low pole: Poorer relationships with parents; rejection by peers	Low pole: Risk for cardiovascular disease, juvenile delinquency, interpersonal problems	Low pole: Smoking, substance abuse, and poor diet and exercise habits; attention-deficit / hyperactivity disorder (ADHD)	Low pole: feeling committed to work organizations; greater relationship satisfaction	Low pole: Conservative attitudes and political party preferences

Adapted from John, Naumann, & Soto, 2008, p.120

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Several types of questionnaires were developed to assess Big Five. For example Goldberg (1992) developed an inventory of bipolar adjective scales (e.g. tense vs. relaxed, cold vs. warm) which are grouped together under the factor name. In addition to single trait word type measures, a statement item type measure, most widely used (De Raad & Perugini, 2002), was developed by Costa and McCrae (1992a). It is called NEO-PI-R in which NEO stands for Neuroticism-Extraversion-Openness, PI stands for Personality Inventory, and R stands for Revised. Unlike the original NEO-PI, the NEO-PI-R measures specific facets of Agreeableness and Conscientiousness (Costa & McCrae, 1992b, Costa & McCrae, 2008). The traits in NEO-PI-R are Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A), and Conscientiousness (C) respectively. Because the dimensions of the five factor model are independent (Olson & Evans, 1999), a person who is high in one dimension may rate a competency the same as a person high in another dimension, but for different reasons. The NEO-PI-R has some strengths comparing to other inventories. Firstly, the NEO-PI-R displays cross-cultural consistency in different countries and cultures (Rolland, 2002; McCrae & Costa, 1997). Secondly, being used in over a thousand published studies showed longitudinal stability and provided well-established validation (Costa &McCrae, 1992a).

2.4 Relationship between Self-Efficacy and Academic Self-Regulation

There is not sufficient research regarding with pre-service or in-service teachers' use of self-regulatory strategies in their own learning. According to the studies, pre-service or in-service teachers do not use self-regulatory strategies as effectively as students and teachers who is self-regulated help their students to develop self-regulatory strategies (Gordon, Dembo, & Hocevar, 2007). In addition, if teachers value self-regulatory skills they are likely to create learning environments supporting student autonomy. What is more, studies on teachers' effectiveness revealed that self-regulatory skills have a strong effect on teachers' self-efficacy beliefs which are important determinants of their behavior and practices in the classroom (Bembenutty, 2006; Dembo, 2001).

For example, Bembenutty (2007) investigated the relationships among teachers self-efficacy beliefs, motivational beliefs, academic delay of gratification, and self-regulation of learning. He administered the Ohio Teacher Sense of Efficacy Scale (OTSES), Academic Self-efficacy Scale, Academic Delay of Gratification, Motivational Beliefs, and Academic Self-regulation to a total of 63 secondary education preservice teachers enrolling in a classroom management course. Zero-order correlations were calculated to test the association between the variables. The results revealed a high correlation between pre-service teachers' self-regulation and their self-efficacy. This correlation demonstrated that higher levels of task value, intrinsic interest, time and study environment management and use of metacognitive

strategies were associated with higher levels of self-efficacy. Also, a positive correlation was determined between task value and metacognitive self-regulation.

Based on the results, it is suggested that teacher education programs should help pre-service teachers learn how to regulate their own learning motivationally, cognitively, and behaviorally, and use effective strategies during their training in order to improve their sense of self-efficacy beliefs. Therefore, it appears that self-efficacy has a mediating role between teachers' use of academic self-regulation in their learning and their classroom behaviors. In other words, teachers who use self-regulatory strategies in their learning are likely to be self-efficacious in their teaching which is related to the development of strategies supporting student self-regulation and autonomy.

Considering the abovementioned literature, it was proposed in the current study that relationship exists between different facets of pre-service science teachers' academic self-regulation (i.e. achievement goals, task value, control of learning beliefs, test anxiety, metacognitive self-regulation, effort regulation, and peer learning) and three dimensions of self-efficacy (i.e. self-efficacy for student engagement, for instructional strategies, and for classroom management). Moreover, links were specified among self-regulation variables (see Table 2.6).

Table 2.6 Paths between academic self-regulation and teacher self-efficacy variables

Path from	to	to	to	to	to	to	to	to	to
MA	SEST	SEINS	SECM					META	
PA	SEST	SEINS	SECM					META	
MV	SEST	SEINS	SECM					META	
PV	SEST	SEINS	SECM					META	

Table 2.6 (Continued)

Path from	to	to	to	to	to	to	to	to	to
TV	SEST	SEINS	SECM	MA	PA	MV	PV	META	
CLB	SEST	SEINS	SECM	MA	PA	MV	PV	META	ER
META	SEST	SEINS	SECM						ER
ER	SEST	SEINS	SECM						
PL	SEST	SEINS	SECM						ER

MA: Mastery Approach, PA: Performans Approach, MV: Mastery Avoidance, PV: Performance Avoidance, TV: Task Value, CLB: Control of Learning Beliefs, META: Metacognitive Self-Regulation, ER: Effort Regulation, PL: Peer Learning, SEST: Self-Efficacy for Student Engagament, SEINS: Self-Efficacy for Instructional Strategies, SECM: Self-Efficacy for classroom management

2.5 Relationship between Self-Efficacy and Personality Traits

Research has demonstrated that teachers' personality traits are associated with their teaching effectiveness. Indeed, a study by Erdle, Murray, and Rushton (1985) demonstrated that there is a significant relationship between personality traits and teaching effectiveness, which is mediated through the teachers' use of a variety of strategies and materials. Katz (1992) reported that teachers who are analytical, imaginative, and creative tend to use various strategies during instruction. In addition, he found that teachers with tough-minded, extraverted, and stables personalities are more receptive to new ideas. In one such study, Phillips, Carlisle, Hautala, and Larson (1985) revealed that physical education teachers who scored high in assertiveness, questioning and imaginativeness tended to provide their students with more time on task and a higher quality of practice time. Moreover, Knoblauch and Hoy (2008) suggested that pre-service teachers' self-efficacy affects teaching effectiveness, which is found to be associated with personality traits.

In another study, Henson and Chambers (2003) examined the relationship among teachers' personality traits, classroom management and their self-efficacy. They conducted their study with 120 teachers pursuing secondary teacher certification who were in their first year of teaching. Participants were assigned to a public school mentor teacher and received regular visits from university supervisors. Results of the study showed that extraverted teachers had higher levels of self-efficacy. Supporting this result, a study by Roberts, Harlin, and Briers (2007) revealed that Extraversion relates positively to overall teacher self-efficacy as well as teacher efficacy for

student engagement, for instructional strategies and for classroom management. Additionally, in their meta-analysis of the big-five personality dimensions and job effectiveness, Barrick and Mount (1991) suggested that Conscientiousness and Neuroticism are valid predictors of job performance for all occupational groups. According to the researchers, viewing Conscientiousness from a positive pole, higher levels of Conscientiousness is expected to be associated with better job performance because Conscientiousness involves hard work, persistence, and responsibility. On the other hand, viewing Neuroticism from a negative pole, higher levels of Neuroticism is expected to be related to worse job performance because Neuroticism involves nervousness, high-strangeness, and worry. Moreover, Barrick and Mount (1991) predicted that for occupations requiring cooperation or interaction with others, Extraversion and Agreeableness are valid predictors of job performance. Additionally, it was predicted that Openness is a valid predictor of training proficiency because Openness involves curiosity, broadmindedness, and intelligence which are characteristics related to positive attitudes toward learning. Results of the meta-analysis, in general, were consistent with the predictions.

In line with the aforementioned literature, it was hypothesized in the present study that all personality traits are significantly linked to teacher self-efficacy, which is closely associated with teaching effectiveness. More specifically, based on relevant theory and literature, it is proposed that extraverted, agreeable and conscientious pre-service science teachers have higher levels of teacher self-efficacy, since teaching involves interaction with others such as students, colleagues, and parents.

Moreover, Openness is anticipated to be positively related to teaching self-efficacy because open individuals are curious, open-minded, and intelligent. Such characteristics are expected to have positive impact on teachers' self-efficacy and, in turn, their teaching effectiveness. On the other hand, it is predicted that Neuroticism is negatively related to teacher self-efficacy since Neuroticism is associated with negative affects and psychological distress, which may interfere with adaptation. In addition, people with higher levels of Neuroticism tend to cope more poorly compared to others when faced with stress or difficulties (Costa & McCrae, 1991a). Based on the abovementioned literature, the links specified between pre-service teachers' personality and their self-efficacy variables in the current study are presented in Table 2.7.

Table 2.7 Paths between self-efficacy and personality traits variables

Path from	*to*	*to*	*to*
Neuroticism	Student Engagement	Instructional Strategies	Classroom Management
Extraversion	Student Engagement	Instructional Strategies	Classroom Management
Openness	Student Engagement	Instructional Strategies	Classroom Management
Agreeableness	Student Engagement	Instructional Strategies	Classroom Management
Conscientiousness	Student Engagement	Instructional Strategies	Classroom Management

2.6 Relationship between Academic Self-Regulation and Personality Traits

Personality traits may have strong impact on students' motivation, cognition, and behavior in their learning (Costa & McCrae, 1992a). In other words styles of self-regulation are integral aspects of personality (Matthews, Schwean, Campbell, Saklofske, & Mohamed, 2000). The study conducted by Blickle (1996), for example, revealed that Conscientiousness is highly correlated with students' learning discipline, which includes their effort, metacognition, time and study environment management, peer learning and their rehearsal and organization strategy use. Moreover, it was found that Openness is correlated with students' critical thinking, their use of learning strategies leading to deeper understanding of the material such as integrating new knowledge into a network of existing knowledge, and accessing different resources.

In addition, Bidjerano and Dai's study (2007) on 219 undergraduate students' personality and use of self-regulation strategies showed an overlap between personality factors and the set of self-regulatory learning strategies. The learning strategies section of the MSLQ and a brief version of Goldberg's Unipolar Big-Five Markers were administered to assess metacognitive, cognitive, and management skills and the Big-Five personality dimensions, respectively. The results of the canonical correlation analysis indicated that Conscientiousness and Openness are significantly linked to metacognitive and behavioral components of self-regulation including critical thinking skills, metacognition, effort regulation, time management, and elaboration.

Moreover, Komarraju and Karau's (2005) study revealed significant relationships between personality traits and motivational factors. A total of 172 university students (85 male and 87 female) enrolling primarily psychology or business majors participated the study and completed the questionnaires of the Five Factor Inventory (NEO-FFI) and the Academic Motivations Inventory (AMI). According to the results, avoidance which refers feeling discouraged about school, worrying about failure, withdrawing in the classroom, and taking courses for extrinsic reasons was positively related with both Neuroticism and Extraversion, and was negatively related with both Conscientiousness and Openness. Engagement which focuses on enjoying the process of learning and sharing ideas, and seeking knowledge for self-improvement was positively linked to Openness and Extraversion. Lastly, achievement refers putting in effort to excel and enjoying outperforming others was positively related to Neuroticism, Openness, and Conscientiousness. Similarly Judge and Ilies (2002) demonstrated that Extraversion is significantly associated with motivational variables such as goal setting and expectancy beliefs.

Additionally, in their meta-analysis, Payne, Youngcourt, and Beaubien (2007) provided an evidence for the relationship between personality traits and achievement goals. They conducted the meta-analysis examining 469 published and unpublished manuscripts. Results showed that mastery goals were related positively to Conscientiousness (ρ = .32), Extraversion (ρ = .29), Openness to experience (ρ = .44), Agreeableness (ρ = .19), and Emotional stability (ρ = .18). Avoidance performance goals, on the other hand, were reported to be negatively linked to

Conscientiousness ($\rho = -.18$), Extraversion ($\rho = -.30$), Openness to experience ($\rho = .25$), Agreeableness ($\rho = -.19$), and Emotional stability ($\rho = -.37$). Prove performance goals was unrelated to Conscientiousness ($\rho = .03$, with a CI containing zero) Extraversion ($\rho = -.03$, with a CI containing zero), Openness to experience ($\rho = -.06$), and Agreeableness ($\rho = -.07$). However, Emotional stability was negatively related to prove performance goals ($\rho = -.32$). Supporting this finding, Klein and Lee (2006) found that mastery goals positively associated with both Conscientiousness and Openness. Wang and Erdheim (2007) also found that while Extraversion is positively related to mastery approach goals and performance approach goals, Neuroticism is positively linked to performance avoidance goals.

In another study, Heimpel, Elliot, and Wood (2006) surveyed 161 (55 male and 106 female) undergraduates in an introductory level psychology course to examine the link between Neuroticism and Extraversion and personal goals. The participants were administered Eysenck Personality Questionnaire - Revised (EPQ-R). This yes/no questionnaire with 24 items assesed Neuroticism and Extraversion. Personal goals questionnaire (Elliot, Sheldon, & Church, 1997) and Rosenberg's (1965) 10-item measure were also used to obtain data about personal goals and self-esteem of the participants. The results indicated that Neuroticism is related to avoidance goals while Extraversion is not. The impact of Neuroticism occurred in two ways: first, Neuroticism is shown to be positively related directly, and second, indirectly, to avoidance goals through self-esteem.

In sum, the aforementioned studies suggest that there is a significant association between personality traits and different aspects of academic self-regulation. Therefore, as suggested by Bidjerano and Dai (2007), although the theoretical relationship between personality traits and self-regulation has not been well-established, several meaningful associations can be proposed and examined based on previous research. In the present study, it was predicted that Conscientiousness, Agreeableness, and Openness are positively associated with different facets of academic self-regulation, except for avoidance goals and test anxiety. In addition, although it is difficult to justify the link between Extraversion and the cognitive, metacognitive, and behavioral components of self-regulation (Bidjerano & Dai, 2007), a positive association was predicted between Extraversion and peer learning, one of the behavioral component of self-regulation. Neuroticism, on the other hand, was predicted to be negatively linked to different facets of academic self-regulation, except for avoidance goals and test anxiety (see Table 2.8).

Table 2.8 Paths between personality and academic self-regulation variables

Path from	to	to	to	to	to	to	to
Neuroticism	Mastery Approach	Performance Approach	Mastery Avoidance	Performance Avoidance	Metacognitive Self-Regulation	Effort Regulation	Test Anxiety
Extraversion	Mastery Approach	Performance Approach	Mastery Avoidance	Performance Avoidance	Metacognitive Self-Regulation	Effort Regulation	
Openness	Mastery Approach	Performance Approach	Mastery Avoidance	Performance Avoidance	Metacognitive Self-Regulation	Effort Regulation	
Agreeableness	Mastery Approach	Performance Approach	Mastery Avoidance	Performance Avoidance	Metacognitive Self-Regulation	Effort Regulation	
Conscientiousness	Mastery Approach	Performance Approach	Mastery Avoidance	Performance Avoidance	Metacognitive Self-Regulation	Effort Regulation	

CHAPTER III

METHOD

In the previous chapters, purpose and significance of the study were presented and related literature was reviewed accordingly. The present chapter gives information about major characteristics of the population and sample, instruments of the study, procedure, data analysis, threats of internal validity, and assumptions of the study.

3.1 Design of the Study

In the present study, the relationships among senior pre-service science teachers' personality, academic self-regulation, and teaching self-efficacy were investigated. The study is a quantitative research which relies on data from participants' self-reports. The design of the study could be stated as a correlational study.

3.2 Study Context

In order to enroll in the Elementary Science Education (ESE) Program in Turkey, candidates are required to take national exam, the Student Selection Exam, same as for other programs which is held once a year. After this exam, candidates are placed in ESE program in universities based on their scores and ranking.

ESE program intends to prepare teachers for the school of the Ministry of National Education. ESE Program is a 4-year-program which trains science teachers of grades 6 to grade 8. During the 4 year, pre-service science teachers are required to complete coursework, suggested by The Council of Higher Education (YÖK). YÖK changed the required courses of ESE Program in 2006. However, the participants in the study followed the former program which had been restructured for all disciplines by the Higher Education Council (YÖK) in 1998 (YÖK, 1998). This restructured program contains courses in different branches of science, namely biology, physics, and chemistry and several courses related to special subject training and pedagogy. The pedagogical domain includes three field experience courses in which pre-service teachers observe teaching environments and teach in actual classes. Pre-service teachers are supposed to teach for at least 24 hours in the last semester of their teacher education program. In addition, science teaching courses also required pre-service science teachers to do teaching practice in their own classroom.

3.3 Population and Sample

This research was intended to be a national study for one part of it. The population was identified as all pre-service science teachers' in Turkey. The sample is totally 1794 senior pre-service teachers from 27 out of 43 education faculties, which were selected by employing clustered random sampling in terms of the geographical regions. All the senior pre-service teachers were participants in these selected universities.

In terms of the geographical region, participants' distribution is displayed in Table 3.1. The most reached senior pre-service teachers were from Mediterranean Region with 80% whereas the least of those were from Marmara Region with 33.3%.

Table 3.1 Frequency distribution of geographical region of senior pre-service teachers (N=1794)

Geographical Region	Sample frequency (f)	Population frequency (f)	Percentage (%)
Marmara	240	720	33.3 %
Aegean	359	465	77.20 %
Mediterranean	72	90	80 %
Black Sea	365	710	51.41 %
Central Anatolia	359	1040	34.52 %
Eastern Anatolia	338	870	38.85 %
South Eastern Anatolia	61	90	67.78 %
Total	1796	3985	45.02%

As shown in Table 3.2, the majority of the sample consisted of the senior pre-service teachers from Aegean Region (20%), Black Sea Region (20%), and Central Anatolia Region (20%). On the other hand, the senior pre-service science teachers from South Eastern Anatolia Region constituted only 3.4 % of the sample. Although 67.78 % of the pre-service science teachers in the region participated in the study (see Table

3.1), since the population size in the region was low, they contributed to the total sample size less than the participants from other regions. Overall, the number of the participants (45.02%) in the sample is approximately half of the senior pre-service teachers in the population.

Table 3.2 Frequency distribution of geographical region of sample (N=1794)

Geographical region	f	%
Marmara	240	13.4 %
Aegean	359	20.0 %
Mediterranean	72	4.0 %
Black Sea	365	20.0 %
Central Anatolia	359	20.0 %
Eastern Anatolia	338	18.8 %
South Eastern Anatolia	61	3.4 %
Missing	0	

In addition, detailed information about the characteristics of the participants and educational level of their parents were presented in Table 3.3. Approximately equal numbers of males (49.2%) and females (50.8%) participated in the study. Participants' average GPA is 2.70 out of 4 and the majority of them are 22 years old. Most of their parents were primary school graduates.

Table 3.3 Characteristics of the sample

Variable	*f*	*%*
Gender		
Male	876	49.2 %
Female	905	50.8 %
Missing	13	
Mother Education Level		
Illiterate	287	16.1%
Primary School	958	53.7%
Middle School	181	10.1%
High School	257	14.4%
College	99	5.5%
Masters Degree	2	0.1%
PhD Degree	0	0
Missing	10	
Father Education Level		
Illiterate	61	3.4%
Primary School	620	34.9%
Middle School	254	14.3%
High School	434	24.4%
College	388	21.8%
Masters Degree	14	0.8%
PhD Degree	5	0.3%
Missing	18	

3.4 Data Collection Instruments

This study used the following five instruments: the Demographics Questionnaire, the Teachers' Sense of Efficacy Scale (TSES), the Achievement Goal Questionnaire (AGQ), the Motivated Strategies for Learning Questionnaire (MSLQ), and the NEO-Five Factor Inventory (NEO-FFI) (see Table 3.4).

Table 3.4 Data Collection Instruments and Variables Assessed

Instruments	Variables
Demographics Questionnaire	University
	Gender
	Educational Level
	Age
	GPA
TSES (Tschannen-Moran & Hoy, 2001)	Student engagement
	Instructional strategies
	Classroom management
AGQ (Elliot & McGregor, 2001)	Mastery approach
	Performance approach
	Mastery avoidance
	Performance avoidance

Table 3.4 (Continued)

Instruments	Variables
MSLQ (Pintrich et al., 1991)	Task value
	Control of learning beliefs
	Test anxiety
	Effort regulation
	Peer learning
	Metacognitive self-regulation
NEO-FFI (Costa & McCrae, 1991b)	Neuroticism
	Extraversion
	Openness
	Agreeableness
	Conscientiousness

3.4.1 Demographics Questionnaire

The Demographics Questionnaire is a self-developed instrument that assesses gender, age, socioeconomic status, and geographical regions.

3.4.2 The Teachers' Sense of Efficacy Scale

Teachers' Sense of Efficacy Scale (TSES), also known as the Ohio State Teacher Efficacy Scale, was used to measure science teaching self-efficacy of senior pre-service science teachers. TSES, a nine-point likert scale ranging from "1 = nothing"

to "9 = a great deal", was developed by Tschannen-Moran and Hoy (2001) in four steps.

In the first step, Tschannen-Moran and Woolfolk Hoy (2001) gathered totally 52 items by using some items of Bandura's scale and adding new items. This 52-item scale was tested on a sample of 224 participants, including 146 pre-service teachers (124 female and 22 male) and 78 in-service teachers (43 female and 35 male). In the second step, they extracted the items with the low factor loadings that the scale was reduced to 32 items. In the third step, the researchers conducted study with 217 participants including 70 pre-service teachers (49 female, 20 male 1 no indication) and 147 in-service teachers (94 female, 53 male) and 3 unknown. Similar to the second step, they reduced the 32-item scale to 18 items with three factors by removing low loaded items. These three factors were labeled as self-efficacy for student engagement (8 items), self-efficacy for instructional strategies (7 items), and self-efficacy for classroom management (3 items). Because the 18-item scale was found weak, in the final step first new items were added up to 36 items then this scale was tested on a sample of 410 participants including 103 pre-service teachers (84 female, 15 male) and 255 in-service teachers (170 female, 84 male, 1 no indication), and 38 unknown. Finally, the scale was developed with 24 items in three sub-scales, namely self-efficacy for student engagement (8 items), self-efficacy for instructional strategies (8 items), and self-efficacy for classroom management (8 items). Intercorrelations between the subscales of instruction, management, and

engagement were .60, .70, and .58. Reliabilities for the teacher efficacy subscales were .87 for engagement, .91 for instruction, and .90 for management.

The TSES was translated and adapted into Turkish by Capa, Cakiroglu, and Sarikaya (2005). The validation study was conducted with 628 (439 females and 189 males) pre-service teachers from six different universities located in four major cities in Turkey. Confirmatory factor analysis (CFA) and Rasch measurement were carried out. CFA indicated a good fit (TLI = .99, CFI = .99, RMSEA = .065). The Cronbach alphas for Turkish version of this instrument (TTSES) were .82 for student engagement, .86 for instructional strategies, and .84 for classroom management. For the whole scale, the reliability of self-efficacy scores was .93.

The components of the scale represent the richness of teachers' work and the requirements for effective teaching (Tschannen-Moran & Woolfolk Hoy, 2001). More specifically, self-efficacy for student engagement reflects teachers' beliefs about their ability to engage of all students. Self-efficacy for instructional strategies refers to teachers' beliefs about their ability to apply many of the instructional strategies. Self-efficacy for classroom management refers to teachers' beliefs about their ability to manage classroom effectively. Table 3.5 presents the descriptions of each dimension and their internal consistencies.

Table 3.5 Descriptions of the subscale of the TTSES with sample items

Subscales	Description	Sample item	n of items	Cronbach alphas (Tschannen-Moran & Woolfolk Hoy, 1991)	Cronbach alphas (Capa et al., 2005)	Cronbach alphas (present study)
Student engagement	Engaging all students	How much can you do to get students to believe they can do well in schoolwork?	8	.87	.82	.83
Instructional strategies	Applying many of the instructional strategies	To what extent can you use a variety of assessment strategies?	8	.91	.86	.87
Classroom management	Managing classroom effectively	How much can do to control disruptive behavior in the classroom?	8	. 90	.84	.84

In order to validate factor structure of the TTSES for the present study, confirmatory factor analysis was conducted The fit statistics revealed a good data fit (RMSEA = .07, GFI = .90, CFI = .89). Lambda-ksi estimates for the latent factors of TTSES in this study are presented in Table 3.6.

Table 3.6 Lambda ksi Estimates for TTSES

	Indicator	Present study LX estimate
Self-efficacy for student engagement	q1	.66
	q2	.61
	q4	.67
	q6	.65
	q9	.66
	q12	68
	q14	
	q22	
Self-efficacy for instructional strategies	q7	
	q10	.66
	q11	.67
	q17	.66
	q18	.68
	q20	.71
	q23	.73
	q24	.69

Table 3.6 (Continued)

	Indicator	Present study LX estimate
	q3	.68
	q5	.50
	q8	.61
Self-efficacy for classroom management	q13	.65
	q15	.75
	q16	.70
	q19	.74
	q21	.69

3.4.3 The Achievement Goal Questionnaire

The Achievement Goal Questionnaire (AGQ), as a five point likert scale from "5 = strongly agree" to "1 = strongly disagree", was used to assess senior pre-service science teachers' achievement goals. The AGQ was developed by Elliot and McGregor (2001) based on the 2 X 2 achievement goal framework. It consists of 15 items in four sub-scales namely, mastery approach goals (3 items), performance approach goals (3 items), mastery avoidance goals (3 items), and performance avoidance goals (6 items). While mastery approach goals emphasize learning and understanding (e.g. "It is important for me to understand the content of this course as thoroughly as possible"), performance approach goals focus on showing abilities to others (e.g. "It is important for me to do better than other students"). Mastery

avoidance goals, on the other hand, are characterized by intention to avoid misunderstanding and making mistakes (e.g. "I worry that I may not learn all that I possibly could in this class"). In contrast to mastery avoidance goals, performance avoidance goals are characterized by striving to avoid failure relative to others (e.g My goal for this class is to avoid performing poorly).

During the development of the questionnaire, Elliot and McGregor (2001) tested the AGO with a sample of 180 (49 male and 131 female) undergraduate students. Internal consistency reliabilities of this sample were .87 for mastery approach, .92 for performance approach, .89 for mastery avoidance, and .83 for performance avoidance. In order to assess the fit of the data, confirmatory factor analyses were conducted. The results indicated that the data fit the model (RMSEA = .04, TLI = .99, CFI = .99).

The instrument was translated and adapted into Turkish by Senler and Sungur (2007). The validation study was conducted with 616 middle school students. The coefficient alpha values for the Turkish sample were found to be .81 for mastery approach goals, .69 for performance approach goals, 65 for mastery avoidance goals, and .64 for performance avoidance goals. The result of the confirmatory factor analysis supported the four factor structure of the instrument (GFI = .92, CFI = .92, NFI = .90, SRMR = .07). Table 3.7 presents the descriptions of each subscale and their internal consistencies.

Table 3.7 Descriptions of the subscale of the AGQ with sample items

Subscales	Description	Sample item	n of items	Cronbach alphas (Elliot & McGregor, 2001)	Cronbach alphas (Senler & Sungur, 2007)	Cronbach alphas (present study)
Mastery approach	Approaching success for own her/his sake	I want to learn as much as possible from this class.	3	.87	.81	.74
Performance approach	Approaching success for normative standards	My goal in this class is to get a better grade than most of the other students.	3	.92	.69	.77
Mastery avoidance	Avoiding failure for own her/his sake	I worry that I may not learn all that I possibly could in this class.	3	.99	.65	.73
Performance avoidance	Avoiding failure for normative standards	My goal in this class is to avoid performing poorly.	6	.83	.64	.70

In order to validate the factor structure for the present study, Confirmatory Factor Analysis was conducted. The results showed a good model fit (RMSEA = .09 , GFI = .91, CFI = .90). Lambda-ksi estimates for the latent factors of AGQ in this study are presented in Table 3.8.

Table 3.8 Lambda ksi Estimates for AGQ

	Indicator	Present study LX estimate
Mastery approach	q1	.67
	q6	.82
	q8	.86
Performance approach	q4	.70
	q10	.80
	q16	.83
Mastery avoidance	q11	.71
	q14	.73
	q17	.73
Performance avoidance	q2	.61
	q7	.73
	q13	.73

3.4.4 The Motivated Strategies for Learning Questionnaire

All components of academic self-regulation except for achievement goals were assessed by Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1991). It is a self-report questionnaire, on a 7-point likert-type scale (1 = not at all true of me to 7 = very true of me).

The MSLQ is comprised of 81 items grouped into two sections: motivation section and learning strategies section. Motivation section consists of six subscales namely Intrinsic Goal Orientation, Extrinsic Goal Orientation, Task Value, Control of Learning Beliefs, Self-Efficacy for Learning and Performance, and Test Anxiety. Learning Strategies section, on the other hand, includes nine subscales which are Rehearsal, Elaboration, Organization, Critical Thinking, Metacognitive Self-Regulation, Time and Study Environment Management, Effort Regulation, Peer Learning, and Help Seeking.

Reliability and validity of MSLQ were investigated with a sample of 380 college students from different majors by Pintrich, Smith, Garcia and McKeachie (1993). The reliability coefficients were found to ranging from .62 to .93 on the Motivation section and from 52 to .80 for the Learning Strategies section. Confirmatory factor analysis indicated reasonable model fit for motivation section ($\chi^2/df = 3.49$, GFI = .77, AGFI = .73 RMR = .07) as well as for learning strategies section ($\chi^2/df = 2.26$, GFI = .78, AGFI = .75 RMR = .08).

The MSLQ was translated and adapted into Turkish by Sungur (2004). This form of the questionnaire was examined with 488 (183 female and 254 male) students enrolled in state schools. The Cronbach alphas were, between .54 and .89 for motivation section and between .57 and .81 for learning strategies section. Considering the values of the original questionnaire, the fit indices were found reasonable for motivation section (χ^2/df = 5.3, GFI = .77, RMR = .11) and learning strategies section (χ^2/df = 4.5, GFI = .71, RMR = .08).

In this study, Task Value, Control of Learning Beliefs, Test Anxiety, Effort Regulation, Peer Learning, and Metacognitive Self-Regulation subscales of the MSLQ were used for the specified purpose. The nine sub-scales were not used for the following reasons: Firstly, sub-scales assessing achievement goals do not make a distinction between approach and avoidance goals. Since recent research suggests making such a distinction, an additional instrument was used to assess pre-service science teachers' achievement goals. Secondly, the metacognitive self-regulation sub-scale of the MSLQ is comprehensive enough to measure the cognitive component of self-regulated learning. Considering this fact and complexity of the proposed conceptual model, other sub-scales of the MSLQ related to learning strategies were not included in the study. Finally, some of the sub-scale scores (e.g. help seeking) intended to be used were removed from analysis due to low reliability coefficients and poor data fit. Tablo 3.9 presents the descriptions of each subscale and their internal consistencies.

Table 3.9 Descriptions of the subscale of the MSLQ with sample items

Subscales	Description	Sample item	n of items	Cronbach alphas (Pintrich et al., 1991)	Cronbach alphas (Sungur, 2004)	Cronbach alphas (present study)
Metacognitive self-regulation	Planning, monitoring, and regulating activities	When I become confused about something I'm reading for this class, I go back and try to figure it out.	12	.79	.81	.77
Effort regulation	Resource of management	I work hard to do well in the classes even if I don't like what we are doing.	4	.69	.62	.57
Peer learning	Resource of management	I try to work with other students from this class to complete the courses' assignments.	3	.76	.61	.56

Table 3.9 (Continued)

Subscales	Description	Sample item	n of items	Cronbach alphas (Pintrich et al., 1991)	Cronbach alphas (Sungur, 2004)	Cronbach alphas (present study)
Task value	Value beliefs for a course	It is important for me to learn the course material in the classes.	6	.90	.87	.84
Control of learning beliefs	Beliefs about her/his skill to succeed in a course	It is my own fault if I don't learn the material in the classes.	4	.68	.62	.60
Test anxiety	Anxiety about tests in a course	When I take a test I think about items on other parts of the test I can't answer.	5	.80	.62	.63

The factor validity for the motivation section of present study was examined by Confirmatory Factor Analysis. The results displayed a good fit (RMSEA = .07, GFI = .94, CFI = .91). Lambda-ksi estimates for the latent factors of motivation section in this study are presented in Table 3.10.

Table 3.10 Lambda ksi estimates for learning strategies

	Indicator	Present study LX estimate
Task value	q3	.61
	q6	.79
	q8	.66
	q11	.80
	q13	.65
	q14	.85
Control of learning beliefs	q1	.66
	q5	.27
	q9	.68
	q12	.39
Test anxiety	q2	.51
	q4	.57
	q7	.65
	q10	.32
	q15	.44

The factor validity for the learning strategies section of present study was also examined by Confirmatory Factor Analysis. The results displayed a good fit (RMSEA = .08, GFI = .92, CFI = .90). Lambda-ksi estimates for the latent factors of motivation section in this study are presented in Table 3.11.

Table 3.11 Lambda ksi estimates for learning strategies

	Indicator	Present study LX estimate
	q16	.12
	q18	.54
	q20	-.20
	q21	.67
	q25	.61
	q26	.60
Metacognitive self –regulation	q27	.69
	q28	.48
	q30	.05
	q32	.45
	q33	.64
	q34	.56
	q19	.62
Effort regulation	q23	.18
	q29	.62
	q31	.29

Table 3.11 (Continued)

	Indicator	Present study LX estimate
	q17	.97
Peer learning	q22	.87
	q24	.46

3.4.5 The NEO Five-Factor Inventory

In this research in order to measure students' personality traits, NEO Five-Factor Inventory (NEO-FFI), a five point likert scale from "5 = strongly agree" to "1 = strongly disagree" was used. Costa and McCrae (1991b) developed this scale as a short form of the NEO Personality Inventory (NEO-PI). During the development of the inventory, the sample of 983 participants of the NEO-PI provided data for item selection. All 180 items of NEO-PI were factored and five principal components were extracted. The item factors were rotated by validimax method. After eliminating items with joint loadings, 60 items remained with five dimensions, which are neuroticism (N), extraversion (E), openness (O), agreeableness (A), and conscientiousness (C). Costa and McCrae (1991a,b) described these five dimensions as follows:

Neuroticism (N) refers to the tendency of an individual to experience unpleasant emotional instability and to have corresponding disturbances in thoughts and actions.

The facets for this domain are Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability.

Extraversion (E) refers to differences in preference for social behavior and lively activity. Characteristics of extraverts include being sociable, gregarious, and outgoing; preferring large groups of people; being active; liking excitement; and being optimistic. The facets for this domain are Warmth, Gregariousness, Assertiveness, Activity, Excitement-Seeking, and Positive Emotions.

Openness (O) involves displaying an active imagination, aesthetic sensitivity, consideration of inner feeling, a preference for variety, intellectual curiosity, and independence of judgment. The facets for this domain are Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values.

Agreeableness (A) is characterized by interpersonal tendencies, including eagerness to help others, altruism, sympathy, and a belief that others will be helpful in return. The facets for this domain are Trust, Straightforwardness, Altruism, Compliance, Modesty, and Tender-Mindedness.

Conscientiousness (C) is an individual's ability to control impulses, plan and organize active processes, carry out tasks, and be harder-working than other people. The facets of this domain are Competence, Order, Dutifulness, Achievement, Self-Discipline, and Deliberation.

The coefficient alphas for the five factors were .90, .78, .76, .86, and .90 respectively (Costa & McCrae, 1992a). The scale was translated and adapted into Turkish as

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NEO-FFI-TR by Gulgoz (2002). Tablo 3.12 presents the descriptions of each subscale and their internal consistencies.

Table 3.12 Descriptions of the dimensions of the NEO-FFI-TR

Dimensions	Description	Sample item	n of items	Cronbach Alphas (Costa & McCrae, 1992a)[*]
Neuroticism (N)	Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability	I often feel inferior to others	12	.90
Extraversion (E)	Warmth, Gregariousness, Assertiveness, Activity, Excitement-Seeking, and Positive Emotions	I like to have a lot of people around me	12	.78
Openness (O)	Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values	I am intigruted by the patterns I find in art and nature.	12	.76
Agreeableness (A)	Trust, Straightforwardness, Altruism, Compliance, Modesty, and Tender-Mindedness	I try to be courteous to everyone I meet.	12	86
Conscientiousness (C)	Competence, Order, Dutifulness, Achievement, Self-Discipline, and Deliberation	I keep my things clean and proper	12	.90

[*] For further information about the items and psychometric properties of the NEO-FFI-TR and reliability coefficients for the present study please contact to Prof.Dr. Sami Gulgoz.

3.5 Procedure

In this study, the relationship among pre-service science teachers' self-efficacy, academic self-regulation, and personality traits were investigated. Initially, this study began with the literature review in line with the specified purpose. Educational Resources Information Center (ERIC), Ebscohost, Science Direct, Kluweronline, International Dissertations Abstracts databases and and other studies done in Turkey were searched by the help of a keyword list. Afterwards, the participant universities of the study were determined, the permission was granted for the study from the Ethics Committee and the universities.

An optical form was designed in order to administer the instruments and enter the data easily and precisely. The entire data were collected with these optical forms prepared by a private firm. Data collection was carried out during the fall semester in the 2008-2009 educational year.

Before the administration of the instruments, participants were informed about the purpose of the study and the directions and the necessary information were explained. Then, only volunteer senior pre-service science teachers were included in the study. Additionally, they were informed that there was no harm or deception to the participants, and confidentiality of research data was ensured. These were expected to reduce the violation of participants' rights. The senior pre-service science teachers volunteered to participate in the study were especially be informed that their names will not be revealed anywhere. They were also informed about the

procedure of the research, and given the chance to withdraw from the study at any time they feel discomfort. The participants were asked to sign the consent form which presents that they participated in the study voluntarily. Moreover, they were given chocolate bar as a symbol of appreciation.

A class hour was given to the participants to provide their answers. After the data collection procedure, data entry was made by the firm who prepared the optical forms. The data was given to the researcher as an Excel file.

3.6 Threats of Internal Validity

Internal validity is the degree to which any relationship observed between the variables is related and is not due to other variables external to the study. Threats that could affect the internal validity of this study include subject characteristics, location, instrumentation, testing, and mortality (Fraenkel & Wallen, 2003).

In this study, since the observed relationships among two or more characteristics of the subjects was not occurred due to other characteristics of the subjects, subject characteristics threat was not a problem. Location was not considered to have an impact on the study because the instrument was administrated to the participants in their own classroom with similar testing condition. Although, the instrument was lengthy, all scorings were done by optical mark reader machine so instrument decay was not a threat for the present study. Also, the instrument contained objective type self-report items that data collector bias threat was not a concern. However, the data were obtained by different data collectors, so the seriousness with which participants

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responded to the items might be affected by data collector characteristics. This study was cross-sectional and missing data analysis was done for the missing values. Therefore, mortality and as well as testing are not considered to be a threat for the present study.

3.7 Data Analysis

The data obtained from the study were analyzed in two main sections. The first section included statistical analysis with preliminary analysis, descriptive statistics, and inferential statistics. SPSS 15.0 and LISREL 8.3 (Jöreskog & Sörbom, 1999) for Windows with SIMPLIS command language were used to compute all statistical data. SPSS 15.0 was utilized for preliminary data analysis, descriptive statistics, and inferential statistics involving repeated analysis of variances, and LISREL 8.3 was used for inferential statistics involving confirmatory factor analyses and path analysis.

3.7.1 Preliminary Data Analysis

In order to ensure the dataset was appropriate for the analyses, preliminary data analysis was conducted. Preliminary data analysis including missing data analysis, outliers and normality check were performed by SPSS 15.0.

3.7.1.1 Missing Data Analysis

The analyses result can be affected by the presence of the missing data values. Missing data mean that there is no value for variables in a study. Missing data occur by two ways, namely, systematic and random. They can be handled data deletion methods (listwise deletion and pairwise deletion) and imputation methods (mean imputation, regression imputation hot or cold deck imputation, expectation-maximization (EM), and multiple imputations). If the percentage of missing values is less than or equal to 5% of the whole data, the missing values have no serious effect on the results that any handling method data can be used (Tabachnick & Fidell, 2001).

3.7.1.2 Outliers

Outliers influence data interpretation and the model significance that it is important to check outliers. Outliers refer the values which are extremely large or small compared with the rest of the data. Outliers can be detected by z-score, standardized residual, Leverage values, and Mahalonobis distance. Any z-score $> \pm 3.29$ and any standardized residual greater than 3.3 are unusual and named as an outlier (Tabachnick & Fidell, 2001; Stevens, 2002). Also, any Leverage value greater than $3p/n$, where $p=k+1$ and k is the number of predictors, may be considered as unusual and called as an outlier. In addition, whether the outliers influence the other values or not are determined by using Cook's distance. Cook's distance greater than 1 means outliers affect the result (Cook & Weisberg, 1982 as cited in Stevens, 2002).

3.7.1.3 Normality

Multivariate normality is required by SEM. Since chi-square fit index is very sensitive of the normality, it should be checked prior to the inferential statistics. However, there is no statistical test for examining multivariate normality that univariate and bivariate normality are assessed to test multivariate normality. As a rule of thumb, Skewnness and Kurtosis values within the range of [+1, -1] indicate univariate normal distribution. However Skewnness and Kurtosis values between +2 and -2 are also considered to be acceptable for normal distribution (George & Mallery, 2003).

3.7.2 Descriptive Statistics

In order to give an overview of the study, after preliminary analysis, descriptive statistics was examined by utilizing SPSS 15.0. Descriptive statistics provided a profile of participants on all variables with respect to means, standard deviations, minimum and maximum values were described.

3.7.3 Inferential Statistics

3.7.3.1 One-way Repeated Measure ANOVA

One-way Repeated Measure ANOVAs were conducted to examine mean differences in the level of pre-service science teachers' science teaching efficacy, achievement

goals, and personality by using SPSS 15.0. Before running the analyses, assumptions of One-way Repeated Measures ANOVA were checked.

3.7.3.2 Path Analysis

Path Analysis was run as another inferential statistics in order to examine the patterns of relationships among variables by using LISREL 8.3 for Window with SIMPLIS command language. Path analysis determines effects among numerous variables which are based on logic, theory, and experience.

3.7.3.2.1 Definitions of Terms

For clarification, definitions of some useful terms regarding path analysis were given below.

Path diagram: Path diagram is a visual portrayal of relations among the variables (Byrne, 1998). The relations (i.e. effects) between variables are represented by arrows. Direct effect is represented by a straight line with a single arrow-head. Bivariate correlation between two variables is represented by a curved line with two arrowheads. Finally, indirect effect occurs when a variable intervenes between the effect of two variables (Mertler & Vannatta, 2002).

Observed, Measured, or Indicator Variable: Observed variables are the variables that are directly observed or measured (Schumacker & Lomax, 1996).

Direct Effect: It is defined as the effect between two latent variables when a single directed line and arrow connects them. Direct effect is measured by a structure coefficient (Schumacker & Lomax, 1996).

Indirect Effect: It is defined as the effect between two latent variables when no single straight line or arrow directly connects them but when the first latent variable is reached from the second latent variable through one or more other latent variables via their paths (Schumacker & Lomax, 1996).

3.7.3.2.2 The Goodness-of-Fit Criteria for Path Analysis

Model fit indices indicate the degree to which model fits the sample data (Schumacker & Lomax, 1996). There are several fit indexes that have been used. The commonly used fit indexes and their interpretations were given below. These model fit indexes and their acceptable fit interpretation were also presented in Table 3.13.

Chi-Square (χ_2): A nonsignificant χ^2 value implies that there is a non-significant difference between the observed and estimated variance-covariance matrices. A nonsignificant χ^2 refers the model fits the data by comparing obtained $\chi2$ value with tabled value for given df (Schumacker & Lomax, 1996).

The Standardized Root-Mean-Square Residual (SRMR): The Standardized Root-Mean-Square Residual (SRMR) measures the mean absolute correlation residual as well as the overall difference between the observed and predicted correlations (Kline, 2005).

Goodness-of-Fit (GFI) and Adjusted Goodness-of-Fit (GFI): Goodness-of-fit (GFI) is a ratio of the sum of the squared differences between the observed and reproduced matrices to the observed variance. The AGFI adjusts the GFI index for the degrees of freedom of a model based on the number of variables (Schumacker & Lomax, 1996).

Root Mean Square Error of Approximation (RMSEA): Root Mean Square Error of Approximation (RMSEA) measures the error of approximation which refers the difference between the fit of the model to sample covariance matrix and to the population covariance matrix (Kline, 2005).

Comparative Fit Index (CFI): Comparative Fit Index (CFI) compares the fit of the specified model to other models (Kline, 2005).

Normed Fit Index (NFI) and Nonnormed Fit Index (NNFI): Normed Fit Index (NFI) implies how well the specified model improves fit to the null model in which there is no relation between the observed variables (Kline, 2005).

Table 3.13 Model fit criteria and accepted fit interpretation

Model fit criterion	Acceptable level	Interpretation
Chi-square	Tabled χ2 value	Compares obtained χ2 value with tabled value for given df
Goodness-of-fit index (GFI)	0 (no fit) to 1 (perfect fit)	Value close to .90 reflects a good fit
Normal Fit Index (NFI)	0 (no fit) to 1 (perfect fit)	Value close to .90 reflects a good fit
Root mean square error of approximation (RMSEA)	0 (no fit) to 0.1 (fair fit)	Value close to .06 reflects a good fit
Comparative Fit Index (CFI)	0 (no fit) to 1 (perfect fit)	Value close to .95 reflects a good fit
Standardized root mean square residual (SRMR)	0 (perfect fit) to 1 (no fit)	Value close to .08 reflects a good fit

Source: Schumacker & Lomax, 1996, p. 121

3.8 Assumptions

1. All conditions were standard during the administration of instruments.

2. Students filled out the instruments sincerely and seriously.

3. Students did not interact with each other during the administration of instruments.

4. The characteristics of sample of the study were assumed to be representative of the population.

CHAPTER IV

RESULTS

This chapter is devoted to present the results of preliminary analysis, the descriptive and the inferential statistics. Missing values, outliers, and normality were checked at the preliminary analysis part. The participants' characteristics and variables were examined descriptively in descriptive statistics part. Finally, in the inferential statistics part the hypothesized model was tested and explained.

4.1 Preliminary Data Analysis

4.1.1 Missing Data Analysis

Because missing values may reduce the precision of statistics, all of the items were checked to identify the missing data percentages in missing data analysis. The missing data values ranged from 0 percent to 2.5 percent. Since missing values are less than 5%, mean imputation method was used. All missing values were replaced by the series mean of the items.

4.1.2 Outliers

The data set in the current study was examined with respect to outliers and influential data points. Table 4.1 presents standardized residuals descriptive statistics.

Table 4.1 Residuals statistics

		Max	*Min*	*M*	*SD*
SEST	Standardized Residual	-5.72	3.88	.00	.99
	Cook's Distance	.00	.08	.00	.00
	Centered Leverage Value	.00	.05	.01	.01
SEINS	Standardized Residual	-5.63	4.09	.00	.99
	Cook's Distance	.00	.07	.00	.00
	Centered Leverage Value	.00	.05	.01	.01
SECM	Standardized Residual	-4.17	2.74	.00	1.00
	Cook's Distance	.00	.02	.00	.00
	Centered Leverage Value	.00	.05	.01	.01
MA	Standardized Residual	-5.28	3.18	.00	1.00
	Cook's Distance	.00	.03	.00	.00
	Centered Leverage Value	.00	.03	.01	.00
PA	Standardized Residual	-2.86	2.38	.00	1.00
	Cook's Distance	.00	.02	.00	.00
	Centered Leverage Value	.00	.03	.00	.00
MV	Standardized Residual	-2.78	3.08	.00	1.00
	Cook's Distance	.00	.02	.00	.00
	Centered Leverage Value	.00	.03	.00	.00
PV	Standardized Residual	-2.15	2.97	.00	1.00
	Cook's Distance	.00	.02	.00	.00
	Centered Leverage Value	.00	.03	.00	.00
TAX	Standardized Residual	-3.07	2.87	.00	1.00
	Cook's Distance	.00	.01	.00	.00
	Centered Leverage Value	.00	.01	.00	.00

Table 4.1 (Continued)

		Max	*Min*	*M*	*SD*
META	Standardized Residual	-4.11	3.89	.00	1.00
	Cook's Distance	.00	.03	.00	.00
	Centered Leverage Value	.00	.04	.01	.01
ER	Standardized Residual	-3.57	4.39	.00	1.00
	Cook's Distance	.00	.04	.00	.00
	Centered Leverage Value	.00	.04	.01	.00

The range of standardized residuals were greater than 3.3 for self-efficacy of student engagement, self-efficacy of instructional strategies, self-efficacy of classroom management, mastery approach, metacognitive self-regulation, and effort regulation that there were identifiable outliers in these variables. However, considering the sample size, it is typical for few outliers to appear without distorting the data (Pallant, 2001).

The outliers for the variables were checked by using Leverage values. For the current study, any Leverage value greater than 3p/n, where p = k +1 and k is the number of predictors, was considered as an outlier. The maximum Leverage values of abovementioned variables were greater than 3p/n, which indicated the presence of outliers.

In order to check whether these outliers were influential or not, Cook's distances were checked. As presented in Table 4.1 the entire Cook's distances were less than 1.

Thus, the outliers on the variables were not influential and they could be retained in the analysis.

4.1.3 Normality

Univariate normality was checked by the values of Skewness and Kurtosis. As Table 4.2 displays all variables except for student engagement, instructional strategies, classroom management, task value, metacognitive self-regulation, and control of learning beliefs, have Skewness and Kurtosis values between -1 and 1, hence can be considered as normally distributed. The Skewness and Kurtosis values for the abovementioned six variables were within -2 and +2 which is also considered to be acceptable for normal distribution (George & Mallery, 2003).

Table 4.2 Univariate normality statistics

	Skewness		Kurtosis	
	Statistic	*Std. error*	*Statistic*	*Std. error*
N	.04	.06	.31	.12
E	.15	.06	.28	.12
O	-.05	.06	.09	.12
A	.05	.06	.12	.12
C	.32	.06	.30	.12
SEST	-.62	.06	1.56	.12
SEINS	-.68	.06	1.49	.12
SECM	-.61	.06	1.21	.12
MA	-.88	.06	.65	.12
PA	-.25	.06	-.49	.12
MV	.10	.06	-.43	.12
PV	.15	.06	-.66	.12
TV	-1.01	.06	1.35	.12
CLB	-.83	.06	1.48	.12
TAX	-.22	.06	-.10	.12
META	-.64	.06	1.08	.12
ER	-.36	.06	.16	.12
PL	-.36	.06	-.21	.12
N-E	-.07	.06	.55	.12
N-O	.18	.06	.48	.12
N-A	.02	.06	.48	.12
N-C	-.04	.06	.27	.12
E-O	.18	.06	.36	.12
E-A	.00	.06	.47	.12
E-C	-.09	.06	.89	.12

Table 4.2 (Continued)

	Skewness		Kurtosis	
	Statistic	*Std. error*	*Statistic*	*Std. error*
O-A	-.13	.06	.51	.12
O-C	-.24	.06	.29	.12
A-C	-.05	.06	.77	.12
SEST-SEINS	.27	.06	1.63	.12
SEST-SECM	-.18	.06	2.21	.12
SEINS-SECM	-.19	.06	1.96	.12
MA-PA	.28	.06	.19	.12
MA-MV	.05	.06	.08	.12
MA-PV	-.13	.06	-.39	.12
PA-MV	-.13	.06	.28	.12
PA-PV	.20	.06	.59	.12
MV-PV	.25	.06	.42	.18

4.1.4 Effect Size

Effect size refers the proportion of error variance in the dependent variable accounted for by the independent variables (Russell & Purcell, 2009). There are different calculations to determine effect size based on the type of statistical method used. Eta squared (η^2), Cohen's d, and R^2 are the more common calculations for effect size.

Multiple correlation indices namely a multiple correlation (R), a squared multiple correlation (R^2), and an adjusted squared multiple correlation (R^2_{adj}), assess the

overall effect of the predictors on the criterion. In other words, all three indices assess how well the linear combination of predictors in the regression analysis predicted the criterion variable. The multiple correlation is a Pearson product-moment correlation coefficient between the predicted criterion scores and the actual criterion scores (Green, Salkind, & Akey, 2000). Correlations range from 0 to 1 where 0 indicates no correlation and 1 indicates a perfect correlation. According to Cohen's (1977) classification of effect sizes, 0.01 refers small, 0.09 refers medium and 0.25 or greater refers large effect size (Weinfurt, 1995). Table 4.13 displays the effect sizes of the study.

4.2 Descriptive Statistics

Descriptive statistics for the variables of the current study which are the subscale scores of Teachers' Sense of Self-efficacy Scale, Achievement Goal Questionnaire, Motivated Strategies for Learning Questionnaire, and NEO-FFI were displayed in the following four sections.

4.2.1 Descriptive Statistics for Pre-Service Science Teachers' Self-Efficacy

As displayed in Table 4.3 senior pre-service science teachers had high levels of self-efficacy with the mean scores ranging from 5.96 to 6.10 on a nine-point scale. The highest mean score was obtained on self-efficacy for instructional strategies *(M =* 6.10*, SD =* .89). This finding implied that pre-service science teachers believed that they can use appropriate instructional strategies effectively in their classes. The high

mean score on self-efficacy for classroom management *(M = 6.07, SD = .90)* also revealed that their judgment about their ability to manage student conduct and classroom behavior is high. Although, the mean score was lowest on the teaching self-efficacy for student engagement *(M = 5.96, SD = .87)*, it was still above the mid-point of nine-point scale implying that pre-service science teachers had also high levels of self-efficacy to engage their students in science learning.

Table 4.3 Descriptive statistics for teacher self-efficacy

	M	*SD*	*Min.*	*Max.*
Student Engagement (SEST)	5.96	.87	1.33	8.00
Instructional Strategies (SEINST)	6.10	.89	1.56	8.00
Classroom Management (SECM)	6.07	.90	1.44	8.00

In order to get a clear picture of pre-service science teachers' self-efficacy, their responses to the individual items in the TSES was also examined and presented in Table 4.4.

Table 4.4 Descriptive statistics for teacher self-efficacy items score

Sub-scale	Statement	*M*	*SD*
SEST	1. How much can you do to get through to the most difficult student?	6.13	1.49
SEST	2. How much can you do to help your students think critically?	6.53	1.45
SECM	3. How much can you do to control disruptive behavior in the classroom?	6.82	1.49
SEST	4. How much can you do to motivate students who show low interest in school work?	6.80	1.42
SECM	5. To what extent can you make your expectations clear about student behavior?	7.08	1.49
SEST	6. How much can you do to get students to believe they can do well in school work?	7.23	1.47
SEINS	7. How well can you respond to difficult questions from your students?	6.66	1.43
SECM	8. How well can you establish routines to keep activities running smoothly?	6.91	1.34
SEST	9. How much can you do to help your students value learning?	6.84	1.37
SEINS	10. How much can you gauge student comprehension of what you have taught?	7.13	1.37
SEINS	11. To what extent can you craft good questions for your students?	7.02	1.41
SEST	12. How much can you do to foster student creativity?	6.71	1.50
SECM	13. How much can you do to get children to follow classroom rules?	7.04	1.39
SEST	14. How much can you do to improve the understanding of a student who is failing?	6.58	1.37
SECM	15. How much can you do to calm a student who is disruptive or noisy?	6.79	1.48
SECM	16. How well can you establish a classroom management system with each group of students?	6.45	1.41

Table 4.4 (Continued)

Sub-scale	Statement	*M*	*SD*
SEINS	17. How much can you do to adjust your lessons to the proper level for individual students?	6.33	1.44
SEINS	18. How much can you use a variety of assessment strategies?	6.94	1.47
SECM	19. How well can you keep a few problem students from ruining an entire lesson?	6.68	1.51
SEINS	20. To what extent can you provide an alternative explanation or example when students are confused?	6.97	1.39
SECM	21. How well can you respond to defiant students?	6.81	1.59
SEST	22. How much can you assist families in helping their children do well in school?	6.73	2.59
SEINS	23. How well can you implement alternative strategies in your classroom?	6.92	1.40
SEINS	24. How well can you provide appropriate challenges for very capable students?	6.85	1.50

Note. Self-efficacy scores were based on a likert scale ranging from 1=nothing to 9= a great deal

In table Table 4.4 high score reflected a high sense of teacher efficacy and a low score reflected a low sense of teacher efficacy. The lowest and the highest score senior pre-service science teachers had in student engagement subscale. Senior pre-service science teachers had highest self-efficacy *(M = 7.23, SD = 1.47)* for making students belief that they can be successful in school. Although senior pre-service science teachers had lowest self-efficacy for working difficult students *(M = 6.13, SD = 1.43),* the score was highly above the middle point.

In order to get an in-depth understanding of pre-service science teachers' self-efficacy, their responses to the TSES were examined in item level and presented in Table 4.5. Table 4.5 displays pre-service science teachers' responses to the TSES items in term of percentages. For the sake of simplicity of interpretations, the data were presented utilizing the following coding scheme: 9 and 8 points were assigned to "a great deal", 7 and 6 to "quite a bit", 5 to "some influence", 4 and 3 to "very little", and 2 and 1 to "nothing".

Table 4.5 Frequency distribution of the responses

		Percentage (%)				
		Nothing	*Very Little*	*Some Influence*	*Quite a bit*	*A great deal*
SEST	Item 1	1.7	6.1	28.0	54.1	10.0
SEST	Item 2	1.0	5.9	17.4	54.8	20.8
SECM	Item 3	.9	4.8	13.1	51.7	29.5
SEST	Item 4	.6	4.4	12.6	54.9	27.5
SECM	Item 5	.6	4.6	9.9	47.0	38.0
SEST	Item 6	.7	2.5	8.5	46.4	41.9
SEINS	Item 7	.7	5.0	15.9	53.6	24.8
SECM	Item 8	.7	2.7	10.9	54.6	31.1
SEST	Item 9	.4	3.9	11.9	55.1	28.6
SEINS	Item 10	.9	2.4	8.0	50.3	38.4
SEINS	Item 11	.7	4.0	9.6	49.1	36.6
SEST	Item 12	1.0	5.2	14.1	50.9	28.8

Table 4.5 (Continued)

		Percentage (%)				
		Nothing	Very Little	Some Influence	Quite a bit	A great deal
SECM	Item 13	.5	3.1	10.1	49.5	36.8
SEST	Item 14	.7	5.0	15.1	57.4	21.7
SECM	Item 15	.7	5.2	13.5	50.0	30.5
SECM	Item 16	1.0	5.5	17.9	56.4	19.1
SEINS	Item 17	.9	7.7	19.3	54.4	17.7
SEINS	Item 18	.9	3.7	12.2	48.3	34.9
SECM	Item 19	.9	6.4	13.8	50.9	28.0
SEINS	Item 20	.8	3.4	10.1	51.7	34.0
SECM	Item 21	.9	6.3	13.2	46.9	32.7
SEST	Item 22	1.5	5.3	14.5	48.0	30.6
SEINS	Item 23	.9	3.1	11.4	52.6	32.0
SEINS	Item 24	1.3	4.1	12.3	49.6	32.8

As shown in Table 4.5, the highest percentages were for the response of "quite a bit" while the lowest percentages were for "nothing". Senior pre-service science teachers generally believed that they were moderately qualified for teaching science in every dimension namely, student engagement, instructional strategies, and classroom management.

For the response of "a great deal", the highest percentage was for item 6 "How much can you do to get students to believe they can do well in school work?" with 41.9% and the lowest percentage was for item 1 "How much can you do to get through to

the most difficult students?" with 10.0% which were both the items of student engagement in science teaching. In this dimension, 57.4% of senior pre-service science teachers thought they were quite qualified for item 14 "How much can you do to improve the understanding of a student who is failing?" in science teaching. Overall, pre-service science teachers' responses to the self-efficacy for student engagement dimension revealed that they have high levels of self-efficacy in this dimension. However, they appeared to have relatively low levels of self-efficacy to get through the most difficult students as indicated by the lowest percentage for the "a great deal" response.

Concerning the teacher self-efficacy for instructional strategies dimension, the highest percentages for the responses of "nothing", "very little", "some influence", "quite a bit", and "a great deal" were 1.3%, 7.7%, 19.3%, 54.45%, and 38.4% respectively. More specifically, 38.4% of senior pre-service science teachers considered they could deal greatly for item 10 "How much can you gauge student comprehension of what you have taught?" in science teaching. For the item 17 "How much can you do to adjust your lessons to the proper level for individual students?" senior pre-service science teachers stated they were quite qualified with 54.4%, they could do some influence with 19.3%, and very little with 7.7%, in science teaching. 1.3% of them believed they could do nothing for item 24 "How well can you provide appropriate challenges for very capable students?" in science teaching.

With respect to teacher self-efficacy for classroom management, the highest percentages for the responses of "nothing", "very little", "some influence", "quite a

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bit", and "a great deal" were 1.0%, 6.4%, 17.9%, 56.4%, and 38.0% respectively. 38.0% of senior pre-service science teachers stated "a great deal" for item 5 "To what extent can you make your expectations clear about student behavior?" in science teaching. For the item 16 "How well can you establish a classroom management system with each group of students?" they believed they were quite qualified with 56.4%, could do some influence with 17.9%, and nothing with 1.0% in science teaching. 6.4% of them assumed that they could do very little for item 19 "How well can you keep a few problem students from ruining an entire lesson?" in science teaching.

Overall, the percentage of pre-service science teachers' responses to the TSES suggested that their self-efficacy was reasonably high as indicated by the highest percentages of "great deal of" responses.

4.2.2 Descriptive Statistics for Pre-Service Science Teachers' Achievement Goals

As one of the facets of pre-service science teachers' academic self-regulation, their achievement goals were assesses through the Achievement Goal Questionnaire. The mean subscale scores on the questionnaire ranged from 2.55 to 4.10 on a five-point scale (see Table 4.6).

Table 4.6 Descriptive statistics for achievement goals

	M	*SD*	*Min.*	*Max.*
Mastery Approach (MA)	4.10	.76	1.00	5.00
Performance Approach (PA)	3.20	1.00	1.00	5.00
Mastery Avoidance (MV)	2.84	.93	1.00	5.00
Performance Avoidance (PV)	2.55	.98	1.00	5.00

The mean score of mastery approach goals *(M* = 4.10, *SD* = .76*)* was the highest mean score*,* while the mean score of performance avoidance goals *(M* = 2.55, *SD* = .98*)* was the lowest mean score. In general, descriptive statistics suggested that pre-service science teachers tend to study for the reasons of mastering tasks, understanding deeply, and getting good grades rather than avoiding misunderstanding, looking stupid, and getting worst grades.

4.2.3 Descriptive Statistics for Different Facets of Pre-Service Science Teachers' Academic Self-Regulation

Different aspects of pre-service science teachers' academic self-regulation including control of learning beliefs, task value, test anxiety, metacognitive self-regulation, effort regulation, and peer learning were examined using the Motivated Strategies for Learning Questionnaire. The results showed that the mean sub-scale scores ranged from 1.28 5 to 6.47 on a seven-point scale (see Table 4.7). More specifically, the scores on the four subscales namely control of learning beliefs *(M* = 3.03, *SD* = .57*)*,

test anxiety *(M = 3.12, SD = .82)*, effort regulation *(M = 2.36, SD = .50)*, and peer

learning *(M = 1.28, SD = .39)* were below the middle point. On the other hand, the

mean score on the task value *(M = 4.53, SD = .98)* was above the middle point and

the score on the metacognitive self-regulation *(M = 6.47, SD = 1.09)* was at the

higher end.

Table 4.7 Descriptive statistics for academic self-regulation

	M	*SD*	*Min.*	*Max.*
Task Value (TV)	4.53	.98	.86	6.00
Control of Learning Beliefs (CLB)	3.03	.57	.57	4.00
Test Anxiety (TANX)	3.12	.82	.71	5.00
Metacognitive Self-regulation (META)	6.47	1.09	1.71	9.00
Effort Regulation (ER)	2.36	.50	.57	3.71
Peer Learning (PL)	1.28	.39	.29	2.00

These results suggested that, in the courses offered by teacher education program,

senior pre-service science teachers tend to control their own cognition using variety

of strategies like planning, monitoring, and evaluating and tend to have low levels of

test anxiety. In addition, they appeared to perceive the tasks that they engage in as

interesting, important, and useful. However, senior pre-service science teachers

appeared to have low levels of control of learning beliefs, effort regulation, and peer

learning. This finding suggested that pre-service science teachers are less likely to

persist longer when they are faced with difficulties and distracters in their learning. Moreover, they tend to believe that they have little control over their learning and they rarely set aside time to work with their peers.

4.2.4 Descriptive Statistics for Pre-Service Science Teachers' Personality

Descriptive statistics were calculated for the Five Factor Personality domain scores. Table 4.8 shows that scores on the Neuroticism domain ranged from 7.65 to 78.71, with a mean score of 39.33 *(SD = 9.79)*. Scores on the Extraversion domain ranged from 6.12 to 76.67, with a mean score of 32.88 *(SD = 9.43)*. Openness domain scores ranged from 6.16 to 60.81 with an average score of 32.78 *(SD = 8.65)*. On the domain of Agreeableness, scores ranged from 1.69 to 75.76, with a mean score of 32.38 *(SD = 10.37)*. On the final domain of Conscientiousness, scores ranged from 5.77 to 73.44, with a mean score of 31.12 *(SD = 10.00)*. According to the these findings, participants demonstrated highest mean score on Neuroticism and lowest mean score on Conscientiousness.

Table 4.8 Descriptive statistics for personality

	M	*SD*	*Min.*	*Max.*
Neuroticism (N)	39.33	9.79	7.65	78.71
Extraversion (E)	32.88	9.43	6.12	76.67
Openness (O)	32.78	8.65	6.16	60.81
Agreeableness (A)	32.38	10.37	1.69	75.76
Conscientiousness (C)	31.12	10.00	5.77	73.44

4.2.5 Bivariate Correlations among Pre-service Science Teachers' Self-Efficacy, Academic Self-Regulation, and Personality

In order to examine the bivarite relationships among pre-service science teachers' self-efficacy, academic self-regulation, and personality correlation analyses were conducted. Among the 153 correlations, 128 of them were significant (see Table 4.9).

Table 4.9 Intercorrelations among the variables

	N	E	O	A	C	SEST	SEINS	SECM	MA	PA	MV	PV	TV	CLB	TANX	META	ER
N	1																
E	-.11**	1															
O	-.02	.29**	1														
A	-.01	.03	.04	1													
C	.00	.05*	.14**	.22**	1												
SEST	.13**	-.28**	-.31**	-.07**	-.25**	1											
SEINS	.15**	-.22**	-.25**	-.04	-.29**	.76**	1										
SECM	.11**	-.21**	-.21**	-.01	-.24**	.70**	.72**	1									
MA	.02	-.13**	-.18**	-.16**	-.30**	.26**	.28**	.20**	1								
PA	-.14**	-.06*	.06	.06*	-.13**	.06*	.09**	.07**	.21**	1							
MV	-.19**	.04	.05*	-.08**	-.06*	-.01	-.03	-.06*	.26**	.30**	1						
PV	-.16**	.05*	.17**	.12**	.02	-.11**	-.08**	-.08**	-.04	.52**	.33**	1					
TV	.03	-.13**	-.21**	-.13**	-.27**	.29**	.26**	.20**	.49**	.10**	.16**	-.12**	1				
CLB	-.03	-.09**	-.12**	-.09**	-.10**	.21**	.17**	.19**	.20**	.10**	.08**	-.01	.52**	1			
TAX	-.28**	.01	.06*	.03	.05*	-.02	-.08**	-.02	-.05*	.26**	.28**	.30**	.07**	.14**	1		
META	.05*	-14**	-.26**	-.13**	-.37**	.34**	.30**	.25**	.40**	.10**	.06*	-.13**	.60**	.39**	.04	1	
ER	.08**	-.07**	-.14**	-.11**	-.41**	.22**	.21**	.18**	.36**	.10**	.02	-.15**	.47**	.28**	-.11**	.58**	1
PL	.01	-.18**	-.12**	-.04	-.12**	.20**	.16**	.10**	.21**	.14**	.16**	.04	.35**	.20**	.19**	.36**	.19**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

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The highest positive correlation coefficients were between teacher self-efficacy variables, namely, student engagement and instructional strategies *(r = .76)*; instructional strategies and classroom management *(r = .72)*; student engagement and classroom management *(r = .70)*. The lowest positive correlations among observed variables were found between neuroticism and metacognitive self-regulation *(r = .05)*; mastery avoidance and openness *(r = .05)*; extraversion and consciousness *(r = .05)*.

On the other hand, the highest negative correlations were found between consciousness and metacognitive self-regulation *(r = -.37)*, mastery approach (*r* = -.30), and instructional strategies (*r* = -.30). The lowest negative correlation were determined between mastery approach and test anxiety (*r* = -.05); performance approach and extraversion (*r* = -.06); mastery avoidance and classroom management (*r* = -.06).

4.3 Inferential Statistics

4.3.1 One-way Repeated Measures ANOVA

The dependent variables; student engagement, instructional strategies, and classroom management of teacher self-efficacy, mastery approach, performance approach, mastery avoidance, and performance avoidance of achievement goal, neuroticism, extraversion, openness, agreeableness, and consciousness of personality were

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considered as continuous variables and measured on interval scale. Thus, the level of measurement assumption is not violated.

Normality was checked and presented in preliminary data analysis above that the normality assumption was not violated.

One-way Repeated Measures ANOVA was conducted by utilizing multivariate analysis. Multivariate analysis does not require the homogeneity-of-variance-of-differences assumption which is also known as sphericity assumption (Green, Salkind, & Akey, 2000). Thus, this assumption was not a case in the current study.

4.3.1.1 Examining Pre-Service Science Teachers' Sense Of Efficacy

Repeated Measures ANOVA was conducted to examine whether the level of pre-service science teachers' sense of efficacy for *student engagement*, for *instructional strategies*, and for *classroom management* differs. Results showed a statistically significant difference in means among three teacher efficacy dimensions (Wilk's Lambda = .95, F (2, 1792) = 48.37, p = .000, η^2 = .05). To determine which means differ from each other significantly, pairwise comparisons were conducted following Holm's sequential Bonferroni procedure (see Table 4.10). Examination of the pairwise comparisons revealed that pre-service science teachers have significantly higher levels of self-efficacy for effective use of instructional strategies (M = 6.86, SD = .99) compared to self-efficacy for student engagement (M = 6.70, SD = .97), t (1793) = 9.47, p = .000. The magnitude of the difference was medium (d = .22).

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Moreover, pre-service science teachers' self-efficacy for effective classroom management ($M = 6.83$, $SD = 1.00$) was found to be at higher levels than the efficacy for students engagement, t (1793) = 6.84, p = .000 with a small effect size (d = .17). However, the mean difference between the self-efficacy for instructional strategies and self-efficacy for classroom management was non-significant t (1793) = 1.67, p = .096. Therefore, it appeared that pre-service science teachers have self-efficacy to use instructional strategies effectively and to manage classroom and student behavior at higher levels than their self-efficacy to engage all students in learning. Additionally, the mean score for efficacy for student engagement ($M = 6.70$) which is well above the mid-point of nine-point likert scale suggests that although it is lower compared to the other two dimensions of teacher efficacy, pre-service science teachers have a reasonable level of sense of efficacy to help students value science learning, to motivate students with low interest and to make them believe that they can be successful.

Table 4.10 Pairwise comparisons for teacher self-efficacy

	t	df	p	Cohen's d
Student Engagement - Instructional Strategies	9.47	1793	.000	.22
Student Engagement - Classroom Management	6.84	1793	.000	.17
Instructional Strategies - Classroom Management	1.67	1793	.096	.00

4.3.1.2 Examining Pre-Service Science Teachers' Achievement Goals

The second Repeated Measures ANOVA was conducted to investigate whether there is a difference in the pre-service science teachers' mean level of achievement goals. Results revealed a significant difference in means among four achievement goals (Wilks' λ = .37, F (3, 1716) = 965.46, p = .000). The multivariate η^2 = .63 indicated that magnitude of the difference in means was large. To determine which means differ from each other significantly, pairwise comparisons were conducted using Holm's sequential Bonferroni procedure. Results showed that pre-service science teachers have significantly higher levels of approach goals compared to the avoidance goals with effect sizes medium to large (see Table 4.11). This finding implied those pre-service science teachers are likely to study for the courses in their program to master the course materials and get good grades rather than to avoid performing poorly or to avoid not understanding. In addition, concerning the comparison between the avoidance goals, pre-service science teachers were found to have more mastery avoidance goals (M = 2.80, SD = .91) compared to performance avoidance goals (M = 2.69, SD = .82), t (1736) = 4.83, p = .000, d = .12. Therefore, it appeared that pre-service science teachers tend to study for the reasons of avoiding not understanding more than avoiding looking dumb or getting the worst grade. Actually, in the current study, the lowest mean score was obtained on the performance avoidance goals.

Table 4.11 Pairwise comparisons for achievement goals

	t	df	p	Cohen's d
Mastery Approach-Performance Approach	31.79	1759	.000	.76
Mastery Approach- Mastery Avoidance	49.57	1760	.000	1.18
Mastery Approach-Performance Avoidance	47.93	1744	.000	1.15
Performance Approach-Mastery Avoidance	14.06	1752	.000	.34
Performance Approach-Performance Avoidance	21.69	1736	.000	.52
Mastery Avoidance-Performance Avoidance	4.83	1736	.000	.12

4.3.1.3 Examining Pre-Service Science Teachers' Personality

The third Repeated Measures ANOVA was carried out to examine whether there is a difference in the pre-service science teachers' mean level personality traits. Results showed a statistically significant difference in means among five personality traits (Wilks' λ = .71, F (4, 1790) = 184.73, p = .000). The multivariate η^2 = .29 indicated that magnitude of the difference in means was large. To determine which means differ from each other significantly, pairwise comparisons were conducted following Holm's sequential Bonferroni procedure (see Table 4.12).

Table 4.12 Pairwise comparisons for personality traits

	t	df	p	Cohen's d
Neuroticism –Extraversion	19.04	1793	.000	.45
Neuroticism - Openness	20.98	1793	.000	.50
Neuroticism- Agreeableness	20.52	1793	.000	.48
Neuroticism-Conscientiousness	26.14	1793	.000	.62
Extraversion- Openness	.35	1793	.726	.01
Extraversion- Agreeableness	1.57	1793	.116	.04
Extraversion-Conscientiousness	5.83	1793	.000	.14
Openness- Agreeableness	1.36	1793	.175	.03
Openness-- Conscientiousness	6.05	1793	.000	.14
Agreeableness-Conscientiousness	4.28	1793	.000	.10

Examination of the pairwise comparisons revealed that while the pre-service science teachers' neuroticism level (M = 39.32, SD = 9.79) is significantly higher than remaining four personality traits, their conscientiousness level (M = 31.13, SD = 9.00) is significantly lower (p = .000). Moreover, it was found that there was no significant difference between pre-service science teachers' extraversion level (M = 32.87, SD = 9.43) and their openness (M = 32.78, SD = 8.65) and agreeableness (M = 32.36, SD = 10.39) levels. Also, the difference in the level of openness and agreeableness was not significant. Therefore, these results suggested that pre-service science teachers tend to demonstrate the characteristics of neuroticism more than the characteristics of the other personality traits. Accordingly, it is expected that negative affects like sadness, embarrassment, and fear may be more dominant in their lives

compared to the other feelings, wills, and behaviors characteristics of the other traits. On the other hand, the lowest mean score on the conscientiousness may imply that pre-service science teachers demonstrate the relevant behaviors and feeling at lower levels compared to the relevant behaviors of other personality traits. In view of that, feeling well-organized and well-prepared to deal with daily life activities, having high levels of aspiration, working hard to realize the goals, and having self-discipline may not be leading aspects of their lives.

4.3.2 Path Analysis

In order to examine the relationships among pre-service science teachers' self-efficacy, academic self-regulation, and personality, path analysis was conducted. In the model, it was hypothesized that personality variables (neuroticism, extraversion, openness, agreeableness, and conscientiousness) were *directly* linked to senior pre-service science teachers' self-efficacy (student engagement, instructional strategies, and classroom management), achievement goals (master approach goals, mastery avoidance goals, performance approach goals, performance avoidance goals), metacognitive self-regulation, and effort regulation, and *indirectly* to pre-service science teachers' self-efficacy through their effect on achievement goals, metacognitive self-regulation, and effort regulation. Moreover, paths were specified directly from task value, control of learning beliefs, and peer learning to teacher self-efficacy. Effect of achievement goals, task value, and control of learning beliefs on teacher self-efficacy was also mediated through their effect on metacognitive self-

regulation. In addition, it was hypothesized that task value and control of learning beliefs were also indirectly associated with teacher self-efficacy through their effect on achievement goals. Furthermore, in the model metacognitive self-regulation, task value and control of learning beliefs were indirectly linked to teacher self-efficacy through their effect on effort regulation. Additionally, a linked was specified between neuroticism and test anxiety. In the proposed model, all the variables were identified as observed variables. The model was examined through the path analysis utilizing LISREL 8.30 (Jöreskog & Sörbom, 1999). Since the resulting fit indices did not indicate a good fit (RMSEA = .16, GFI = .91, SRMR = .08, CFI = .78), new paths were specified considering the modification indices. In the revised model, paths were added from self-efficacy for classroom management to self-efficacy for instructional strategies and to self-efficacy for student engagement. Moreover, the path was specified from performance approach goals to mastery approach goals and from peer learning to metacognitive self-regulation. Additionally, covariances were set from performance approach goals to performance avoidance goals and from self-efficacy for instructional strategies to self-efficacy for student engagement. The final SIMPLIS syntax for the structural model was provided in Appendix B. The resulted fit indices indicated that the model fits the data well (RMSEA = .10 , GFI = .97, CFI = .93, SRMR = .05). The Chi-Square, $\chi2$ = 591.375, was significant (p = 0.00) with degrees of freedom, df = 29, As Schumacker and Lomax (1996), $\chi2$ criterion tends to indicate a significant probability level with large sample sizes, generally with sample size above 200. The model in the current study was tested with 1794 students; therefore, it is not unusual to obtain significant $\chi2$ (Tabachnick & Fidell, 2001).

Since the fit indices indicated a theoretically sound model that explained the data well, the standardized path coefficients for direct effect were analyzed and displayed in Appendix C and Appendix D.

4.3.2.1 Relationships between Personality and Academic Self-Regulation

In this section, findings regarding with the relationship between pre-service science teachers' personality and their academic self-regulation are presented (see Figure 4.1). In the model, the results concerning the relationship between pre-service science teachers' personality and their academic self-regulation and the relationship among different components of academic self-regulation showed that pre-service science teachers' personality and their performance approach goals, task value, and control of learning beliefs explained 53% of the variance in mastery approach goals (see Table 4.13). In particularly, neuroticism $(\beta = .08)$, agreeableness $(\beta = .06)$, consciousness $(\beta = .05)$, and performance approach goals $(\beta = .66)$ have significant effect on mastery approach goals. These findings suggested that higher levels of neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability), agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) and conscientiousness (i.e., competence, self-discipline, aspiration, hard work, deliberation, and persistence) were positively related to mastery approach for pre-service science teachers. Also pre-service science teachers who study for showing their abilities to other, getting the highest grades, and looking smart seem to have the aim of advancing learning,

mastering a task, and understanding deeply. However, openness *(β = -.07)* and task value *(β = -.07)* were determined to be related negatively to this dimension. Openness (i.e., preference to try different activities, and intellectual curiosity) and giving value to courses were negatively associated with studying for advancing learning, mastering a task, and understanding deeply.

Table 4.13 Direct effects on mastery approach

Effect	*Standardized Coefficients*	*Standard Errors of the Estimates*	*t*	R^2
On Mastery Approach				
of Performance Approach	.66	.02	38.81*	
of Neuroticism	.08	.03	3.85*	
of Extraversion	-.02	.04	-1.29	
of Openness	-.07	.02	-4.36*	.53
of Agreeableness	.06	.02	2.89*	
of Consciousness	.05	.14	2.96*	
of Task Value	-.07	.02	-4.17*	
of Control of Learning Beliefs	-.02	.01	-.93	

When performance approach goals are examined as one of the components of pre-service science teachers' academic self-regulation, it was found that other components of academic self-regulation (i.e. task value, and control of learning beliefs) and pre-service science teachers' personality accounted for 10% of the

variance in this dimension (see Table 4.14). There were positive relationship between extraversion *(β = .09)*, agreeableness *(β = .20)* and performance approach goals indicating that higher levels of extraversion (i.e., warmth, gregariousness, assertiveness, positive emotions, and excitement seeking) and agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) leads to higher level of performance approach goals. Similarly to mastery approach goals, negative relationships were found between openness *β = -.07)* and task value *(β = -.07)* and this dimension. Openness (i.e., preference to try different activities, and intellectual curiosity) and giving value to courses were negatively associated with studying for showing their abilities to other, getting the highest grades, and looking smart.

Table 4.14 Direct effects on performance approach

Effect	Standardized Coefficients	Standard Errors of the Estimates	t	R^2
On Performance Approach				
of Neuroticism	-.02	.04	-.80	
of Extraversion	.09	.05	3.40*	
of Openness	-.05	.03	-2.34*	
of Agreeableness	.20	.03	7.09*	.10
of Consciousness	.02	.20	.70	
of Task Value	-.15	.02	-6.30*	
of Control of Learning Beliefs	.02	.02	.91	

Moreover, 10% of the variance of mastery avoidance goals was explained by pre-service science teachers' personality and academic self-regulation implying significant association with neuroticism $(\beta = .07)$ and openness $(\beta = -.31)$. These findings demonstrated that while higher level of neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability) was positively linked to study for the reason of avoiding misunderstanding and not learning, openness (i.e., preference to try different activities, and intellectual curiosity) was linked negatively (see Table 4.15).

Table 4.15 Direct effects on mastery avoidance

Effect	*Standardized Coefficients*	*Standard Errors of the Estimates*	*t*	R^2
On Mastery Avoidance				
of Neuroticism	.07	.04	2.35*	
of Extraversion	.00	.07	.07	
of Openness	-.31	.04	-13.41*	
of Agreeableness	.03	.04	.96	.10
of Consciousness	.05	.25	1.86	
of Task Value	.03	.03	1.12	
of Control of Learning Beliefs	.00	.02	.01	

With respect to performance avoidance goals, pre-service science teachers' personality and academic self-regulation explained 10% of the variance of this dimension. Openness *(β = .05)*, consciousness *(β = -.12)*, and task value *(β = -.27)* were found to be significantly related to mastery avoidance goals. Accordingly, openness (i.e., preference to try different activities, and intellectual curiosity) and giving value to courses were positively associated with studying for the reason of avoiding misunderstanding and not learning. Conversely, conscientiousness (i.e., competence, self-discipline, aspiration, hard work, deliberation, and persistence) was negatively linked to this dimension (see Table 4.16).

Table 4.16 Direct effects on performance avoidance

Effect	*Standardized Coefficients*	*Standard Errors of the Estimates*	*t*	R^2
On Performance Avoidance				
of Neuroticism	.00	.04	-.09	
of Extraversion	-.02	.06	-.77	
of Openness	.05	.04	2.17*	
of Agreeableness	-.01	.04	-.23	.10
of Consciousness	-.12	.24	-4.70*	
of Task Value	.27	.03	11.68*	
of Control of Learning Beliefs	.02	.02	.72	

In addition, pre-service science teachers' personality and academic self-regulation accounted for 39 % of the variance in metacognitive self-regulation dimension (see Table 4.17). Specifically, neuroticism (β = .39*),* agreeableness (β = .14*),* mastery approach goals (β = .15*),* and peer learning (β = .24*)* predicted metacognitive self-regulation. Thus, for pre-service science teachers, higher levels of neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability) and agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) were positively related to metacognitive self-regulation. Similarly, it was found that pre-service science teachers who study for the aim of advancing learning, mastering a task, and understanding deeply and perceive their peers as learning resource tend to use metacognitive strategies like planning, monitoring, and evaluating more. On the contrary, extraversion (β= *-.09),* openness

($\beta = -.12$), mastery avoidance goals ($\beta = -.04$), task value ($\beta = -.07$), and control of learning beliefs ($\beta = -.12$) were found to have significantly effect on metacognitive self-regulation. These findings indicated that extraversion (i.e., warmth, gregariousness, assertiveness, positive emotions, and excitement seeking) and openness (i.e., preference to try different activities, and intellectual curiosity) were negatively linked to metacognitive self-regulation. Additionally, pre-service science teachers who study for the reason of avoiding misunderstanding and not learning, give value to courses, and believe their skills were likely to use metacognitive strategies less.

Table 4.17 Direct effects on metacognitive self-regulation

Effect	Standardized Coefficients	Standard Errors of the Estimates	t	R^2
On Metacognitive Self-Regulation				
of Neuroticism	.39	.00	16.10*	
of Extraversion	-.09	.01	-4.29*	
of Openness	-.12	.00	-5.79*	
of Agreeableness	.14	.00	5.88*	
of Consciousness	-.01	.02	-.61	
of Mastery Approach	.15	.00	5.57*	.39
of Performance Approach	.01	.00	.53	
of Mastery Avoidance	-.04	.00	-2.19*	
of Performance Avoidance	-.01	.00	-.25	
of Task Value	-.07	.00	-3.22*	
of Control of Learning Beliefs	-.12	.00	-6.66*	
of Peer Learning	.24	.02	12.38*	

Furthermore, 23 % of the variance of effort regulation dimension was explained by pre-service science teachers' personality and academic self-regulation (see Table 4.18). According to the results, neuroticism *(β = .07),* openness *(β = .24),* consciousness *(β = .05),* metacognitive self-regulation *(β = .27),* and peer learning *(β = .20)* were significantly associated with effort regulation. Higher levels of neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability), openness (i.e., preference to try different activities, and intellectual curiosity), and conscientiousness (i.e., competence, self-discipline,

aspiration, hard work, deliberation, and persistence) were determined to be positively related to effort regulation. These findings also demonstrated that pre-service science teachers who use metacognitive strategies and perceive peers as learning resource are likely to study hard to succeed in their courses. Conversely, negative associations were found between agreeableness $(\beta = -.12)$ and control of learning beliefs $(\beta = -.06)$ and effort regulation. Hence, it can be said that agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) and giving value to courses were negatively linked to studying hard to succeed in these courses.

Table 4.18 Direct effects on effort regulation and text anxiety

Effect	Standardized Coefficients	Standard Errors of the Estimates	t	R^2
On Effort Regulation				
of Neuroticism	.07	.00	2.49*	
of Extraversion	-.04	.01	-1.55	
of Openness	.24	.00	10.66*	
of Agreeableness	-.12	.00	-4.63*	
of Consciousness	.05	.02	2.31*	.23
of Control of Learning Beliefs	-.06	.00	-2.66*	
of Metacognitive Self-Regulation	.27	.03	10.45*	
of Peer Learning	.20	.02	8.91*	
On Test Anxiety				
of Neuroticism	-.23	.03	-10.07*	.05

Finally, neuroticism *(β = -.23)* accounted for 5% of the variance in test anxiety indicating there was negative relationship between neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability) and giving value to courses (see Table 4.18).
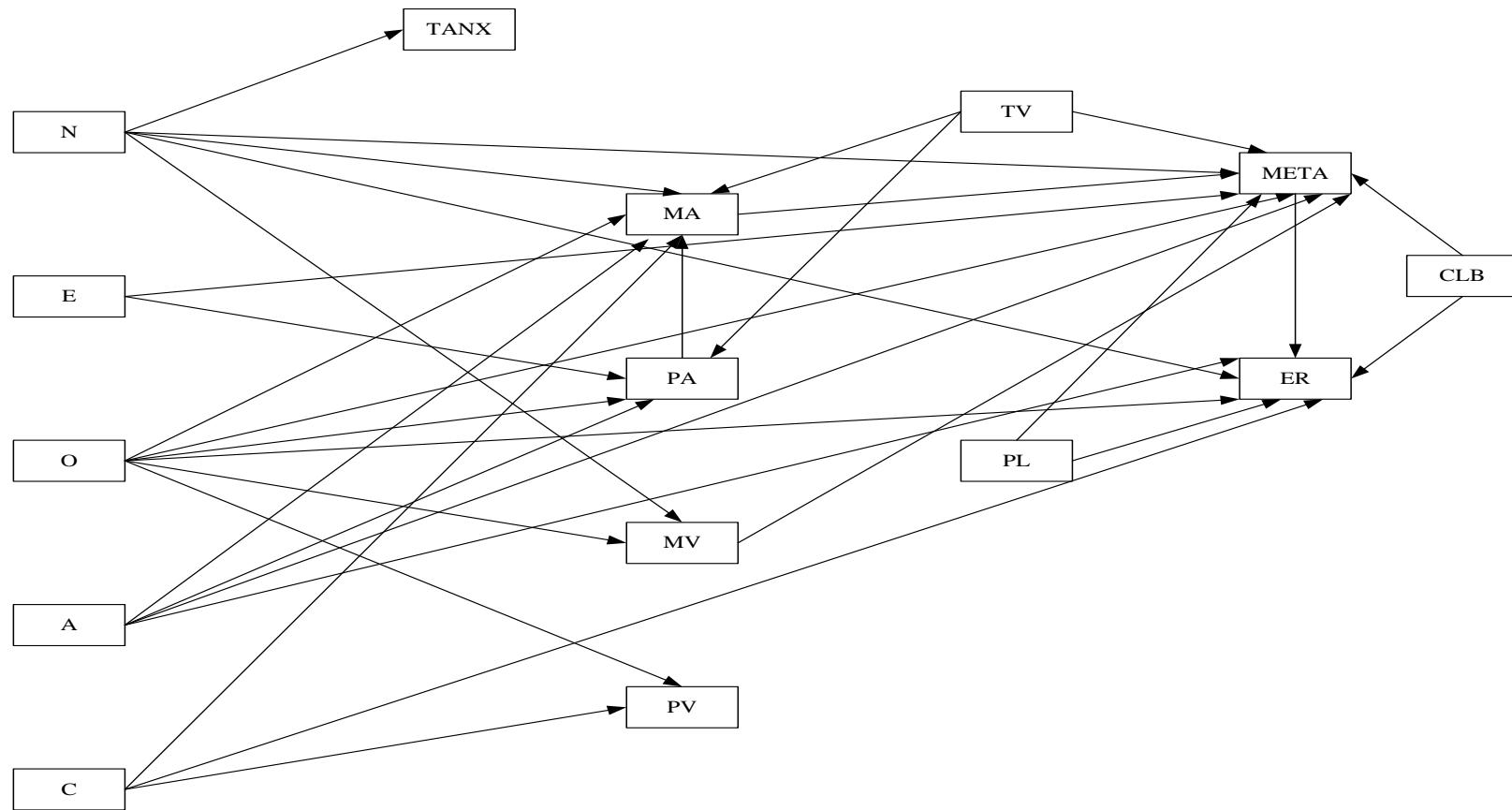
Figure 4.1 Pre-service science teachers' personality and their academic self-regulation with significant path coefficients

4.3.2.2. Relationships between Academic Self-Regulation and Teacher Self-Efficacy

In this section, findings concerning the relationship between pre-service science teachers' academic self-regulation and their self-efficacy are presented (see Figure 4.2). Overall, results showed that pre-service science teachers' personality and academic self-regulation accounted for 10 % of variance in self-efficacy for student engagement (see Table 4.19). Concerning academic self-regulation variables, performance approach goals (β = .09), and metacognitive self-regulation (β = .14) were significantly and positively associated with their self-efficacy for student engagement. These findings implied that pre-service science teachers who use metacognitive strategies like planning, monitoring, and evaluating and who study for the reasons of showing their abilities to other, getting the highest grades, and looking smart appeared to have higher levels of self-efficacy for student engagement. On the other hand, negative associations were found between performance avoidance goals (β = -.16) and self-efficacy for student engagement representing pre-service science teachers who study for the reasons of avoiding looking dumb or getting the worst grade in their courses tend to have lower levels of self-efficacy in this dimension.

Table 4.19 Direct effects on self-efficacy of student engagement

Effect	Standardized Coefficients	Standard Errors of the Estimates	t	R^2
On Student Engagement				
of Classroom Management	-.04	.01	-.96	
of Neuroticism	.01	.01	.15	
of Extraversion	-.10	.01	-3.63*	
of Openness	-.06	.01	-2.10*	
of Agreeableness	.13	.00	4.53*	
of Consciousness	.09	.03	3.49*	
of Mastery Approach	-.07	.01	-1.79	.10
of Performance Approach	.09	.00	2.54*	
of Mastery Avoidance	-.02	.00	-.68	
of Performance Avoidance	-.16	.00	-6.46*	
of Task Value	.03	.00	1.12	
of Control of Learning Beliefs	.03	.00	1.22	
of Metacognitive Self-Regulation	.14	.03	4.87*	
of Effort Regulation	.01	.03	.42	
of Peer Learning	-.03	.03	-1.24	

Results also showed that personality and academic self-regulation accounted for 23 % of variance in self-efficacy for instructional strategies (see Table 4.20). With respect to academic self-regulation variables, performance avoidance goals ($\beta = .05$), and metacognitive self-regulation ($\beta = .12$) were found to be significantly related to pre-service science teachers' self-efficacy for instructional strategy. Pre-service

science teachers who use metacognitive strategies like planning, monitoring, and evaluating and who study for the aim of avoiding looking dumb or getting the worst grade in their courses appeared to higher levels of teacher self-efficacy for instructional strategies. In contrast, control of learning beliefs ($\beta = -.08$), and effort regulation ($\beta = -.07$) were significantly linked to teacher self-efficacy for instructional strategies suggesting that pre-service science teachers who believe their skills and also study hard to succeed in their courses appeared to have lower levels of teaching self-efficacy in this dimension.

Table 4.20 Direct effects on self-efficacy of instructional strategies

Effect	*Standardized Coefficients*	*Standard Errors of the Estimates*	*t*	*R²*
On Instructional Strategies				
of Classroom Management	-.05	.02	-1.47	
of Neuroticism	.07	.02	2.29*	
of Extraversion	.00	.02	.06	
of Openness	-.14	.01	-5.88*	
of Agreeableness	.36	.01	13.23*	
of Consciousness	-.06	.08	-2.33*	
of Mastery Approach	-.03	.02	-.77	.23
of Performance Approach	.04	.01	1.22	
of Mastery Avoidance	.03	.01	1.12	
of Performance Avoidance	.05	.01	2.21*	
of Task Value	.00	.01	-.12	
of Control of Learning Beliefs	-.08	.01	-3.85*	
of Metacognitive Self-Regulation	.12	.10	4.52*	
of Effort Regulation	-.07	.08	-3.09*	
of Peer Learning	.00	.08	.01	

Finally, results demonstrated that personality and academic self-regulation accounted for 23 % of variance in self-efficacy for classroom management (see Table 4.21). Concerning self-regulation variables, it was observed that mastery approach goals (β = .48) and performance approach goals (β = .29*)* were found to have significant effect on pre-service science teachers' self-efficacy for this dimension. Pre-service

science teachers who study for the aim of advancing learning, mastering a task, understanding deeply as well as showing their abilities to other, getting the highest grade, and looking smart appeared to have higher level of self-efficacy for classroom management. On the other hand, results showed that performance avoidance goals (β = -.07), task value (β = -.07), and peer learning (β = -.05) were negatively related to self-efficacy for classroom management. Regarding the dimensions of academic self regulation, pre-service science teachers who give value to courses and perceive their peers as learning resource besides studying due to avoiding looking dumb or getting the worst grade in their courses appeared to have lower levels of self-efficacy in this dimension.

Table 4.21 Direct effects on self-efficacy of classroom management

Effect	Standardized Coefficients	Standard Errors of the Estimates	t	R^2
On Classroom Management				
of Neuroticism	.04	.02	1.97*	
of Extraversion	.02	.03	1.38	
of Openness	.04	.02	2.15*	
of Agreeableness	.05	.02	2.41*	
of Consciousness	.02	.12	1.51	
of Mastery Approach	.48	.02	22.62*	.64
of Performance Approach	.29	.02	14.18*	
of Mastery Avoidance	.00	.01	.14	
of Performance Avoidance	-.07	.01	-4.75*	
of Task Value	-.07	.01	-4.46*	
of Control of Learning Beliefs	-.03	.01	-2.00	
of Metacognitive Self-Regulation	.03	.15	1.64	
of Effort Regulation	-.01	.13	-.39	
of Peer Learning	-.05	.12	-3.07*	
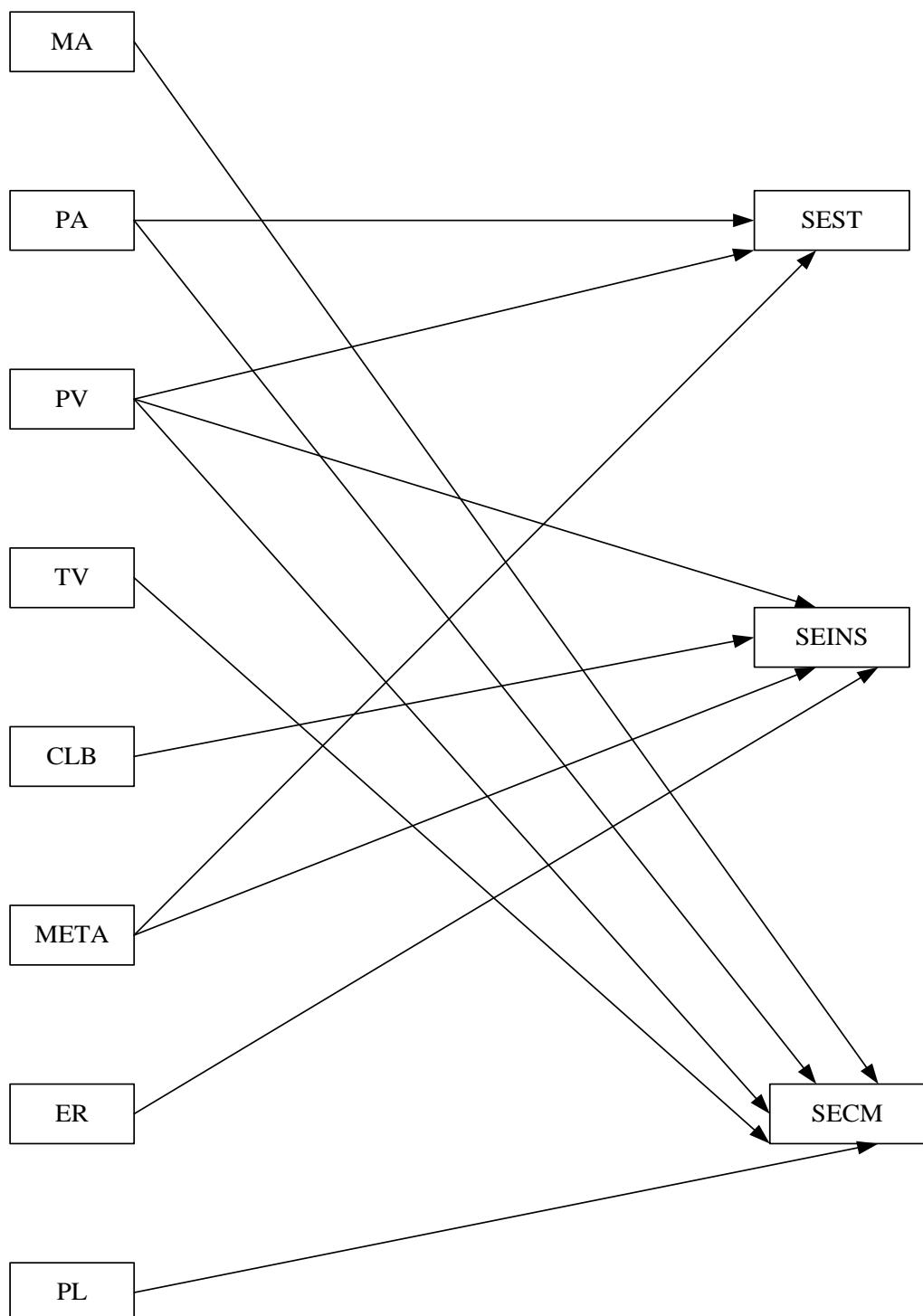
Figure 4.2 Pre-service science teachers' academic self-regulation and their self-efficacy with significant path coefficients

4.3.2.3 Relationships between Personality and Teacher Self-Efficacy

This section focuses on the findings concerning the relationship between pre-service science teachers' personality and their self-efficacy (see Figure 4.3). The results demonstrated that consciousness (β = .09), agreeableness (β = .13) were significantly associated with pre-service science teachers' self-efficacy for student engagement (see Table 4.19). These findings implied that, for pre-service science teachers, higher levels of conscientiousness (i.e., competence, self-discipline, aspiration, hard work, deliberation, and persistence) and agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) were positively linked to their self-efficacy to engage all students in learning. On the other hand, negative associations were found between extraversion (β = -.10), openness (β = -.06) and self-efficacy for student engagement. Therefore, it appeared that lower levels of extraversion (i.e., warmth, gregariousness, assertiveness, positive emotions, and excitement seeking) and openness (i.e., preference to try different activities, and intellectual curiosity) bring about higher teachers' beliefs in their capability to engage all students.

Concerning the self-efficacy for instructional strategies, neuroticism (β = .07), agreeableness (β = .36) predicted this dimension that having higher level of neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability) and agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) lead to higher teachers' beliefs in their capability to apply many of the instructional strategies (see Table 4.20). On the contrary, consciousness (β = -.06), and openness (β = -.14) were significantly linked

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to teacher self-efficacy for instructional strategies. These findings suggested that conscientiousness (i.e., competence, self-discipline, aspiration, hard work, deliberation, and persistence) and openness (i.e., preference to try different activities, and intellectual curiosity) were negatively linked to pre-service science teachers' beliefs about applying many instructional strategies.

When examining the direct paths to the self-efficacy for classroom management, it was observed that neuroticism ($\beta = .04$), openness ($\beta = .04$), and agreeableness ($\beta = .05$) were found to have significant effect on pre-service science teachers' self-efficacy for this dimension (see Table 4.21). These findings referred that higher levels of neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability), openness (i.e., preference to try different activities, and intellectual curiosity) and agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) were positively related to their belief to ability to manage classroom effectively.
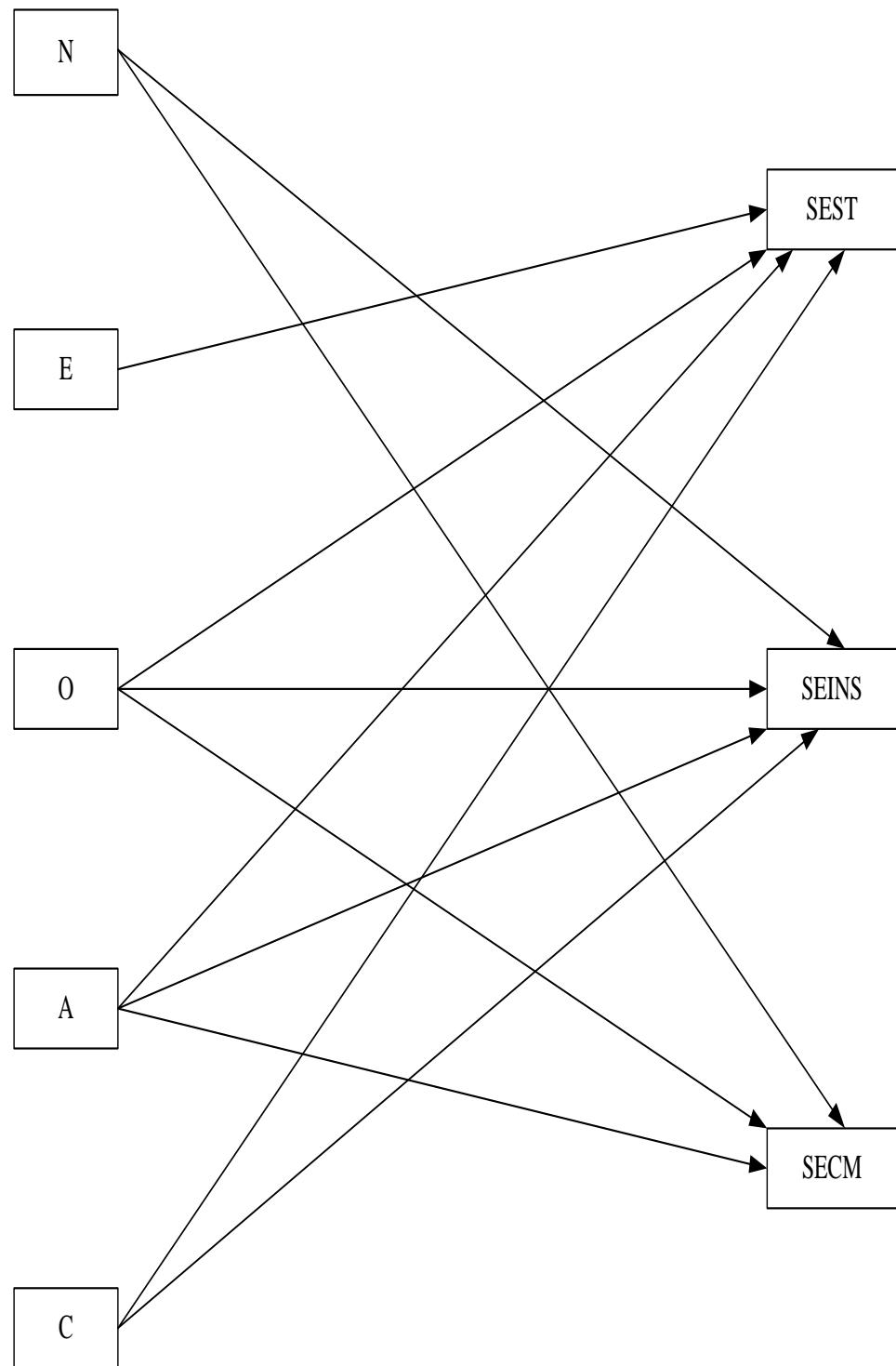
Figure 4.3 Pre-service science teachers' personality and their self-efficacy with significant path coefficients

4.4 Summary

Overall, these findings suggested that higher level of agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) was positively linked to all dimensions of teacher self-efficacy. Neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability) was positively associated with self-efficacy for instructional strategies and classroom management whereas openness (i.e., preference to try different activities, and intellectual curiosity) was negatively associated with self-efficacy for student engagement and instructional strategies. Also, pre-service science teachers who study for the aim of showing their abilities to other, getting the highest grades, and looking smart tend to have higher levels of self-efficacy for student engagement and classroom management while those of them who study for the aim of avoiding looking dumb or getting the worst grade in their courses seemed to tend to have lower levels of self-efficacy for these dimensions.

CHAPTER V

CONCLUSIONS, DISCUSSION and IMPLICATIONS

This chapter begins with summarizing the findings of this study. Following this summary, implications of the major findings are discussed and recommendations for future research are presented. This chapter presents the summary of the study, conclusions, and discussion of the results, and finally addresses the implications of the study and recommendations for further studies.

5.1 Conclusions

The following conclusions can be drawn from the results of the current study:

1.   Neuroticism (i.e. anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability) was positively associated with pre-service science teachers' self-efficacy for instructional strategies and classroom management.

2.   Extraversion (i.e., warmth, gregariousness, assertiveness, positive emotions, and excitement seeking) was negatively linked to pre-service science teachers' self-efficacy for student engagement.

3.   Openness (i.e., preference to try different activities, and intellectual curiosity) was negatively associated with self-efficacy for student engagement and instructional

strategies and positively associated with pre-service science teachers' self-efficacy for classroom management.

4.   Agreeableness (i.e., trust, straightforwardness, altruism, compliance, and tender-mindedness) was positively linked to all dimensions of pre-service science teachers' teaching self-efficacy.

5.   Conscientiousness (i.e., competence, self-discipline, aspiration, hard work, deliberation, and persistence) was positively linked to self-efficacy for student engagement and negatively linked to pre-service science teachers' self-efficacy for instructional strategies.

6.   Pre-service science teachers whose aim is being best performer (i.e. having performance approach goals) and those who use metacognitive strategies tend to have higher levels of self-efficacy for student engagement.

7.   Pre-service science teachers who focus on avoiding inferiority (i.e. having performance avoidance goals) appear to have lower levels of self-efficacy for student engagement.

8.   Pre-service science teachers who adopt performance avoidance goals and use metacognitive strategies are likely to have higher levels of self-efficacy for instructional strategies.

9.   Pre-service science teachers who believe to have control on their learning and persist in the face of challenging tasks are likely to have lower levels of self-efficacy for instructional strategies.

10.   Pre-service science teachers who focus on mastering task and getting good grades tend to have higher levels of self-efficacy for classroom management.

11.   Pre-service science teachers who avoid being the lowest performer in the class and working with peers, and do not give value to learning task are likely to have lower levels of self-efficacy for classroom management.

5.2 Discussions

5.2.1 Relationship between Personality and Teacher Self-Efficacy

The main purpose of the present study was to examine the relationship among pre-service science teachers' personality, academic self-regulation and teaching self-efficacy. Concerning the relationship between pre-service science teachers' personality and their teaching self-efficacy, it was predicted that extraversion, openness, agreeableness, and conscientiousness were positively linked to pre-service science teachers' sense of efficacy. However, only agreeableness was found to be positively associated with all dimensions of teaching self-efficacy. On the other hand, while conscientiousness was found to be positively related to only self-efficacy for student engagement, openness was found to be positively linked to only self-efficacy for classroom management. These findings suggested that pre-service science teachers scoring high on conscientiousness (i.e. having high aspiration levels, working hard to realize their goals, persisting in the face of difficulties, and being well-organized) are likely to have higher levels of self-efficacy for improving the understanding of failing students, getting through to the most difficult students, and motivating students with low interest in schoolwork. Moreover, pre-service science teachers with higher levels of active imagination, aesthetic sensitivity, receptivity to

inner feelings, preference for variety and novelty, intellectual curiosity, and independence of judgments (i.e. openness) appear to have higher levels of self-efficacy for controlling disruptive behaviors in the classroom and establishing a classroom management system with each group of students. However, contrary to the predictions, openness was found to be negatively associated with self-efficacy for student engagement and self-efficacy for instructional strategies. This finding can be partly explained by Turkish culture. In Turkey, education and thus teachers are highly respected. Teachers are expected to be good models for students with their socially approved behaviors in line with traditional values. Therefore, pre-service science teachers who tend to enjoy novel experiences and consider unconventional ideas may think that, as a teacher, they may not meet the expectations set by society (i.e., families, school administration, and colleagues). For example, one of the items in the self-efficacy for student engagement dimension of the TSES was "to what extent can you assist families in helping their children do well in school?" While 35 % of the pre-service science teachers below the median openness score were found to state "a great deal" (i.e. selected 8 or 9 in the nine-point scale) for this item, only 26 % of those above the median were found to select these higher ends of the scale. This finding may suggest that if pre-service science teachers believe that they have personalities which may not be compatible with social values and norms, their self-efficacy to cooperate with families to enhance student engagement in learning may be lower compared to closed pre-service science teachers who honor tradition. However, at this point it should be noted that the abovementioned explanations are

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speculative and should be elaborated through the use of qualitative data collection procedures, such as interviews, to make more valid interpretations of the findings.

Another unexpected relationship was observed between conscientiousness and self-efficacy for instructional strategies. The direction of the relationship between these two variables was found to be negative. This finding could be due to the fact that individuals scoring high on conscientiousness are well-organized and tend to think carefully before acting. However, pre-service science teachers with such traits may think that although they are well-organized and well-prepared for their classes, something unexpected could occur in the classroom that they did not consider beforehand and, therefore, in such a situation, it may be difficult to think and act effectively without a pre-determined plan. Such a thought could lower their self-efficacy, for instance, for responding to difficult questions from their students or providing an alternative example or explanation when students become confused.

Moreover, a negative relationship was unexpectedly determined between extraversion and self-efficacy for student engagement. Since teaching involves interpersonal relations, it was predicted that pre-service science teachers who are sociable, assertive, talkative, and active have high levels of self-efficacy for student engagement. On the other hand when examining the effect of extraversion on pre-service science teachers' teaching self-efficacy through extraversion's effect on performance approach goals, it was found that there was a positive relationship between extraversion performance approach goals, which was also positively linked to self-efficacy for student engagement and classroom management. Therefore, the

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indirect effect of extraversion mediated by performance approach goals on teaching self-efficacy appears to be positive.

Results of the path analysis regarding pre-service science teachers' personality and their teaching self-efficacy also unexpectedly revealed that there were positive associations between neuroticism and all dimensions of teaching self-efficacy. However, since negative effects such as embarrassment, guilt, and anger are the core of the neuroticism, it was predicted that neuroticism is negatively linked to teaching self-efficacy. The unexpected result concerning the relationship between neuroticism and pre-service science teachers' sense of efficacy can be also partly explained by the Turkish context. In the present study, descriptive statistics revealed that pre-service science teachers have high levels of neuroticism. These data were obtained from pre-service science teachers who are to graduate at the end of the academic year. In Turkey, people go through very competitive processes to obtain jobs. Graduated teachers must take national exams to potentially obtain opportunities to work in public schools. Teachers are ranked according to their exam scores and those with the highest grades are appointed to a job. Similarly, getting a job in private schools is a difficult task for teachers. They have to demonstrate that they are highly qualified teachers with high a grade point average (GPA) and good interpersonal relations. Most private schools seek experienced teachers. For this reason, newly graduated teachers may not have high hopes finding jobs in those schools. Actually, this competitive culture starts in students' early years of school in Turkey. Starting in 6th grade, students must take national exams in order to attend highly recognized high

schools and universities. Since graduating from top schools and universities can help them get better jobs and become more optimistic about their future, students compete with one another to be successful on these exams. In addition, since students' GPA in school contributes to their national exam scores, they must also try to get higher scores compared to others in classroom exams (Sungur et al., 2009). Therefore, people experience a competitive life driven by the worry about their future. So, it is not unusual that pre-service science teachers feel dependent, hopeless, sad, and worried at high levels. Moreover, it appears that negative effects experienced in such an environment act as a motive for the individuals: As neuroticism increases, teaching self-efficacy increases. Similarly, neuroticism is found to be positively related to different components of self-regulation, including mastery approach goals, performance approach goals, mastery avoidance goals, metacognition, and effort regulation. Additionally, pre-service science teachers with higher levels of neuroticism were found have lower levels of test anxiety. These findings provide a support to the evidence in the literature that neuroticism can improve effort regulation and motivation, as is in the case of defensive pessimism by which worried people, in expecting failure, put forth efforts to prevent it (Bidjerano & Dai, 2007; Norem & Cantor, 1986).

5.2.2 Relationship between Academic Self-Regulation and Teacher Self-Efficacy

Concerning the relationship between pre-service science teachers' academic self-regulation and their teaching self-efficacy, results showed that metacognitive self-

regulation and performance approach goals were positive predictors of pre-service science teachers' self-efficacy in all three dimensions, namely self-efficacy for student engagement, self-efficacy for instructional strategies, and self-efficacy for classroom management. Although the relationship between performance approach goals and self-efficacy for instructional strategies and between metacognition and self-efficacy for classroom management were not statistically significant, the direction of the relationship was positive. These findings suggested that pre-service science teachers who use metacognitive skills like planning, monitoring, and evaluating in their own learning and study for the reasons of showing their abilities to others, getting a good grade or looking smart tend to have higher levels of teaching self-efficacy. Similarly, Bembenutty (2007) demonstrated that pre-service teachers who use effectively metacognitive strategies like planning, self-monitoring, and self-evaluating of their own academic progress tend to have a high sense of teaching efficacy.

On the other hand, concerning the motivational component of self-regulation, task value beliefs were found unexpectedly to be negatively related to adaptive outcomes such as self-efficacy for classroom management, mastery approach goals, performance approach goals, and metacognition. These findings are contrary to the findings in the literature (Ablard & Libschultz, 1998; Neber & Schommer-Aikins, 2002), except for Araz and Sungur's (2007) study in which a negative relationship was found between task value beliefs and the use of learning strategies resulting in deeper processing of information and achievement. Araz and Sungur (2007)

suggested that using the MSLQ to assess task value beliefs can be problematic since the sub-scale designed to measure this construct includes three sub-components, namely importance value, utility value, and intrinsic interest. Among these sub-components of task value beliefs, utility value is thought to be associated with extrinsic motivation, which is generally found to be negatively linked to adaptive outcomes (Wigfield & Eccles, 2000). For this reason, according to Araz and Sungur (2007), while proposing conceptual models, it may be better to include these sub-components separately rather than combining them with overall task value beliefs

5.2.3 Relationship between Personality, Academic Self-Regulation and Teacher Self-Efficacy

Regarding the relationship between personality and different facets of self-regulation, agreeableness and conscientiousness were found to be mainly associated with adaptive outcomes as well as neuroticism. On the other hand, the relationship between extraversion and different components of self-regulation was found to be non-significant except for performance approach goals and metacognition. More specifically, while a positive association was found between extraversion and performance approach goals, the link between extraversion and metacognition was negative. However, as suggested by Bidjerano and Dai (2007), based on the available literature, it is difficult to justify the relationship between personality and different facets of self-regulation. But the observed relationships for conscientiousness and

agreeableness were, in general, consistent with the relevant literature (Bidjerano & Dai, 2007; Chamorro-Premuzic & Furnham, 2003; Komarraju & Karau, 2005).

Regarding the relationship among different components of self-regulation, results showed that mastery approach goals and peer learning were positively associated with metacognition. Moreover, a positive relation was found between metacognition and effort regulation. These results were in congruence with the findings in the literature (Sungur, 2007). However, contrary to the relevant theory and literature, control of learning beliefs were found to be negatively linked to metacognition and effort regulation. These findings implied that pre-service science teachers who think that outcomes rely on one's own effort rather than external factors are less likely to study strategically and persist longer in the face of difficulties. The reason for this finding may be that students in typical classrooms in Turkey are instructed mainly by lecture and discussion methods. Students depend on the notes and handouts taken in lectures to study for the exams (Gencer & Cakiroglu, 2007). For this reason, pre-service science teachers who have gone through such an educational system may think that effort means memorizing teacher explanations and handouts. Thus, if effort is conceptualized in this way, it is not unusual to find that control of learning beliefs is negatively linked to adaptive outcomes. However, to be able to obtain more valid explanations for these findings concerning control of learning beliefs, it is suggested that future studies examine these beliefs in relation to contextual factors using qualitative data collection procedures.

5.3 Implications

The present study showed that self-regulation and teaching self-efficacy have important personality correlates. Given the stability of personality traits, it is suggested that teacher education programs consider the personality disposition each pre-service science teacher brings to the learning environment (Bidjerano & Dai, 2007). With such a consideration, advisors, instructors, and counseling service should realize individual differences and serve collaboratively.

In addition, Agreeableness was found to be related positively to all dimension of self-efficacy. Since one of the important aspects of the agreeableness involves altruism, teaching education programs should promote development of altruism in pre-service science teachers: Pre-service science teachers can be provided with opportunities to enhance their knowledge and awareness of the skills they possess which they can utilize to help their students. They can involve in altruistic activities. For instance, community serving builds empathy and subsequent altruism. Recent ESE program contains community service course which aims to increase pre-service science teachers' awareness of the social issues and develop certain ideas of voluntary works that will be helpful in dealing with such issues. Pre-service science teachers gain knowledge and skills about understanding the existing social issues, especially in relation to education, and develop responsible behavior through conducting voluntary work in this course. Additionally, pre-service science teachers are given an opportunity to realize the variety of feelings and actions of students. In so doing, they learn how to build empathy and help their future students more

effectively. As it was mentioned before, the participants of the study were following the former ESE program and this program did not include community service course. The findings of the study suggest that this course is is to be very beneficial to foster pre-service science teachers' self-efficacy by encouraging development of altruistic behaviors. For this reason, it is suggested that the ESE program should keep containing community service course. Also, the content of this course can be examined in detail and necessary revision can be done in order to enhance pre-service science teachers' prosocial understanding, altruistic behaviors, and their awareness about the skills they have to help their students more. Furthermore, other courses which cover similar content can be included in the ESE program or integrated into existing courses and offered to pre-service science teachers at the beginning of their undergraduate education.

Along with the community service course, seminars can be organized at education faculties. In these seminars, social workers, counselors can share their experiences, discussion can be conducted, activities can be offered and related movies can be shown. Instructors can utilize cooperative learning or/and co-operative activities in their courses to help pre-service science teachers to become more considerate and cooperative. What is more, pre-service science teachers can be guided to enroll student groups or organizations which contribute to society.

Related to academic self-regulation, it is suggested that teacher education programs are structured so that pre-service science teachers as learners become aware of their own learning and use effective metacognitive strategies. In order to achieve this end,

pre-service science teachers should experience learning environments where they deal with open-ended and challenging tasks (Paris & Paris, 2001). Instructors can integrate teaching tools such as prompts, regulatory check-list to their instruction or/and use problem based learning as a method to enhance metacognitive strategy use. Additionally, instructors can be trained in using and demonstrating self-regulatory strategies to serve as social models for the pre-service science teachers (Dembo, 2001).

Moreover, approach goals should be stressed by instructors and become a policy of education faculties. In order to facilitate the adaptation of approach goals, more specifically mastery approach goals, classroom environments can be created relying on the structure of TARGET which is the acronym of task, authority, recognition, grouping, evaluation, and time (Ames, 1992; Maehr & Midgley, 1991). Accordingly, in the courses offered in teacher education programs, tasks given to pre-service science teachers should be interesting, diverse and challenging. Instructors should focus on meaningful learning and provide pre-service science teachers with some degree of control over instruction. They should also allow pre-service science teachers to work at their own pace and learn independently.Despite pre-service science teachers work collaboratively, they should get individual feedback from instructors focusing on their improvement. In addition, instructors and pre-service science teachers should determine work schedules together. Pre-service science teachers should be able to do planning and adjust time for their work such as their assignments and portfolios.

5.4 Limitations and Recommendations

There are some limitations of the current study that should be considered while interpreting the result. The first limitation is related to the measurement of the constructs. This study relies solely on the self-report data. This can lead to common method bias about verifying consistency and accuracy of the findings. In order to get an in-depth understanding of the observed relationships and provide better explanations, qualitative approach may be employed in future studies. Such an approach can help determine to what extent the unexpected findings can be explained by culture. In line with this idea, the study can be replicated in different cultures.

The second limitation concerns the generalizability of findings. The subject of this study was limited to the senior pre-service science teachers from selected universities in Turkey. Therefore, results may not be generalized to other countries and cultural contexts. Additionally this study may be replicated with a larger sample which includes also freshman, sophomore, and junior pre-service science teachers to be able to determine whether teaching self-efficacy differs across grade levels. Indeed, the present study was conducted with only senior pre-service science teachers who had not taken Practice Teaching in Science course which is offered in the last semester of the teacher education programs in Turkey. Teaching practice course gives pre-service teachers opportunity to apply their knowledge in real classroom environment that pre-service science teachers' beliefs about their teaching efficacy may change. Therefore, longitudinal studies can help examination of the changes in pre-service science teachers' self-efficacy beliefs during their education.

Another limitation is related to the method and data analysis technique utilized in the current study. Since a cross-sectional design is used, observed relationships in the path model do not imply causality.

In the present study, personality was used as a predictor variable. However, in future studies, the mediating role of personality on pre-service science teachers' self-efficacy and self-regulation can be examined through experimental studies in which they are exposed to treatments designed to improve their teaching self-efficacy and academic self-regulation. Then, using personality variables as mediators, researchers can examine whether certain personality traits promote or hinder the development of self-efficacy beliefs and self-regulatory skills (Bidjerano & Dai, 2007).

Finally, in the present study, for some variables, the percentage of variance explained was low. In order to improve the proposed model, additional variables, such as those related to sources of teaching self-efficacy (i.e. mastery experience, verbal persuasion, and vicarious experience), can be integrated to the model.

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APPENDIX A

THE INITIAL SIMPLIS SYNTAX FOR THE PATH MODEL

Path Analysis

Observed Variables: neu ext open agre cons sest seins secm ma pa mv pv tv clb tanx

meta pl er

Covariance Matrix from File: modelson.cov

Sample Size: 1794

Relationships:

sest seins secm = neu ext open agre cons er meta pl tv clb ma pa mv pv

tanx = neu

er = pl clb meta cons open agre neu ext

meta = clb tv ma pa mv pv neu ext open agre cons

ma pa mv pv = neu ext open agre cons tv clb

Path Diagram

Number of Decimals=3

Wide Print

Print Residuals

Lisrel output: SS SC EF

End of Problem

APPENDIX B

THE FINAL SIMPLIS SYNTAX FOR THE PATH MODEL

Path Analysis

Observed Variables: neu ext open agre cons sest seins secm ma pa mv pv tv clb tanx

meta pl er

Covariance Matrix from File: modelson.cov

Sample Size: 1794

Relationships:

sest seins secm = neu ext open agre cons er meta pl tv clb ma pa mv pv

tanx = neu

er = pl clb meta cons open agre neu ext

meta = clb tv ma pa mv pv neu ext open agre cons

ma pa mv pv = neu ext open agre cons tv clb

Path Diagram

Number of Decimals=3

Wide Print

Print Residuals

set covariance from seins to sest

set path from secm to sest

set path from secm to seins

set covariance from pa to pv

set path from pa to ma

set path from pl to meta

Lisrel output: SS SC EF

End of Problem

APPENDIX C

GOODNESS-OF-FIT STATISTICS

Degrees of Freedom = 29

Minimum Fit Function Chi-Square = 591.375 (P = 0.0)

Normal Theory Weighted Least Squares Chi-Square = 541.919 (P = 0.0)

Estimated Non-centrality Parameter (NCP) = 512.919

90 Percent Confidence Interval for NCP = (441.040 ; 592.224)

Minimum Fit Function Value = 0.330

Population Discrepancy Function Value (F0) = 0.287

90 Percent Confidence Interval for F0 = (0.247 ; 0.332)

Root Mean Square Error of Approximation (RMSEA) = 0.0995

90 Percent Confidence Interval for RMSEA = (0.0923 ; 0.107)

P-Value for Test of Close Fit (RMSEA < 0.05) = 0.000

Expected Cross-Validation Index (ECVI) = 0.463

90 Percent Confidence Interval for ECVI = (0.422 ; 0.507)

ECVI for Saturated Model = 0.192

ECVI for Independence Model = 4.711

Chi-Square for Independence Model with 153 Degrees of Freedom = 8372.616

Independence AIC = 8408.616

Model AIC = 825.919

Saturated AIC = 342.000

Independence CAIC = 8525.475

Model CAIC = 1747.812

Saturated CAIC = 1452.167

Root Mean Square Residual (RMR) = 3.052

Standardized RMR = 0.0527

Goodness of Fit Index (GFI) = 0.968

Adjusted Goodness of Fit Index (AGFI) = 0.808

Parsimony Goodness of Fit Index (PGFI) = 0.164

Normed Fit Index (NFI) = 0.929

Non-Normed Fit Index (NNFI) = 0.639

Parsimony Normed Fit Index (PNFI) = 0.176

Comparative Fit Index (CFI) = 0.932

Incremental Fit Index (IFI) = 0.933

Relative Fit Index (RFI) = 0.627

Critical N (CN) = 151.347
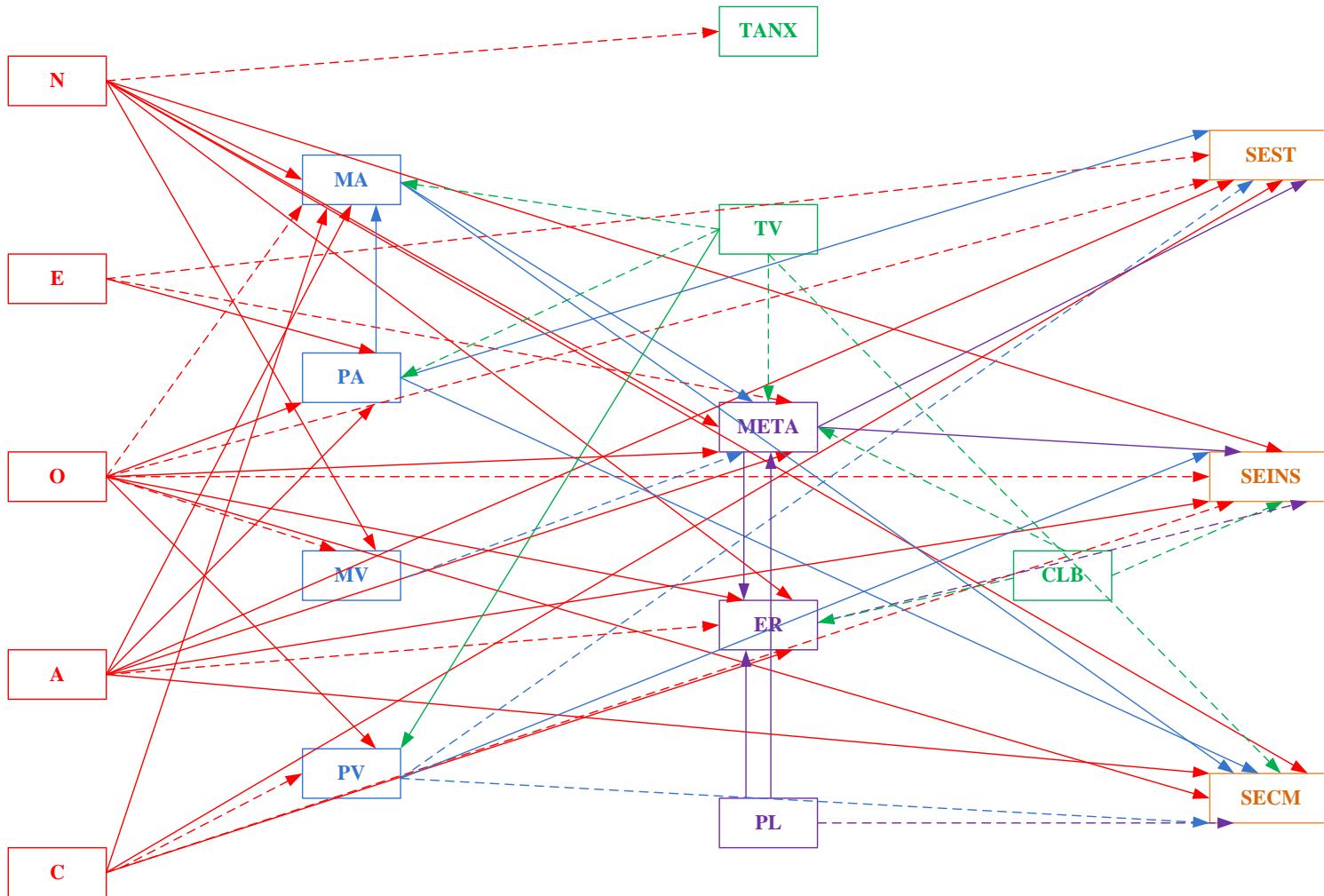
Değerli Öğretmen Adayı,

Bu anket sizin kişilik özelliklerinizi, hedef yöneliminizi, öğrenme stratejilerinizi ve öğretmeye ilişkin özyeterlik inançlarınızı belirlemek amacıyla hazırlanmıştır. Bu sorulara vereceğiniz yanıtlar, araştırma amacıyla kullanılacak ve gizli tutulacaktır. Sizlerin görüşleri bizler için çok önemlidir.

Yardımlarınız için teşekkür ederim.

ODTÜ Doktora Öğrencisi

Burcu ŞENLER

Kişisel Bilgiler

Cinsiyetiniz: ❏ Kız   ❏ Erkek

Yaşınız:

Üniversitenizin adı:

Genel Not Ortalamanız:

Annenizin Eğitim Durumu:	Babanızın Eğitim Durumu:
❏ Hiç okula gitmemiş	❏ Hiç okula gitmemiş
❏ İlkokul	❏ İlkokul
❏ Ortaokul	❏ Ortaokul
❏ Lise	❏ Lise
❏ Üniversite	❏ Üniversite
❏ Yüksek lisans / Doktora	❏ Yüksek lisans / Doktora

APPENDIX F

ÖĞRETMEN ÖZYETERLİK ÖLÇEĞİ

Bu ölçekte öğretmeye ilişkin özyeterlik inançlarınızı belirlemeye yönelik sorular yer almaktadır. Sorulara cevap verirken eğer kendinizi çok yeterli görüyorsanız çok yeterli, yetersiz görüyorsanız yetersiz sütununu işaretleyiniz. Bu iki durum dışında ise çok yeterli ve yetersiz arasında en iyi tanımladığını düşündüğünüz sütunu işaretleyiniz. Unutmayın **Doğru** ya da **Yanlış** cevap yoktur. Yapmanız gereken sizi en iyi tanımlayacak cevabı işaretlemenizdir.

	yetersiz		çok az yeterli		biraz yeterli		oldukça yeterli		çok yeterli
1. Çalışması zor öğrencilere ulaşmayı ne kadar başarabilirsiniz?	1	2	3	4	5	6	7	8	9
2. Öğrencilerin eleştirel düşünmelerini ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
3. Sınıfta dersi olumsuz yönde etkileyen davranışları kontrol etmeyi ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
4. Derslere az ilgi gösteren öğrencileri motive etmeyi ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
5. Öğrenci davranışlarıyla ilgili beklentilerinizi ne kadar açık ortaya koyabilirsiniz?	1	2	3	4	5	6	7	8	9
6. Öğrencileri okulda başarılı olabileceklerine inandırmayı ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
7. Öğrencilerin zor sorularına ne kadar iyi cevap verebilirsiniz?	1	2	3	4	5	6	7	8	9
8. Sınıfta yapılan etkinliklerin düzenli yürümesini ne kadar iyi sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
9. Öğrencilerin öğrenmeye değer vermelerini ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
10. Öğrettiklerinizin öğrenciler tarafından kavranıp kavranmadığını ne kadar iyi değerlendirebilirsiniz?	1	2	3	4	5	6	7	8	9
11. Öğrencilerinizi iyi bir şekilde değerlendirmesine olanak sağlayacak soruları ne ölçüde hazırlayabilirsiniz?	1	2	3	4	5	6	7	8	9

12. Öğrencilerin yaratıcılığının gelişmesine ne kadar yardımcı olabilirsiniz?	1	2	3	4	5	6	7	8	9
13. Öğrencilerin sınıf kurallarına uymalarını ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
14. Başarısız bir öğrencinin dersi daha iyi anlamasını ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
15. Dersi olumsuz yönde etkileyen ya da derste gürültü yapan öğrencileri ne kadar yatıştırabilirsiniz?	1	2	3	4	5	6	7	8	9
16. Farklı öğrenci gruplarına uygun sınıf yönetim sistemi ne kadar iyi oluşturabilirsiniz?	1	2	3	4	5	6	7	8	9
17. Derslerin her bir öğrencinin seviyesine uygun olmasını ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
18. Farklı değerlendirme yöntemlerini ne kadar kullanabilirsiniz?	1	2	3	4	5	6	7	8	9
19. Birkaç problemli öğrencinin derse zarar vermesini ne kadar iyi engelleyebilirsiniz?	1	2	3	4	5	6	7	8	9
20. Öğrencilerin kafası karıştığında ne kadar alternatif açıklama ya da örnek sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
21. Sizi hiçe sayan davranışları gösteren öğrencilerle ne kadar iyi baş edebilirsiniz?	1	2	3	4	5	6	7	8	9
22. Çocuklarının okulda başarılı olmalarına yardımcı olmaları için ailelere ne kadar destek olabilirsiniz?	1	2	3	4	5	6	7	8	9
23. Sınıfta farklı öğretim yöntemlerini ne kadar iyi uygulayabilirsiniz?	1	2	3	4	5	6	7	8	9
24. Çok yetenekli öğrencilere uygun öğrenme ortamını ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9

APPENDIX G

HEDEF YÖNELİMİ ÖLÇEĞİ

Bu ölçekte alan ve meslek derslerindeki hedef yöneliminizi belirlemeye yönelik ifadeler yer almaktadır. Eğer ifadenin her zaman için geçerli olduğunu düşünüyorsanız, her zaman sütununu işaretleyiniz. Eğer ifadenin hiçbir zaman için geçerli olduğunu düşünüyorsanız, hiçbir zaman sütununu işaretleyiniz. Bu iki durum dışında ise her zaman ve hiçbir zaman arasında sizi en iyi tanımladığını düşündüğünüz sütunu işaretleyiniz. Unutmayın **Doğru** ya da **Yanlış** cevap yoktur yapmanız gereken sizi en iyi tanımlayacak cevabı işaretlemenizdir.

	Her Zaman	Çoğunlukla	Bazen	Nadiren	Hiçbir Zaman
1. Bu derslerin içeriğini mümkün olduğunca iyi anlamak benim için önemlidir.					
2. Bu derslerdeki amacım sınıftaki diğer öğrencilerden daha kötü performans sergilemekten kaçınmaktır.					
3. Bu derslerin zorlayıcı noktalarının bana ileride olumlu katkılarının olacağını düşünüyorum.					
4. Diğer öğrencilerden daha iyisini yapmak benim için önemlidir.					
5. Bu derslerin bana tehdit oluşturduğunu düşünüyorum.					
6. Bu derslerden mümkün olduğunca çok şey öğrenmek istiyorum.					
7. Bu derslerde beni sıklıkla motive eden şey, diğerlerinden daha kötü performans sergileme korkusudur.					
8. Bu derslerde verilen her şeyi tam olarak öğrenmek arzusundayım.					
9. Bu derslerin zorlayıcı noktaları benim için olumlu etkiler ifade eder.					
10. Bu derslerde amacım, diğer pek çok öğrenciden daha iyi bir not almaktır.					
11. Bu derslerde öğrenebileceğimden daha azını öğrenmekten korkuyorum.					

12. Bu dersleri okul hayatımda bir tehdit olarak görüyorum.					
13. Bu derslerdeki tek amacım diğerlerinden daha başarısız olmanın önüne geçmektir.					
14. Bu derslerde öğrenilecek her şeyi öğrenemeyebileceğimden sıklıkla endişe duyuyorum.					
15. Bu derslerde başarılı olmayı bekliyorum.					
16. Bu derslerden diğerlerine göre daha başarılı olmak benim için önemlidir.					
17. Bazen bu derslerin içeriğini istediğim kadar iyi anlayamayacağımdan korkuyorum.					
18. Bu derslerden mükemmel bir not alacağıma inanıyorum					
19. Bu derslerde amacım başarısız olmaktan kaçınmaktır.					
20. Bu derslerde beni sıklıkla motive eden şey başarısız olma korkusudur.					
21. Bu derslerde sadece başarısız olmaktan kaçınmak istiyorum.					

ÖĞRENMEDE GÜDÜSEL STRATEJİLER ANKETİ

Bu ankette alan ve meslek derslerine karşı tutumunuzu, motivasyonunuzu, bu derslerde kullandığınız öğrenme stratejileri ve çalışma becerilerini belirlemeye yönelik ifadeler yer almaktadır. Cevap verirken aşağıda verilen ölçeği göz önüne alınız. **Eğer ifadenin sizi tam olarak yansıttığını düşünüyorsanız, 7' yi; ifadenin sizi hiç yansıtmadığını düşünüyorsanız, 1' i işaretleyiniz. Bu iki durum dışında ise 1 ve 7 arasında sizi en iyi tanımladığını düşündüğünüz numarayı işaretleyiniz.** Unutmayın Doğru ya da Yanlış cevap yoktur yapmanız gereken sizi en iyi tanımlayan numarayı işaretlemenizdir.

1 --- 2 --- 3 --- 4 --- 5 --- 6 -- 7

beni hiç   beni tam olarak
yansıtmıyor   yansıtıyor

1. Eğer uygun şekilde çalışırsam, dersteki konuları öğrenebilirim.	1	2	3	4	5	6	7
2. Dersin sınavları sırasında, diğer arkadaşlarıma göre soruları ne kadar iyi yanıtlayıp yanıtlayamadığımı düşünürüm.	1	2	3	4	5	6	7
3. Derste öğrendiklerimi başka derslerde de kullanabileceğimi düşünüyorum.	1	2	3	4	5	6	7
4. Dersin sınavları sırasında bir soru üzerinde uğraşırken, aklım sınavın diğer kısımlarında yer alan cevaplayamadığım sorularda olur.	1	2	3	4	5	6	7
5. Dersteki konuları **öğrenemezsem** bu benim hatamdır.	1	2	3	4	5	6	7
6. Dersteki konuları öğrenmek benim için önemlidir.	1	2	3	4	5	6	7
7. Dersin sınavları sırasında dersten başarısız olmanın sonuçlarını aklımdan geçiririm.	1	2	3	4	5	6	7
8. Dersin kapsamında yer alan konular çok ilgimi çekiyor.	1	2	3	4	5	6	7

9. Yeterince sıkı çalışırsam derste başarılı olurum.	1	2	3	4	5	6	7
10. Dersin sınavlarında kendimi mutsuz ve huzursuz hissederim.	1	2	3	4	5	6	7
11. Derste öğrendiklerimin benim için faydalı olduğunu düşünüyorum.	1	2	3	4	5	6	7
12. Derste bir konuyu **anlayamazsam** bu yeterince sıkı çalışmadığım içindir.	1	2	3	4	5	6	7
13. Dersteki konulardan hoşlanıyorum.	1	2	3	4	5	6	7
14. Dersteki konuları anlamak benim için önemlidir.	1	2	3	4	5	6	7
15. Dersin sınavlarında kalbimin hızla attığını hissederim.	1	2	3	4	5	6	7
16. Ders sırasında başka şeyler düşündüğüm için önemli kısımları sıklıkla kaçırırım.	1	2	3	4	5	6	7
17. Ders çalışırken çoğu kez arkadaşlarıma konuları açıklamaya çalışırım.	1	2	3	4	5	6	7
18. Ders ile ilgili bir şeyler okurken, okuduklarıma odaklanabilmek için sorular oluştururum.	1	2	3	4	5	6	7
19. Ders çalışırken kendimi çoğu zaman o kadar isteksiz ya da o kadar sıkılmış hissederim ki, planladıklarımı **tamamlamadan** çalışmaktan vazgeçerim.	1	2	3	4	5	6	7
20. Derste bir konuyu anlamakta zorluk çeksem bile hiç kimseden yardım almaksızın kendi kendime çalışırım.	1	2	3	4	5	6	7
21. Ders ile ilgili bir şeyler okurken bir konuda kafam karışırsa, başa döner ve anlamak için çaba gösteririm.	1	2	3	4	5	6	7
22. Eğer ders ile ilgili okumam gereken konuları anlamakta zorlanıyorsam, okuma stratejimi değiştiririm.	1	2	3	4	5	6	7
23. Derste verilen ödevleri tamamlamak için sınıftaki diğer öğrencilerle çalışırım.	1	2	3	4	5	6	7
24. Derste yaptıklarımızdan **hoşlanmasam bile** başarılı olabilmek için sıkı çalışırım.	1	2	3	4	5	6	7
25. Ders çalışırken konuları sınıftaki arkadaşlarımla tartışmak için sıklıkla zaman ayırırım.	1	2	3	4	5	6	7
26. Yeni bir konuyu detaylı bir şekilde çalışmaya başlamadan önce çoğu kez konunun nasıl organize edildiğini anlamak için ilk olarak konuyu hızlıca gözden geçiririm.	1	2	3	4	5	6	7
27. Derste işlenen konuları anladığımdan emin olabilmek için kendi kendime sorular sorarım.	1	2	3	4	5	6	7

28.	Çalışma tarzımı, dersin gereklilikleri ve öğretmenin öğretme stiline uygun olacak tarzda değiştirmeye çalışırım.	1	2	3	4	5	6	7
29.	Genelde derse gelmeden önce konuyla ilgili bir şeyler okurum fakat okuduklarımı çoğunlukla **anlamam**.	1	2	3	4	5	6	7
30.	İyi anlamadığım bir konuyu öğretmenimden açıklamasını isterim.	1	2	3	4	5	6	7
31.	Eğer bir konu zorsa ya çalışmaktan vazgeçerim ya da yalnızca kolay kısımlarını çalışırım.	1	2	3	4	5	6	7
32.	Ders çalışırken, konuları sadece okuyup geçmek yerine ne öğrenmem gerektiği konusunda düşünmeye çalışırım.	1	2	3	4	5	6	7
33.	Derste bir konuyu anlayamazsam sınıftaki başka bir öğrenciden yardım isterim.	1	2	3	4	5	6	7
34.	Konu çok sıkıcı olsa da, ilgimi **çekmese** de konuyu bitirene kadar çalışmaya devam ederim.	1	2	3	4	5	6	7
35.	Gerektiğinde yardım isteyebileceğim arkadaşlarımı belirlemeye çalışırım.	1	2	3	4	5	6	7
36.	Ders çalışırken iyi anlamadığım kavramları belirlemeye çalışırım.	1	2	3	4	5	6	7
37.	Ders çalışırken, çalışmalarımı yönlendirebilmek için kendime hedefler belirlerim.	1	2	3	4	5	6	7
38.	Ders sırasında not alırken kafam karışırsa, notlarımı dersten sonra düzenlerim.	1	2	3	4	5	6	7

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Year	Place	Enrollment
2006- Present	METU Department of Elementary Education	Research Assistant
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English

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Diving, Hiking, Latin Dancing

İLKÖĞRETİM FEN BİLGİSİ ÖĞRETMEN ADAYLARININ ÖZ-YETERLİK İNANÇLARI İLE KİŞİLİK ÖZELLİKLERİ VE AKADEMİK ÖZ-DÜZENLEME BECERİLERİ ARASINDAKİ İLİŞKİ

Giriş

Son yıllarda yapılan birçok çalışma, etkili bir öğretim yapmada sadece pedagoji bilgisi ile alan bilgisinin yeterli olmadığını göstermiştir. Öğretmenlerin iyi bir öğretim yapabileceklerine yönelik inançları da aynı zamanda etkili bir öğretim yapmalarını etkiler (Knoblauch & Hoy, 2008). Öğretmen öz-yeterlik inançları - zor ve güdüsü düşük öğrenciler de dahil olmak üzere, öğrencilerin öğrenmelerini başarılı bir şekilde sağlama inancı- öğretmenlerin sınıf içi davranışları ve başarı, motivasyon gibi öğrenci çıktılarıyla ilişkilidir (Ashton & Webb, 1986; Midgley, Feldlaufer, & Eccles, 1989). Diğer bir deyişle öğretmen öz-yeterlik inançları öğrencilerin eğitimsel, sosyal ve duygusal ihtiyaçlarını karşılamada çok önemli bir rol oynamaktadır. Ayrıca öğretmen öz-yeterlik inançları öğretmenlerin amaçlarını belirler. Bu nedenle öz-yeterlik inançları öğretmenlerin performansını ve dolayısıyla öğrenci başarısını etkiler (Bandura, 1993; Goddard, Hoy, & Woolfolk Hoy, 2000;

Hoy, Sweetland, & Smith, 2002). Bunun yanında öz-yeterlik inançlarının öğretmen davranışlarını etkilediği de saptanmıştır (Riggs, Diaz, Riggs, Jesunathadas, Brasch, Torer, Shamansky, Crowell, & Pelletier, 1994). Örneğin, öz-yeterlik inançları öğretmenlerin farklı materyaller ve yaklaşımları deneme arzusunu etkilediği için çeşitli öğretim metotlarını uygulama isteklerini arttırır (Weiner, 2003). Gerçekten de öz-yeterlik inançları yüksek olan öğretmenlerin yeni stratejiler kullanmaya hevesli oldukları (Cousins & Walker, 2000), öğrencilerin ihtiyaçlarını daha iyi karşıladıkları (Ashton & Webb, 1986) ve öğretmeye gönülden bağlı oldukları (Coladarci, 1992) görülmüştür. Bu öğretmenler zorluklar karşısında çabuk yılmamaktadırlar. Zor öğrencilerle daha uzun sure çalışıp, öğrenci hatalarına karşı daha hoş görülüdürler (Gibson & Dembo, 1984; Ashton & Webb, 1986; Fuchs, Fuchs, & Bishop, 1992).

İlgili alanda sınırlı sayıda çalışma öğretmen adaylarının öz-yeterlik inançlarını ve ona etki eden faktörleri konu almıştır. Bu faktörlerden biri olan öz-düzenleme becerileri biliş ve bilişötesi kadar güdüsel ve davranışsal bileşenler de içermektedir (Zimmerman, 2000). Diğer bir deyişle son dönemlerde ortaya atılan öz-düzenleme beceri modelleri Bandura'nın sosyal-bilişsel kuramına dayandığı için eğer birey kendi kendini motive edemezse bilişsel ve bilişötesi stratejileri tam anlamıyla kullanamaz. Pek çok güdüsel inanç hedef belirlemede ve strateji planlamada önem taşır. Bu güdüsel inançlar, öğrencilerin kendi öğrenmelerini kontrol etmelerini, öğrenmeye verdikleri değer algılarını, hedef yönelimlerini ve sınav kaygısını içerir. Öğrenmeye verilen değer yani içsel değer ile hedef yönelimleri öğrencilerin öğrenme nedenlerini belirler (Pintich & DeGroot, 1990; VanderStoep, Pintrich, & Fagerlin,

1996; Zimmerman, 2000). Son dönemdeki çalışmalar hedef yönelimlerini öğrenme yaklaşım, performans yaklaşım, öğrenme kaçınma ve performans kaçınma olmak üzere dört gruba ayırmıştır. Öğrenme yaklaşma anlamlı öğrenmeyi vurgularken öğrenme kaçınma tam olarak öğrenememekten kaçınmayı vurgular. Bunun yanında, performans yaklaşma en yüksek notu almayı hedeflerken performans kaçınma en düşük notu almaktan kaçınmayı hedefler (Elliot & Church, 1997; Elliot & McGregor, 2001; Elliot & Reis, 2003; Pintrich & Schunk, 2002). Konuyla ilgili çalışmalar yaklaşma hedeflerinin, içsel değerin ve çaba göstermenin başarıyı doğrudan belirlediğini ve planlama, öğrenmeyi düzenleme gibi bilişötesi stratejileri kullanmayla pozitif bir ilişkisi olduğunu göstermiştir (Ames & Archer, 1988; Meece, Blumenfeld, & Hoyle, 1988; Neber, & Schommer-Aikins, 2002; Pintich & DeGroot, 1990, Sungur, 2007). Diğer yandan bilişsel ve bilişötesi bileşenler öğrencilerin planlama ve düzenleme gibi çeşitli strateji kullanımını kapsar. Davranış bileşenleri ise çaba gösterme (zor ya da sıkıcı konuları öğrenmeye karşı çaba sarf etme) ve akranla öğrenmeyi (akranla birlikte çalışma) içerir. Kendi öğrenmelerinde bilişsel, güdüsel ve davranışsal olarak aktif olan bireyler öz-düzenleme becerilerine sahip bireyler olarak tanımlanabilir. Zimmerman'a (2002) göre öz-düzenleme bireylerin hedeflerine ulaşmak için düşüncelerini, davranışlarını ve duygularını aktif ve sürdürebilir hale getirme sürecidir. Dolayısı ile öz-düzenleme becerilerine sahip olan bireyler hedeflerini belirleyebilir, bu hedeflere ulaşmak için uygun stratejileri kullanabilir ve kendi öğrenmelerini değerlendirebilirler. Bu bireyler stratejileri kullanma ve çaba sarf etme konusunda motive olmuşlardır (Pintrich & DeGroot, 1990; McCoach & Siegle, 2003). Bu nedenle, öz-düzenleme becerilerine sahip

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bireyler kendi öğrenmelerinde pasif olan ve öğretmene bağımlı olmayan bireylerden daha başarılıdırlar (Risemberg & Zimmerman, 1992).

Farklı sınıf seviyelerinde öğrencilerin öz-düzenleme becerilerine ilişkin pek çok çalışma olmasına karşın öğretmenlerin ya da öğretmen adaylarının kendi öğrenme süreçlerinde öz-düzenleme becerilerini kullanmalarına yönelik az sayıda çalışmaya rastlanılmaktadır. Yapılan bu az sayıdaki çalışma öğretmenlerin ve öğretmen adaylarının öz-düzenleme stratejilerini öğrenciler kadar etkili kullanamadıklarını ortaya koymuştur. Ayrıca öz-düzenleme becerilerini kullanan öğretmenlerin öğrencilerine öz-düzenleme becerilerini öğrettikleri ve bu becerileri kullanmaya teşvik ettikleri görülmüştür (Gordon, Dembo, & Hocevar, 2007). Bunun yanında, öğretmen etkinliği üzerine olan çalışmalar öz-düzenleme becerilerinin öğretmenlerin davranışlarıyla ve sınıf uygulamalarıyla anlamlı bir şekilde ilişkili olduğunu dolayısıyla öğretmenlerin öz-yeterlik inançlarının da önemli bir belirleyicisi olduğunu göstermiştir (Bembenutty, 2006; Dembo, 2001).

İlgili literatüre bakıldığında kişilik özelliklerinin öğretmen öz-yeterlik inancıyla ilişkili bir diğer faktör olduğu görülmüştür. Beş faktör kişilik modeline göre faktörler (Duygusal Dengesizlik, Dışadönüklük, Açıklık, Geçimlilik, Sorumluluk) kişiliğin başlıca temellerindendir ve davranışı etkiler (Costa & McCrae, 1992). Bu faktörlerden özellikle iki tanesi dışadönüklük ve sorumluluk eğitim alanında oldukça dikkat çekmektedir. Dışadönüklük puanları yüksek olan kişiler sosyal, meraklı iken sorumluluk puanları yüksek olan kişiler öz-disiplinli, düzenli ve görevlerine bağlıdırlar. Dolayısıyla kişilik özelliklerinin öğrencilerin öğrenme sürecindeki

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motivasyonu, bilişleri ve davranışları üzerinde etkili olduğu söylenebilir (Costa & McCrae, 1992). Dahası kişilik özellikleri performans motivasyonu ve iş performansı ile ilişki olduğu için (Barrick, & Mount, 1991; Judge, & Ilies, 2002), belirli kişilik özelliklerine sahip kişiler daha yüksek öğretmen öz-yeterlik inanç düzeyine sahip olabilirler. Örneğin, Erdle, Murray ve Rushton'in (1985) çalışması öğretmenlerin kullandıkları stratejiler ve materyaller üzerinden kişilik özellikleri ile öğretmen etkinliği arasında anlamlı bir ilişki olduğunu göstermiştir. Katz (1992) bu sonucu destekleyerek analitik düşünme yeteneğine sahip, yaratıcı öğretmenlerin öğretimlerinde çeşitli stratejiler kullandıklarını tespit etmiştir. Ayrıca, dışadönük ve kararlı yapıdaki öğretmenlerin yeni düşüncelere daha açık olduğunu saptamıştır. Bunun yanında, Knoblauch ve Hoy (2008) öğretmen öz-yeterlik inancının kişilik özellikleri ile ilişkili olan etkili öğretim üzerinde önemli bir etkisi olduğunu öne sürmüştür.

Bu çalışmanın amacı öğretmen adaylarının öz-yeterlik inançları, akademik öz-düzenleme becerileri ve kişilik özellikleri arasındaki olası ilişkileri belirlemektir. Kapsamlı bir literatür taraması ışığında üç varsayımda bulunulmuştur. İlki, kişilik özellikleri ile akademik öz-düzenleme becerileri arasında ilişki olabilir. İkincisi, kişilik özellikleri hem doğrudan hem de dolaylı olarak öz-yeterlik inançlarıyla ilişkili olabilir. Son olarak, akademik öz-düzenleme becerileri öz-yeterlik inançlarıyla ilişkili olabilir. Bu varsayımları test etmek için değişkenler arasındaki ilişkileri tanımlayan bir model geliştirilmiştir (bkz. Şekil 1).
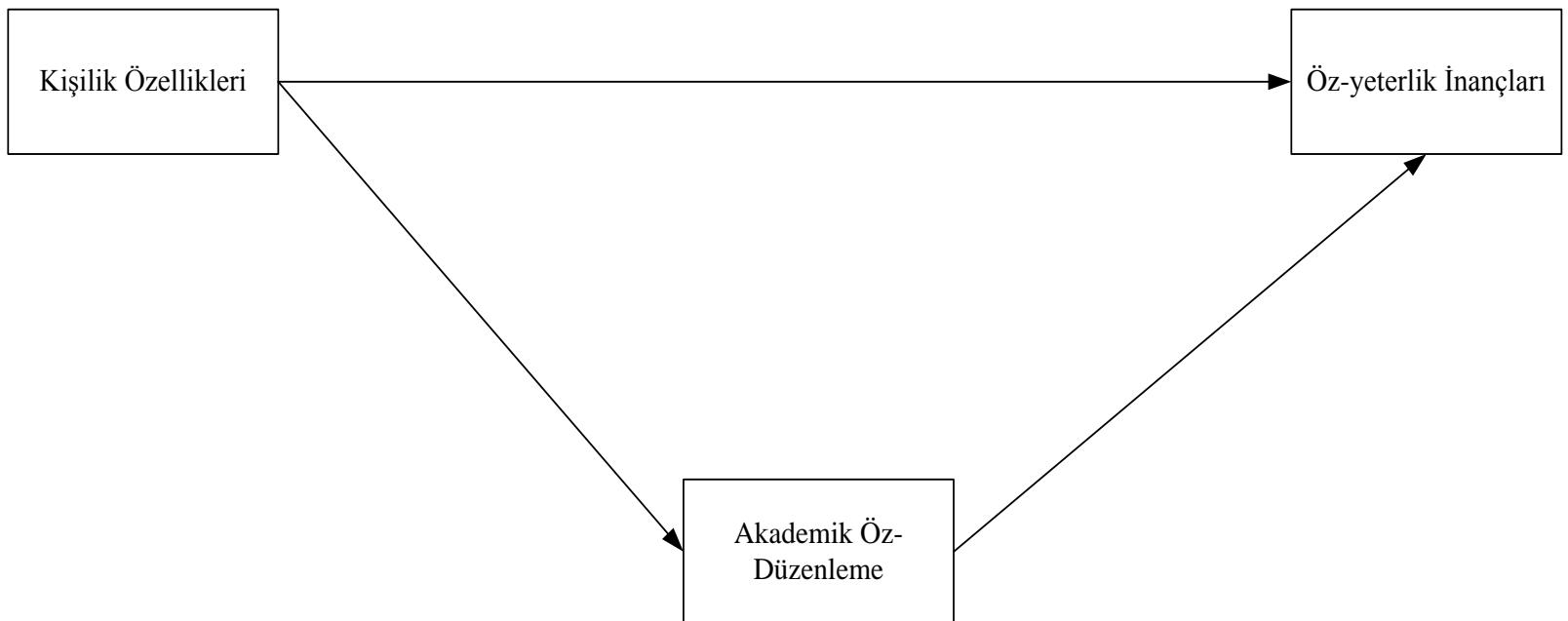
Şekil 1 Öz-yeterlik inançları, akademik öz-düzenleme becerileri ve kişilik özellikleri arasındaki ilişkiyi gösteren model

Bu varsayımlar doğrultusunda aşağıdaki sorulara cevap aranmıştır.

1. Türk fen bilgisi öğretmen adaylarının akademik öz-düzenleme becerileri (hedef yönelimi, içsel değer, öğrenmeyi kontrol etme, kaygı, bilişötesi öz-düzenleme, çaba gösterme ve akranla öğrenme) ile öz-yeterlik inançları (öğrenci katılımını sağlama, öğretim stratejilerini kullanma ve sınıf yönetimi) arasındaki ilişki var mıdır?

2. Türk fen bilgisi öğretmen adaylarının kişilik özellikleri (Duygusal Dengesizlik, Dışadönüklük, Açıklık, Geçimlilik, Sorumluluk) ile öz-yeterlik inançları arasındaki ilişki var mıdır?

3. Türk fen bilgisi öğretmen adaylarının kişilik özellikleri ile akademik öz-düzenleme becerileri arasındaki ilişki var mıdır?

Fen Bilgisi Öğretmen Adaylarının Öz-yeterlik İnançları ile Öz-Düzenleme Becerileri Arasındaki İlişki

Öğretmenlerin ve öğretmen adaylarının kendi öğrenme süreçlerinde öz-düzenleme becerilerini kullanmalarına ilişkin yeterli çalışma bulunmamaktadır. Var olan çalışmalara göre öğretmenler ya da öğretmen adayları öz-düzenleme becerilerini öğrenciler kadar etkili kullanamamakta ve öz-düzenleme becerisi olan bir öğretmenin öğrencilerine bu becerileri kazanmada yardım etmekte olduğu görülmüştür (Gordon, Dembo, & Hocevar, 2007). Ek olarak, eğer öğretmenler öz-düzenleme becerilerine değer verirlerse öğrenci otonomisini destekleyen sınıf ortamı yaratmaktadırlar.

Bunun yanında, öğretmenlerin etkinliği üzerine yapılan çalışmalar, öz-düzenleme becerilerinin sınıf içi davranışlarının belirleyicisi olan öz-yeterlik inancı üzerinde büyük etkisi olduğunu ortaya koymuştur (Bembenutty, 2006; Dembo, 2001).

Örneğin Bembenutty (2007) öğretmenlerin öz-yeterlik inançları, güdüsel inançları, akademik doyumu engelleme ve öz-düzenleme becerileri arasındaki ilişkiyi incelemiştir. 63 ortaöğretim öğretmenine ölçekler uygulanmış ve değişkenler arasındaki ilişki için sıfır korelasyonlar hesaplanmıştır. Sonuçlar, öğretmenlerin öz-yeterlik inançları ile öz-düzenleme becerileri arasında yüksek korelasyon olduğunu göstermiştir. İçsel değer, içsel ilgi ve bilişötesi strateji kullanımı ile öz-yeterlik inançları arasında pozitif bir ilişki olduğu tespit edilmiştir. Yine içsel değer ile bilişötesi strateji kullanımı arasında pozitif bir ilişki olduğu görülmüştür.

Bu araştırmalara dayanarak öğretmen yetiştirme programları öğretmen adaylarının öz-yeterlik inançlarını geliştirmek için kendi öğrenmelerini güdüsel, bilişsel ve davranışsal olarak düzenlemelerine ve kendi eğitimlerinde etkili stratejileri kullanmalarına yardımcı olmalıdır. Böylelikle, öz-yeterlik inançlarının, öğretmenlerin kendi öğrenmelerinde kullandıkları akademik öz-düzenleme becerileri ile sınıf içi davranışları arasında önemli bir rol oynadığı görülmektedir.

Yukarıda bahsedilen literatüre dayanarak bu çalışmada fen bilgisi öğretmen adaylarının akademik öz-düzenleme becerileri (hedef yönelimi, içsel değer, öğrenmeyi kontrol etme, sınav kaygısı, bilişötesi strateji kullanımı, çaba gösterme ve akranla öğrenme) ile öz-yeterlik inançları (öğrenci katılımına, öğretim stratejilerine

ve sınıf yönetimine yönelik öz-yeterlik inançları) arasında ilişki olduğu öne sürülmüştür. Ek olarak akademik öz-düzenleme becerilerinin değişkenleri arasında da ilişki olduğu düşünülmüştür (bkz. Tablo 1).

Tablo 1 Akademik öz-düzenleme beceri değişkenleri ile öz-yeterlik inanç değişkenleri arasındaki yollar

Yollar						
geldiği değişken	*gittiği değişkenler*					
Öğrenme Yaklaşma	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi		Bilişötesi	Öz-düzenleme
Performans Yaklaşma	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi		Bilişötesi	Öz-düzenleme
Öğrenme Kaçınma	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi		Bilişötesi	Öz-düzenleme
Performans Kaçınma	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi		Bilişötesi	Öz-düzenleme

Tablo 1 (Devamı)

geldiği değişken	Yollar gittiği değişkenler								
İçsel Değer	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi	Öğrenme Yaklaşma	Performans Yaklaşma	Öğrenme Kaçınma	Performans Kaçınma	Bilişötesi Öz-düzenleme	
Öğrenmeyi Kontrol Etme	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi	Öğrenme Yaklaşma	Performans Yaklaşma	Öğrenme Kaçınma	Performans Kaçınma	Bilişötesi Öz-düzenleme	Çaba Gösterme
Bilişötesi Öz-düzenleme	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi						Çaba Gösterme
Çaba Gösterme	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi						
Akranla Öğrenme	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi						Çaba Gösterme

Fen Bilgisi Öğretmen Adaylarının Öz-yeterlik İnançları ile Kişilik Özellikleri Arasındaki İlişki

İlgili literatür öğretmenlerin kişilik özelliklerinin etkili öğretim yapmayla ilişkili olduğunu göstermiştir. Bu konudaki çalışmalardan birinde Henson ile Chambers (2003) öğretmenlerin kişilik özellikleri, sınıf yönetim şekilleri ve öz-yeterlik inançları arasındaki ilişkiyi incelemiştir. Bu amaçla öğretmenlikte ilk yılı olan 120 ortaöğretim öğretmeniyle çalışma yapılmıştır. Çalışma sonunda dışadönük öğretmenlerin daha yüksek düzeyde öz-yeterlik inancına sahip oldukları saptanmıştır. Bu sonucu destekleyen bir başka çalışmada kişilik özelliklerinden Dışadönüklük toplam öz-yeterlik inançları ile olduğu kadar öğrenci katılımına, öğretim stratejilerine ve sınıf yönetimine yönelik öz–yeterlik inançları ile pozitif ilişkili bulunmuştur (Roberts, Harlin, & Briers, 2007). Dahası Barrick ile Mount'un (1991) kişilik özellikleri ile meslek etkinliği üzerine yaptıkları meta-analiz sonucunda sorumluluk ve duygusal dengesizlik boyutlarının meslek performansları üzerine etkili olduğu görülmüştür. Sorumluluk çalışkanlık ve zorluklar karşısında direnç gibi alt boyutlar içerdiği için yüksek düzeyde sorumluluğun daha iyi iş performansıyla ilişkili olduğu tespit edilmiştir. Öte yandan, duygusal dengesizlik kaygı ve endişe alt boyutlarına sahip olduğu için yüksek düzeyde duygusal dengesizliğin daha kötü iş performansıyla ilişkili olduğu saptanmıştır.

Konuyla ilgili yapılan çalışmalar ışığında, kişilik özelliklerinin öğretim etkinliği üzerinde doğrudan etkisi olan öz-yeterlik inançlarıyla ilişkili olduğu düşünülmüştür.

Daha detaylı belirtmek gerekirse, öğretmenlik öğrencilerle, meslektaşlarla ve velilerle iletişim gerektirdiği için dışadönüklük, geçimlilik ve sorumluluk puanı yüksek olan kişilerin daha yüksek düzeyde öz-yeterlik inançlarına sahip olduğu öne sürülmüştür. Yeniliklere açık kişiler meraklı ve açık görüşlü oldukları için bu kişilerin de yine daha yüksek düzeyde öz-yeterlik inançlarına sahip olduğu beklenmektedir. Öte yandan, duygusal dengesizlik negatif duygu ve stresle bağlantılı olduğu için duygusal dengesizlik ile öz-yeterlik inançları arasında negatif bir korelasyon beklenmektedir. Tablo 2 öğretmen adaylarının kişilik özellikleri değişkenleri ile öz-yeterlik inanç değişkenleri arasındaki bağlantılar gösterilmiştir.

Tablo 2 Kişilik özellikleri ile öz-yeterlik inanç değişkenleri arasındaki yollar

	Yollar		
geldiği değişken	*gittiği değişkenler*		
Duygusal Dengesizlik	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi
Dışadönüklük	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi
Açıklık	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi
Geçimlilik	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi
Sorumluluk	Öğrenci Katılımı	Öğretim Stratejileri	Sınıf Yönetimi

Fen Bilgisi Öğretmen Adaylarının Öz-Düzenleme Becerileri ile Kişilik Özellikleri Arasındaki İlişki

Kişilik özelliklerinin öğrencilerin öğrenme sürecindeki motivasyonları, bilişleri ve davranışları üzerine etkilidir (Costa & McCrae, 1992). Başka bir deyişle öz-düzenleme becerileri kişiliğin ayrılmaz bir parçasıdır (Matthews, Schwean, Campbell, Saklofske, & Mohamed, 2000). Örneğin, Blickle (1996) tarafından yapılan çalışma, kişilik özelliklerinden sorumluluğun çaba gösterme, bilişötesi, zaman ve çalışmanı alanını düzenleme, akranla öğrenme, organizasyon stratejilerini kullanma gibi öğrenme disipliniyle yüksek bir korelasyon gösterdiğini ortaya koymuştur. Ek olarak, açıklık öğrencilerin kritik düşünme becerileri ve daha iyi anlamaya yönelik öğrenme stratejileri kullanmaları ile bağlantılı çıkmıştır. Ayrıca, Bidjerano ve Dai'nin (2007) 219 üniversite öğrencisi üzerine yaptığı çalışma, kişilik özellikleri ile öz-düzenleme becerileri arasında örtüşme olduğunu göstermiştir. Kanonikal korelasyon analizi sonucunda sorumluluk ile açıklığın kritik düşünme becerisi, bilişötesi stratejiler kullanımı, çaba gösterme ve zaman yönetimi arasında anlamlı bir ilişki olduğunu göstermiştir. Benzer şekilde, Komarraju ve Karau (2005) kişilik özellikleri ile güdüsel faktörler arasında anlamlı bir ilişki olduğunu ortaya çıkarmıştır.

Daha detaylı açıklamak gerekirse, kaçınma yani başarısız olmaktan korkma, okulla ilgili cesaretsiz hissetme duygusal dengesizlik ve dışadönüklük ile pozitif bir ilişkiye sahip iken, sorumluluk ve açıklık ile negatif bir ilişkiye sahiptir. Katılım diğer bir deyişle öğrenmekten ve öğrendiklerini paylaşmaktan keyif alma, gelişmek için

çalışma açıklık ve dışadönüklük ile pozitif ilişkilidir. Son olarak, başkalarından daha başarılı olmak için çalışma ve çabalama duygusal dengesizlik, açıklık ve sorumluluk arasında pozitif bir ilişki vardır. Benzer şekilde Judge ve Ilies (2002) dışadönüklük ile hedef belirleme arasında anlamlı bir ilişki olduğunu bulmuştur. Dahası, Payne, Youngcourt ve Beaubien (2007) yaptıkları meta-analiz sonucunda sorumluluk, dışadönüklük, açıklık, geçimlilik ve duygusal dengesizlik öğrenme hedefleri ile pozitif ilişkili iken performans kaçınma hedefleri ile negatif ilişkili olduğunu saptamıştır. Yine, Klein ve Lee (2006) öğrenme hedefleri ile sorumluluk ve açıklık arasında pozitif bir ilişki bulmuştur.

Özet olarak, yukarıdaki çalışmalar kişilik özellikleri ile öz-düzenleme becerileri arasında anlamlı bir ilişkinin olduğunu ortaya koymaktadır. Her ne kadar bu ilişki henüz teorik olarak kurulamamış olsa da ilgili çalışmalara dayanarak iki değişken arasında anlamlı bir ilişki olduğu öne sürülmüştür. Bu çalışma sonucunda sorumluluk, geçimlilik ve açıklık ile sınav kaygısı ve kaçınma hedefleri dışındaki öz-düzenleme becerileri arasında ve dışadönüklük ile akranla öğrenme arasında pozitif bir ilişki beklenilmektedir. Diğer yandan, duygusal dengesizlik ile sınav kaygısı ve kaçınma hedefleri dışındaki öz-düzenleme becerileri arasında negatif bir ilişki beklenilmektedir (bkz Tablo 3).

Tablo 3 Akademik öz-düzenleme becerileri ile kişilik özellikleri değişkenleri arasındaki yollar

	Yollar							
geldiği değişken	*gittiği değişkenler*							
Duygusal Dengesizlik	Öğrenme Yaklaşma	Performans Yaklaşma	Öğrenme Kaçınma	Performans Kaçınma	Bilişötesi düzenleme	Öz-	Çaba Gösterme	Sınav Kaygısı
Dışadönüklük	Öğrenme Yaklaşma	Performans Yaklaşma	Öğrenme Kaçınma	Performans Kaçınma	Bilişötesi düzenleme	Öz-	Çaba Gösterme	
Açıklık	Öğrenme Yaklaşma	Performans Yaklaşma	Öğrenme Kaçınma	Performans Kaçınma	Bilişötesi düzenleme	Öz-	Çaba Gösterme	
Geçimlilik	Öğrenme Yaklaşma	Performans Yaklaşma	Öğrenme Kaçınma	Performans Kaçınma	Bilişötesi düzenleme	Öz-	Çaba Gösterme	
Sorumluluk	Öğrenme Yaklaşma	Performans Yaklaşma	Öğrenme Kaçınma	Performans Kaçınma	Bilişötesi düzenleme	Öz-	Çaba Gösterme	

Yöntem

Örneklem

Bu çalışmada popülasyon Türkiye'deki tüm fen bilgisi öğretmen adayları, örneklem ise 27 devlet üniversitesinden seçilen 1794 (876 erkek, 905 kız) son sınıf fen bilgisi öğretmen adayı olarak belirlenmiştir. Seçilen üniversitelerin hepsi Yüksek Öğretim Kurumu (1998) tarafından yapılandırılan aynı eğitim programını izlemektedir. Örneklem seçiminde öncelikle 7 coğrafi bölgede Fen Bilgisi Eğitimi Anabilim Dalı içeren üniversiteler belirlenmiş daha sonra da enerji, zaman ve bütçe doğrultusunda popülasyonu en iyi şekilde temsil edecek örneklem üniversiteleri seçilmiştir. Seçilen üniversitelerdeki tüm son sınıf fen bilgisi öğretmen adayları çalışmaya dahil edilmiştir. Coğrafi bölgelere göre örneklem dağılımı Tablo 4'te sunulmuştur. En çok Akdeniz Bölgesindeki üniversitelerde öğrenim görmekte olan öğrencilere ulaşılabilmişken en az Marmara Bölgesindeki öğrencilere ulaşılabilmiştir.

Tablo 4 Coğrafi bölgelere göre son sınıf fen bilgisi öğretmen adaylarının dağılımı (N=1794)

Coğrafi Bölge	Örneklemdeki Öğrenci sayısı *(f)*	Popülasyondaki öğrenci sayısı *(f)*	Yüzde *(%)*
Marmara	240	720	%33.3
Ege	359	465	%77.20
Akdeniz	72	90	%80
Karadeniz	365	710	%51.41
İç Anadolu	359	1040	%34.52
Doğu Anadolu	338	870	%38.85
Güneydoğu Anadolu	61	90	%67.78

Buna ek olarak örneklemde yer alan fen bilgisi öğretmen adaylarının demografik bilgileri ile ebeveynlerinin eğitim durumları Tablo 5'te gösterilmiştir. Örneklem cinsiyet bakımından yaklaşık olarak eşit sayıda erkek (%49.2) ve bayan (%50.8) öğretmen adaylarından oluşmuştur. Adayların genel not ortalamaları 4 üzerinden 2.70 ve yaşları ortalama 22'dir. Ebeveynlerinin büyük bir kısmı ilkokul mezunudur.

Tablo 5 Örneklemin demografik bilgileri

Değişken	*f*	*%*
Cinsiyet		
Erkek	876	%49.2
Bayan	905	%50.8
Cevapsız	13	
Annenin Eğitim Durumu		
Hiç okula gitmemiş	287	%16.1
İlkokul	958	%53.7
Orta Okul	181	%10.1
Lise	257	%14.4
Üniversite	99	%5.5
Mastır	2	%0.1
Doktora	0	0
Cevapsız	10	
Babanın Eğitim Durumu		
Hiç okula gitmemiş	61	%3.4
İlkokul	620	%34.9
Orta Okul	254	%14.3
Lise	434	%24.4
Üniversite	388	%21.8
Mastır	14	%0.8
Doktora	5	%0.3
Cevapsız	18	

Veri Toplama Araçları

Öğretmen Öz-yeterlik Ölçeği

Fen bilgisi öğretmen adaylarının öz-yeterlik inançlarını ölçmek amacıyla Tschannen-Moran ve Hoy (2001) tarafından geliştirilen, "Öğretmen Öz-yeterlik Ölçeği" kullanılmıştır. Ölçek 24 maddeden oluşmuştur. Ölçek öğrenci katılımına yönelik öz-yeterlik inancı (8 madde), öğretim stratejilerine yönelik öz-yeterlik inancı (8 madde) ve sınıf yönetimine yönelik öz-yeterlik inancı (8 madde) olmak üzere 3 alt boyuttan meydana gelmiştir. Capa, Cakıroglu ve Sarikaya (2005) tarafından Türkçeye uyarlanmıştır. Ölçeğin Türkçe versiyonun güvenirlik katsayıları sırasıyla; öğrenci katılımı için .82, öğretim stratejileri için .86 ve sınıf yönetimi için .84'tür. Tüm ölçeğin güvenirlik katsayısı ise .93'tür.

Hedef Yönelimi Anketi

Öğrencilerin hedef yönelimlerini belirlemek amacıyla kullanılan Hedef Yönelimi Anketi (Elliot & McGregor, 2001), öğrenme kaçınma, öğrenme yaklaşma, performans kaçınma ve performans yaklaşma olmak üzere dört boyuttan oluşmaktadır. Performans kaçınma 6, diğer boyutlar 3 olmak üzere toplam 15 maddeden meydana gelmektedir. Ölçek, Şenler ve Sungur (2007) tarafından Türkçe'ye uyarlanmıştır. Ölçeğin Türkçe versiyonun güvenirlik katsayıları sırasıyla; öğrenme yaklaşma .81, öğrenme kaçınma .65, performans yaklaşma .69, performans kaçınma .64'tür.

Öğrenmede Güdüsel Stratejiler Anketi

Öğrenmede Güdüsel Stratejiler Anketi (Pintrich, Smith, Garcia, & McKeachie, 1991), motivasyon ve öğrenme stratejileri olmak üzere iki temel kısımdan oluşmaktadır. Çalışma, motivasyon kısmından içsel değer, sınav kaygısı, öğrenmeyi kontrol etme alt boyutları ile öğrenme stratejileri kısmından bilişötesi öz-düzenleme, çaba gösterme ve akranla öğrenme alt boyutlarını içermek üzere toplam 34 maddeden oluşmuştur. Ölçek, Sungur (2004) tarafından Türkçe'ye uyarlanmıştır. Ölçeğin Türkçe versiyonunun güvenirlik katsayıları sırasıyla içsel değer .87, sınav kaygısı .62, öğrenmeyi kontrol etme .62, bilişötesi öz-düzenleme .81, çaba gösterme .62 ve akranla öğrenme .61'dir.

NEO-FFI Kişilik Envanteri

NEO-FFI Kişilik Envanteri (Costa ve McCrae, 1992), toplam 5 faktör ve 60 maddeden oluşmaktadır. Her biri altı alt boyut içeren faktörler; duygusal dengesizlik, dışadönüklük, açıklık, geçimlilik ve sorumluluktur. Ölçek, Gülgöz (2002) tarafından Türkçe'ye uyarlanmıştır.

Bulgular

Çalışmadaki değişkenlerin betimsel sonuçları Tablo 6'da verilmiştir. Analiz sonucunda elde edilen bulgular, fen bilgisi öğretmen adaylarının öz-yeterlik inancının üç alt boyutunda da ortalamanın üstünde puan aldıklarını göstermiştir.

Ancak bu üç alt boyut arasında en yüksek puanı öğretim stratejilerini kullanmaya yönelik öz-yeterlik inancında *(M=*6.10*, SD=*.89*)*. almışlardır. Bu sonuç fen bilgisi öğretmen adaylarının uygun stratejileri sınıflarında etkili olarak kullanmalarına olan inançlarının yüksek olduğunu gösterir. Sınıf yönetimine yönelik öz-yeterlik inançlarının *(M=*6.07, *SD=*.90) yüksek olması öğrencilerin sınıf içi davranışlarında doğru kararlar verebileceklerine inançlarının yüksek olduğunu gösterir. Her ne kadar en düşük puanı öğrenci katılımına yönelik öz-yeterlik inancından *(M=*5.96, *SD=*.87*)* almış olsalar da bu alt boyuttaki puanları hala ortalama puanın üzerindedir.

Tablo 6 Değişkenlere göre betimsel sonuçlar

	M	SD
Öz-Yeterlik İnançları		
Öğrenci Katılımı	5.96	.87
Öğretim Stratejileri	6.10	.89
Sınıf Yönetimi	6.07	.90
Kişilik Özellikleri		
Duygusal Dengesizlik	7.86	1.96
Dışadönüklük	6.57	1.89
Açıklık	6.56	1.73
Geçimlilik	6.47	2.08
Sorumluluk	6.23	1.80
Akademik Öz-Düzenleme		
İçsel Değer	4.53	.98
Öğrenmeyi Kontrol Etme	3.03	.57
Sınav Kaygısı	3.12	.82
Bilişötesi Öz-Düzenleme	6.47	1.09
Çaba Gösterme	2.36	.50
Akranla Öğrenme	1.28	.39
Hedef Yönelimleri		
Öğrenme Yaklaşma	4.10	.76
Performans Yaklaşma	3.20	1.00
Öğrenme Kaçınma	2.84	.93
Performance Kaçınma	2.55	.98

Fen bilgisi öğretmen adaylarının hedef yönelimlerine bakıldığında, adayların en yüksek puanı öğrenme yaklaşma *(M=4.10, SD=.76)* en düşük puanı ise performans kaçınmadan aldıkları görülmüştür. Bu da fen bilgisi öğretmen adaylarının çalışma

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nedenlerinin düşük not almaktan kaçınmak yerine konuyu iyice anlamak, anlamlı öğrenmek olduğunu gösterir.

Akademik öz-düzenleme becerileri göz önüne alındığında fen bilgisi öğretmen adaylarının öğrenmeyi kontrol etme, *(M=3.03, SD=.57),* sınav kaygısı *(M=3.12, SD=.82),* çaba gösterme *(M=2.36, SD=.50)* ve akranla öğrenme *(M=1.28, SD=.39)* puanlarının ortalama puanın altında olduğu görülmüştür. Diğer yandan, içsel değer *(M=4.53, SD=.98)* ve bilişötesi öz-düzenleme *(M=6.47, SD=1.09)* puanlarının ortalama puanın üstünde olduğu görülmüştür. Bu sonuçlar, fen bilgisi öğretmen adaylarının çeşitli öğretim stratejilerini kullanarak biliş düzeylerini geliştirebildiklerini, öğrenmeye değer verdiklerini, sınav kaygılarının yüksek olmadığını, zorluklar karşısında çabuk yıldıklarını, kendi öğrenmeleri üzerinde çok az kontrole sahip olduklarını düşündüklerini ve akranlarıyla çalışmaktansa yalnız çalışmayı tercih ettiklerini gösterir.

Fen bilgisi öğretmen adaylarının kişilik özelliklerinin betimsel sonuçlarına bakıldığında, en yüksek puanın duygusal dengesizlik *(M=39.33, SD=9.79)* boyutunda alındığı, en düşük puanın ise sorumluluk boyutunda alındığı görülmüştür. *(M=31.12, SD=10.00).* Bu sonuçlara göre fen bilgisi öğretmen adayları belirlenen hedeflere yönelik çok çalışma, içsel disipline sahip olma gibi sorumluluk boyutunun göstergelerine yüksek seviyede sahip olmadıklarını gösterir.

Fen bilgisi öğretmen adaylarının öz-yeterlik inançları, akademik öz-düzenleme becerileri ve kişilik özellikleri arasındaki ilişkiyi bulmak için bir model önerilerek

yol analizi yapılmıştır. Önerilen modelde tüm değişkenler gözlenen değişken olarak belirlenmiştir. Model LISREL 8.30 (Jöreskog & Sörbom, 1999) kullanılarak test edilmiştir. Test sonucunda uyum indeksleri (RMSEA = .16, GFI = .91, SRMR = .08, CFI= .78) kabul değerleri arasında olmadığı için, modifikasyon indeksleri göz önüne alınarak yeni yollar tanımlanmıştır. Revize edilmiş modelde, sınıf yönetimine yönelik öz-yeterlik inançlarından öğretim stratejilerini kullanmaya yönelik öz-yeterlik inançlarına doğru, yine sınıf yönetimine yönelik öz-yeterlik inançlarından öğrenci katılımına yönelik öz-yeterlik inançlarına doğru, performans yaklaşmadan öğrenme yaklaşmaya doğru ve akranla öğrenmeden bilişötesi öz-düzenleme becerilerine doğru yollar tanımlanmıştır. Buna ek olarak, performans yaklaşmadan performans kaçınmaya ve öğretim stratejilerini kullanmaya yönelik öz-yeterlik inançlarından öğrenci katılımına yönelik öz-yeterlik inançlarına doğru kovaryanslar tanımlanmıştır. Revize edilmiş modelin uyum indeksleri (RMSEA = .10, GFI = .97, CFI = .93, SRMR = .05) bu modelin uyumunun çok iyi olduğunu göstermiştir. Doğrudan etkileri gösteren yol katsayıları Tablo 7'de gösterilmiştir. Bunun yanında, istatistiksel olarak anlamlı yollar Şekil 2'de sunulmuştur. Burada önemle belirtilmesi gereken nokta bu yolların bir değişkenin diğerinin nedeni olduğunu değil, bir değişkenin diğerini etkilediğini göstermesidir.

Tablo 7 Değişkenler üzerindeki doğrudan etkiler

Etki	Standartlaşmış katsayılar	Hata Standart Sapması	t	R^2
Öğrenci Katılımı üzerine				
Sınıf Yönetimi	-.04	.01	-.96	
Duygusal Dengesizlik	.01	.01	.15	
Dışadönüklük	-.10	.01	-3.63*	
Açıklık	-.06	.01	-2.10*	
Geçimlilik	.13	.00	4.53*	
Sorumluluk	.09	.03	3.49*	
Öğrenme Yaklaşma	-.07	.01	-1.79	.10
Performans Yaklaşma	.09	.00	2.54*	
Öğrenme Kaçınma	-.02	.00	-.68	
Performans Kaçınma	-.16	.00	-6.46*	
İçsel Değer	.03	.00	1.12	
Öğrenmeyi Kontrol Etme	.03	.00	1.22	
Bilişötesi Öz-Düzenleme	.14	.03	4.87*	
Çaba Gösterme	.01	.03	.42	
Akranla Öğrenme	-.03	.03	-1.24	

Tablo 7 (Devamı)

Etki	Standartlaşmış katsayılar	Hata Standart Sapması	t	R²
Öğretim Stratejileri üzerine				
Sınıf Yönetimi	-.05	.02	-1.47	
Duygusal Dengesizlik	.07	.02	2.29*	
Dışadönüklük	.00	.02	.06	
Açıklık	-.14	.01	-5.88*	
Geçimlilik	.36	.01	13.23*	
Sorumluluk	-.06	.08	-2.33*	
Öğrenme Yaklaşma	-.03	.02	-.77	.23
Performans Yaklaşma	.04	.01	1.22	
Öğrenme Kaçınma	.03	.01	1.12	
Performans Kaçınma	.05	.01	2.21*	
İçsel Değer	.00	.01	-.12	
Öğrenmeyi Kontrol Etme	-.08	.01	-3.85*	
Bilişötesi Öz-Düzenleme	.12	.10	4.52*	
Çaba Gösterme	-.07	.08	-3.09*	
Akranla Öğrenme	.00	.08	.01	

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Tablo 7 (Devamı)

Etki	*Standartlaşmış katsayılar*	*Hata Standart Sapması*	*t*	*R²*
Sınıf Yönetimi üzerine				
Duygusal Dengesizlik	*.04*	*.02*	*1.97**	
Dışadönüklük	*.02*	*.03*	*1.38*	
Açıklık	*.04*	*.02*	*2.15**	
Geçimlilik	*.05*	*.02*	*2.41**	
Sorumluluk	*.02*	*.12*	*1.51*	
Öğrenme Yaklaşma	*.48*	*.02*	*22.62**	*.64*
Performans Yaklaşma	*.29*	*.02*	*14.18**	
Öğrenme Kaçınma	*.00*	*.01*	*.14*	
Performans Kaçınma	*-.07*	*.01*	*-4.75**	
İçsel Değer	*-.07*	*.01*	*-4.46**	
Öğrenmeyi Kontrol Etme	*-.03*	*.01*	*-2.00*	
Bilişötesi Öz-Düzenleme	*.03*	*.15*	*1.64*	
Çaba Gösterme	*-.01*	*.13*	*-.39*	
Akranla Öğrenme	*-.05*	*.12*	*-3.07**	
Öğrenme Yaklaşma üzerine				
Performans Yaklaşma	*.66*	*.02*	*38.81**	
Duygusal Dengesizlik	*.08*	*.03*	*3.85**	
Dışadönüklük	*-.02*	*.04*	*-1.29*	
Açıklık	*-.07*	*.02*	*-4.36**	*.53*
Geçimlilik	*.06*	*.02*	*2.89**	
Sorumluluk	*.05*	*.14*	*2.96**	
İçsel Değer	*-.07*	*.02*	*-4.17**	
Öğrenmeyi Kontrol Etme	*-.02*	*.01*	*-.93*	

Tablo 7 (Devamı)

Etki	*Standartlaşmış katsayılar*	*Hata Standart Sapması*	*t*	*R²*
Performans Yaklaşma üzerine				
Duygusal Dengesizlik	*-.02*	*.04*	*-.80*	
Dışadönüklük	*.09*	*.05*	*3.40**	
Açıklık	*-.05*	*.03*	*-2.34**	
Geçimlilik	*.20*	*.03*	*7.09**	*.10*
Sorumluluk	*.02*	*.20*	*.70*	
İçsel Değer	*-.15*	*.02*	*-6.30**	
Öğrenmeyi Kontrol Etme	*.02*	*.02*	*.91*	
Öğrenme Kaçınma üzerine				
Duygusal Dengesizlik	*.07*	*.04*	*2.35**	
Dışadönüklük	*.00*	*.07*	*.07*	
Açıklık	*-.31*	*.04*	*-13.41**	
Geçimlilik	*.03*	*.04*	*.96*	*.10*
Sorumluluk	*.05*	*.25*	*1.86*	
İçsel Değer	*.03*	*.03*	*1.12*	
Öğrenmeyi Kontrol Etme	*.00*	*.02*	*.01*	
Performans Kaçınma üzerine				
Duygusal Dengesizlik	*.00*	*.04*	*-.09*	
Dışadönüklük	*-.02*	*.06*	*-.77*	
Açıklık	*.05*	*.04*	*2.17**	
Geçimlilik	*-.01*	*.04*	*-.23*	*.10*
Sorumluluk	*-.12*	*.24*	*-4.70**	
İçsel Değer	*.27*	*.03*	*11.68**	
Öğrenmeyi Kontrol Etme	*.02*	*.02*	*.72*	

Tablo 7 (Devamı)

Etki	*Standartlaşmış katsayılar*	*Hata Sapması*	*Standart*	*t*	*R²*
Bilişötesi Öz-Düzenleme üzerine					
Duygusal Dengesizlik	*.39*	*.00*		*16.10**	
Dışadönüklük	*-.09*	*.01*		*-4.29**	
Açıklık	*-.12*	*.00*		*-5.79**	
Geçimlilik	*.14*	*.00*		*5.88**	
Sorumluluk	*-.01*	*.02*		*-.61*	
Öğrenme Yaklaşma	*.15*	*.00*		*5.57**	*.39*
Performans Yaklaşma	*.01*	*.00*		*.53*	
Öğrenme Kaçınma	*-.04*	*.00*		*-2.19**	
Performans Kaçınma	*-.01*	*.00*		*-.25*	
İçsel Değer	*-.07*	*.00*		*-3.22**	
Öğrenmeyi Kontrol Etme	*-.12*	*.00*		*-6.66**	
Akranla Öğrenme	*.24*	*.02*		*12.38**	
Çaba Gösterme üzerine					
Duygusal Dengesizlik	*.07*	*.00*		*2.49**	
Dışadönüklük	*-.04*	*.01*		*-1.55*	
Açıklık	*.24*	*.00*		*10.66**	
Geçimlilik	*-.12*	*.00*		*-4.63**	
Sorumluluk	*.05*	*.02*		*2.31**	*.23*
Öğrenmeyi Kontrol Etme	*-.06*	*.00*		*-2.66**	
Bilişötesi Öz-Düzenleme	*.27*	*.03*		*10.45**	
Akranla Öğrenme	*.20*	*.02*		*8.91**	
Sınav Kaygısı üzerine					
Duygusal Dengesizlik	*-.23*	*.03*		*-10.07**	*.05*

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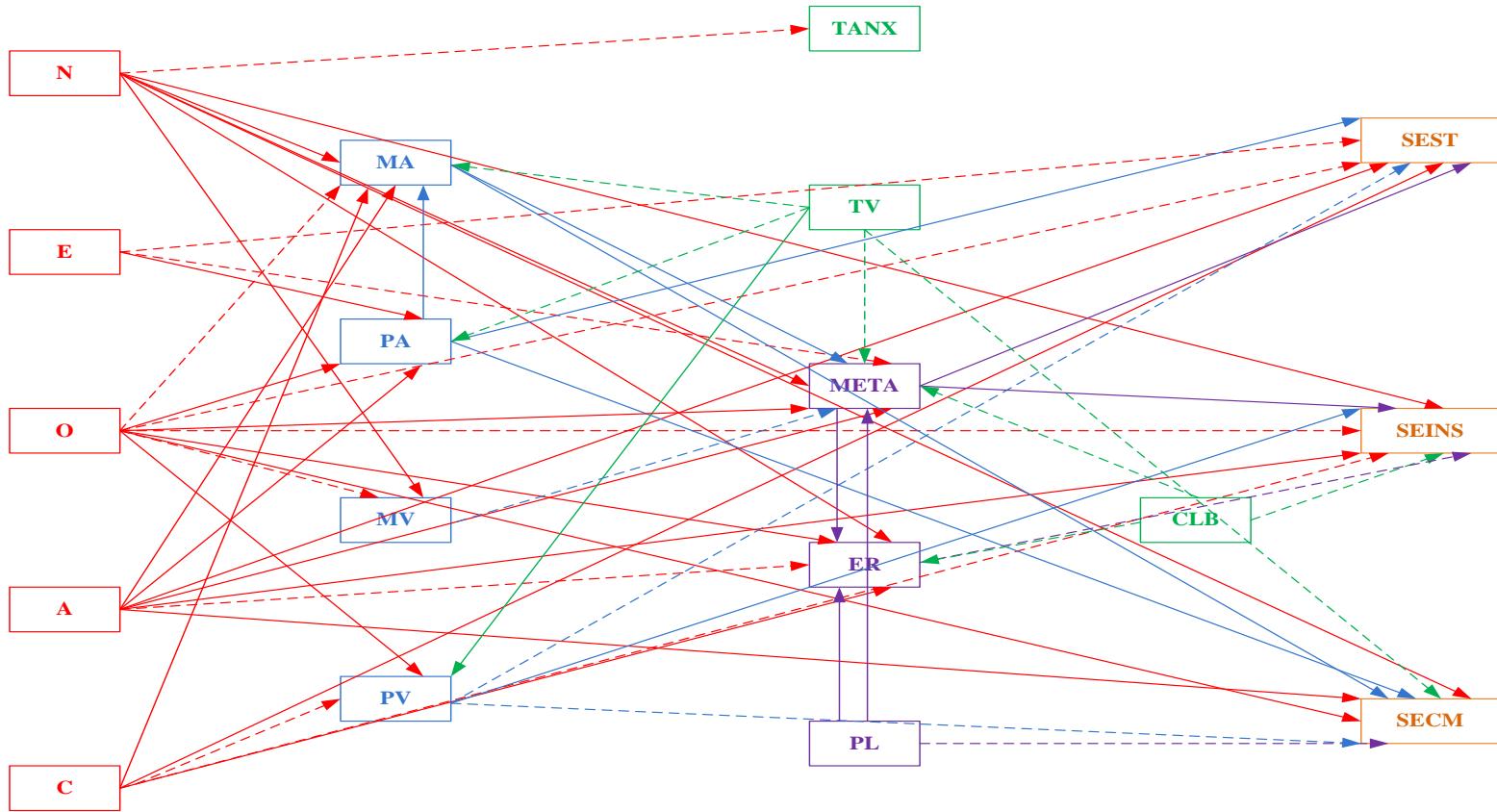
Şekil 2 İstatistiksel anlamlı yollarla model

Sonuçlar ve Tartışma

Modelde fen bilgisi öğretmen adaylarının kişilik özellikleri ile akademik öz-düzenleme becerileri öğrenci katılımına ilişkin öz-yeterlik inançlarını %10, öğretim stratejilerine ilişkin öz-yeterlik inançlarını %23 ve sınıf yönetimine ilişkin öz-yeterlik inançlarını %64 oranında açıklamaktadır (bkz. Tablo 7). Bulgular geçimlilik boyutunun öz-yeterlik inançlarının tüm alt boyutları ile pozitif bir ilişkisi olduğunu göstermiştir. Bu sonuç, başkalarına güvenen, uyumlu ve açık sözlü kişilerin daha yüksek seviyede öz-yeterlik inançlarına sahip olduğunu gösterir. Dahası, bilişötesi becerileri yüksek olan fen bilgisi öğretmen adaylarının öğrenci katılımına ve öğretim stratejilerine yönelik öz-yeterlik inançlarının da yüksek olduğu görülmüştür. Diğer yandan bilişötesi becerileriler ile sınıf yönetimine ilişkin öz-yeterlik inancı arasında anlamlı olmayan fakat pozitif bir ilişki olduğu saptanmıştır. Ayrıca performans yaklaşma ile öğrenci katılımına ve sınıf yönetimine yönelik öz-yeterlik inançları arasında pozitif bir ilişki saptanmıştır. Ek olarak, geçimliliğin öğrenme yaklaşma ve performans yaklaşma ile; dışadönüklülüğün performans yaklaşma ile pozitif ilişkili olduğu bulunmuştur.

Bunun ötesinde, duygusal dengesizlik ile hem öğrenme yaklaşma hem de öğrenme kaçınma arasında pozitif bir ilişki olduğu görülmüştür. Ayrıca, sorumluluk performans kaçınma ile negatif, öğrenme yaklaşma ile pozitif ilişkilidir. Öğrenme yaklaşma ile performans yaklaşma arasında güçlü bir ilişki vardır. Bu sonuç, anlamlı

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öğrenmek için çalışan fen bilgisi öğretmen adaylarının aynı zamanda iyi bir not almayı hedeflediklerini gösterir. Diğer yandan, açıklık ve içsel değer yaklaşma hedefleri ile negatif, performans kaçınma hedefi ile pozitif ilişkilidir. Yol analizinin diğer bir sonucu dışadönüklük ve açıklık ile bilişötesi öz-düzenleme becerileri arasında negatif bir ilişki olduğunu göstermiştir. Buna ek olarak, öğrenme kaçınma, öğrenmeyi kontrol etme ve içsel değer ile bilişötesi öz-düzenleme becerileri arasında yine negatif bir ilişki olduğu görülmüştür. Sonuç olarak, kişilik özellikleri ve öz-düzenleme becerilerinin diğer alt boyutları bilişötesi öz-düzenlemeyi %39 oranında açıklamıştır (bkz. Tablo 7).

Ayrıca, duygusal dengesizlik, açıklık, sorumluluk, bilişötesi öz-düzenleme becerileri ve akranla öğrenme ile çaba gösterme arasında pozitif bir ilişki tespit edilmiştir. Ancak çaba gösterme ile geçimlilik ve öğrenmeyi kontrol etme arasında negatif bir ilişki bulunmuştur. Bulgular, kişilik özellikleri ve öz-düzenleme becerilerinin diğer alt boyutları çaba göstermeyi %23 oranında açıkladığını göstermiştir (bkz. Tablo 7). Son olarak duygusal dengesizlik ile sınav kaygısı arasında negatif bir ilişki olduğu görülmüştür.

Sonuçlar bilişötesi öz-düzenleme ile performans kaçınmanın öz-yeterlik inancının tüm alt boyutlarının pozitif bir yordayıcısı olduğunu göstermiştir. İstatistiksel olarak anlamlı olmasa da performans yaklaşma ile öğretim stratejilerine yönelik öz-yeterlik inançları ve bilişötesi öz-düzenleme becerileri ile sınıf yönetimine yönelik öz-

yeterlik inançları arasında pozitif bir ilişki saptanmıştır. Bu bulgular, planlama, değerlendirme gibi bilişötesi öz-düzenleme becerileri kullanan ve iyi bir not almak için çalışan öğretmen adaylarının öz-yeterlik inanç seviyelerinin yüksek olduğunu gösterir. Benzer şekilde Bembenutty (2007) kendi akademik süreçlerinde bilişötesi öz-düzenleme becerilerini etkili kullanan öğretmen adaylarının yüksek düzeyde öz-yeterlik inançları olduğunu bulmuştur.

Öte yandan, öz-düzenleme becerilerinin güdüsel alt boyutlarından biri olan içsel değer beklenmeyen bir şekilde bireye özgü çıktılarla yani sınıf yönetimine ilişkin öz-yeterlik inançları, öğrenme yaklaşma, performans yaklaşma ve bilişötesi öz-düzenleme becerileri ile negatif ilişkili çıkmıştır. Bu sonuçlar, içsel değer ile strateji kullanımı arasında negatif bir ilişki bulan Araz ve Sungur'un (2007) çalışması dışındaki literatürdeki diğer çalışmalarla (Ablard & Libschultz, 1998; Neber & Schommer-Aikins, 2002) uyuşmamaktadır. Araz ve Sungur (2007) MSLQ ölçeğinin içsel değeri alt bileşenleri (önem, kullanışlılık ve ilgi) ile ölçtüğü için içsel değeri ölçmede sınırlı olduğunu öne sürmüşlerdir. Bu alt bileşenler arasında kullanışlılık, bireye özgü çıktılarla negatif ilişkili olan dışsal motivasyonla ilişkilidir (Wigfield & Eccles, 2000). Bu nedenle, Araz ve Sungur'a (2007) göre bu şekilde bir model kurulacağı zaman içsel değerin bileşenleri ayrı ayrı ölçülmelidir.

Fen bilgisi öğretmen adaylarının öz-yeterlik inançları ve kişilik özellikleri göz önüne alındığında öz-yeterlik inançları ile dışadönüklük, açıklık, geçimlilik ve sorumluluk

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arasında pozitif bir ilişki önerilmişti. Ancak, sadece geçimlilik öz-yeterlik inançlarının tüm alt boyutları ile pozitif ilişkilidir. Diğer yandan, sorumluluk sadece öğrenci katılımına ilişkin öz-yeterlik inançları ile açıklık ise sadece sınıf yönetimine ilişkin öz-yeterlik inançları ile pozitif ilişkili olduğu görüldü. Bu sonuçlara göre sorumluluk puanları yüksek olan fen bilgisi öğretmen adayları diğer bir deyişle hedeflerine ulaşmak için sıkı çalışan, zorluklar karşısında yılmayanların zor öğrencilerle çalışma, öğrenci başarısızlıklarının nedenlerini bulma ve öğrencileri motive etme konusunda öz-yeterlik inanç düzeyleri yüksektir. Hayal gücüne sahip, entelektüel ilgileri olan ve açık görüşlü diğer bir deyişle açıklık puanı yüksek olan fen bilgisi öğretmen adaylarının sınıfta istenmeyen davranışları kontrol etmede ve sınıf yönetimini öğrencilerle birlikte sağlama konusunda öz-yeterlik inançları daha yüksek düzeydedir. Ancak, öngörülenin aksine açıklık öğrenci katılımına ve öğretim stratejilerine yönelim öz-yeterlik inançlarıyla negatif ilişkilidir. Bu bulgu biraz Türk kültürü ile açıklanabilir. Türkiye'de eğitime ve öğretmenlik mesleğine çok saygı duyulmaktadır. Öğretmenlerden öğrencilerine iyi bir model olması ve geleneksel değerlere uygun davranması beklenir. Dolayısı ile yeni deneyimlerden keyif alan ve sıra dışı fikirlere sahip öğretmen adayları, örnek bir öğretmen olarak, toplum bir başka deyişle ailelerin, okul yönetiminin ve meslektaşlarının beklentilerini karşılayamayacaklarını düşünüyor olabilirler. Örneğin, öğrenci katılımına yönelik öz-yeterlik inançları ölçmeye ilişkin maddelerden biri olan "Çocuklarının okulda başarılı olmalarına yardımcı olmaları için ailelere ne kadar destek olabilirsiniz?"

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sorusuna açıklık puanı ortalamanın altında olan fen bilgisi öğretmen adaylarının %35'i "çok yeterli" diye cevap verirken; açıklık puanı ortalamanın üstünde olan fen bilgisi öğretmen adaylarının sadece %26'sı ölçeğin bu yüksek ucunda yer almıştır. Bu sonuç doğrultusunda kişilik yapıları, toplumsal normlar ve değerlerle uyuşmayan fen bilgisi öğretmen adaylarının öğrenme sürecindeki öğrenci katılımı için ailelerle işbirliği yapma konusunda öz-yeterlik inanç seviyeleri, geleneksel yapıya sahip olan fen bilgisi öğretmen adaylarının bu alt boyuttaki öz-yeterlik inanç seviyelerinden düşüktür denebilir. Ancak bu noktada bu açıklamanın spekülatif olduğu ve görüşme metodu gibi verilerin nitel yollarla toplanılarak daha geçerli açıklamalar yapılması gerektiği söylenmelidir.

Bir başka beklenilmeyen sonuç, sorumluluk ile öğretim stratejilerine yönelik öz-yeterlik inancı arasındaki ilişkide görülmüştür. Bu iki değişken arasındaki ilişki negatiftir. Bu sonuca, sorumluluk boyutunda yüksek puan alanların iyi organizasyon yapan kişiler olması nedeniyle harekete geçmeden önce ayrıntılı düşünüyor olmaları sebep olmuş olabilir. Bu yapıya sahip fen bilgisi öğretmen adayları iyi organizasyon yapan ve iyi hazırlanan kişiler olmalarına karşın sınıfta daha önceden düşünüp hesap etmedikleri bir durumla karşılaştıklarında önceden bu durumla ilgili düşünmedikleri ya da bu duruma dair bir planları olmadığı için harekete geçmeleri zor olabilir. Bu tarz bir düşünce mesela öğrencilerden gelen zor bir soruya cevap verme ya da öğrencilere alternatif bir açıklama yapma durumunda öz-yeterlik inanç seviyesini düşürebilir.

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Bir diğer beklenmeyen sonuç dışadönüklük ile öğrenci katılımına yönelik öz-yeterlik inançları arasındaki negatif ilişkidir. Öğretmenlik sosyal ilişkiler gerektirdiği için konuşkan, aktif, sosyal fen bilgisi öğretmen adaylarının öz-yeterlik inançlarının yüksek olması beklenilmişti. Öte yandan dışadönüklük boyutunun performans kaçınma üzerinden öz-yeterlik inançlarına etkisi incelendiğinde, dışadönüklük ile performans yaklaşma arasında performans yaklaşma ile de öğrenci katılımına ve sınıf yönetimine ilişkin öz-yeterlik inançları arasında pozitif bir ilişki olduğu görülmüştür. Bu nedenle, dışadönüklük boyutunun performans yaklaşma aracılığıyla öz-yeterlik inançlar üzerine dolaylı etkisi pozitiftir.

Yol analiz sonucunda elde edilen bir başka beklenmeyen bulgu, duygusal dengesizlik ile öz-yeterlik inançlarının tüm alt boyutları arasındaki pozitif ilişkidir. Suçluluk duygusu, öfke gibi negatif duygular duygusal dengesizlik boyutunu oluşturan başlıca etmenler olduğu için öz-yeterlilik inançları ile arasında negatif bir ilişki olacağı beklenilmişti. Bu durum Türkiye koşulları ile belki bir parça açıklanabilir. Bu çalışmada betimsel istatistik fen bilgisi öğretmen adaylarının duygusal dengesizlik puanlarının yüksek olduğunu göstermiştir. Bu veriler sene sonunda mezun olacak fen bilgisi öğretmen adaylarından toplanmıştır. Türkiye'de insanlar meslek sahibi olmak için rekabete dayalı bir süreçten geçmektedir. Mezun öğretmenlerin devlet okullarında çalışabilmek için ÖSYM tarafından yürütülen bir sınava girmeleri gerekmektedir. Öğretmenler sınav sonucunda aldıkları puana göre en yüksek puandan başlanmak üzere atanırlar. Benzer şekilde özel okullarda iş bulabilme de

yine zorlu bir süreçtir. Öğretmenler bu okullarda çalışabilmek için yüksek not ortalamasına sahip, nitelikli ve iyi ilişkiler kurabilen biri olduklarını göstermek zorundadır. Ancak pek çok özel okul deneyimli öğretmene iş vermektedir. Bu nedenle, yeni mezun öğretmenler iş sahibi olma konusunda umutsuz olabilirler. Aslında, Türkiye'de rekabet kültürü öğrenim hayatının çok erken yıllarında başlamaktadır. İyi bir liseye ve devamında iyi bir üniversiteye gitmek için öğrenciler ilköğretim yıllarından başlayarak ülke çapında yürütülen sınavlara girmek zorundadır. Üst sıralardaki liselerden ve üniversitelerden mezun olmak daha iyi ve kolay iş sahibi olmalarına yardımcı olduğu ve dolayısıyla gelecek hakkında daha iyimser olmalarını sağladığı için bu sınavlarda birbirlerinden daha başarılı olmak için rekabet ederler. Buna ek olarak, öğrencilerin not ortalaması ülke çapında girdikleri sınavlardan aldıkları puana katkıda bulunduğu için öğrenciler aynı zamanda okulda yapılan sınavlarda da yüksek not almaya çalışırlar (Sungur & Senler, 2009). Dolayısı ile insanların gelecek hakkında kaygılarla yönlenen rekabet dolu bir hayatları vardır. Bu nedenle, fen bilgisi öğretmen adaylarının yüksek düzeyde umutsuzluk ve kaygı hissetmeleri olağandır. Görünen o ki, negatif duygular onları motive etmektedir. Şöyle ki, duygusal dengesizlik puanları arttıkça, öz-yeterlik inanç düzeyleri de artmaktadır. Benzer şekilde, duygusal dengesizlik ile öğrenme yaklaşma, performans yaklaşma, öğrenme kaçınma, bilişötesi öz-düzenleme ve çaba gösterme gibi akademik öz-düzenleme becerilerinin alt boyutları arasında da pozitif ilişkili olduğu görülmüştür. Ayrıca duygusal dengesizlik düzeyi yüksek olan fen bilgisi öğretmen

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adaylarının daha az sınav kaygısı yaşadıkları saptanmıştır. Bu sonuç, literatürde de yer alan duygusal dengesizliğin çabayı ve motivasyonu arttırdığı, kaygılı insanların başarısız olmamak için çok çaba gösterdiği (Bidjerano & Dai, 2007; Norem & Cantor, 1986) bulgusuyla örtüşmektedir.

Kişilik özellikleri ile öz-düzenleme becerilerinin diğer alt boyutları arasındaki ilişkiye bakıldığında geçimlilik ile sorumluluk boyutunun da duygusal dengesizlik boyutu kadar öz-düzenleme becerileri alt boyutlarıyla ilişkili olduğu görülmektedir. Diğer yandan, dışadönüklük performans yaklaşma ve bilişötesi öz-düzenleme dışında diğer alt boyutlarla ilişkili değildir. Daha ayrıntılı söylemek gerekirse, dışadönüklük performans yaklaşma ile pozitif, bilişötesi öz-düzenleme ile negatif ilişkilidir. Bidjerano ve Dai'ye göre (2007) ilgili literatüre dayanarak kişilik özellikleri ile öz-düzenleme becerilerinin farklı alt boyutları arasındaki ilişkileri açıklamak zordur. Ancak yine de sorumluluk ve geçimlilik için gözlenen ilişkiler ilgili literatürle örtüşmektedir (Bidjerano & Dai, 2007; Chamorro-Premuzic & Furnham, 2003; Komarraju & Karau, 2005).

Öz-düzenleme becerilerinin alt boyutlarının kendi arasındaki ilişkiler göz önüne alındığında öğrenme yaklaşma ile akranla öğrenme bilişötesi öz-düzenleme becerileri ile pozitif ilişkilidir. Dahası, bilişötesi öz-düzenleme ile çaba gösterme arasında da pozitif bir ilişki vardır. Bu sonuç literatürdeki bulgularla uyumludur. Ancak, ilgili teori ve literatüre ters olarak öğrenmeyi kontrol etme, bilişötesi öz-düzenleme ve

çaba gösterme ile negatif ilişkilidir. Bu bulgular, başarının dış etkenlerden çok kendilerine bağlı olduğunu düşünen fen bilgisi öğretmen adaylarının zorluklar karşısında çabuk yıldığını ve öğrenmelerinde daha az strateji kullandıklarını gösterir. Bunun nedeni Türkiye'de öğretimin genel olarak düz anlatım ve tartışma şeklinde yapılması olabilir. Öğrenciler sınavlara çalışırken ders notlarına ve ders esnasında tuttukları notlara bağımlıdır (Gencer & Cakiroglu, 2007). Bu sebeple, bu tarz eğitim sisteminden geçen öğrenciler için öğrenme öğretmenlerinin notlarını ezberlemek anlamına gelebilir. Böylelikle, öğrenmek için çaba gösterme eğer bu şekilde tanımlanmışsa, öğrenmeyi kontrol etmenin bireye özgü çıktılar ile negatif ilişkili çıkması normaldir. Fakat, bu durumu daha geçerli bir şekilde açıklayabilmek için nitel çalışma yapılması önerilmektedir.

Sonuç olarak bu çalışma öz-yeterlik inançları ile öz-düzenleme becerilerinin kişilik özelikleri ile ilişkili olduğunu göstermiştir. Kişilik özelliklerinin sabit olduğu düşünülürse öğretmen yetiştirme programları her fen bilgisi öğretmen adayının öğretim ortamına getirdiği kişilik yapısını göz önüne almalıdır (Bidjerano & Dai, 2007). Bu çalışmada kişilik özellikleri yordayıcı değişken olarak belirlenmiştir. Ancak, gelecek çalışmalarda kişiliğin öz-yeterlik ve öz-düzenleme üzerindeki rolü deneysel çalışmalarla incelenebilir. Böylelikle, belirli kişilik özelliklerinin öz-yeterlik inancının ve öz-düzenleme becerilerinin gelişimine ne yönde katkısı olduğu belirlenebilir (Bidjerano & Dai, 2007).

Dahası, öğretmen yetiştirme programları fen bilgisi öğretmen adaylarının kendi öğrenmelerinin farkına varmaları ve bilişötesi stratejileri etkili bir şekilde kullanmaları yönünde yapılandırılmalıdır. Bunu sağlamak için fen bilgisi öğretmen adaylarına açık uçlu ve zorlayıcı ödevler kapsayan eğitim-öğretim ortamı sağlanmalıdır (Paris & Paris, 2001). Ek olarak, öğretim elemanları öz-düzenleme becerilerini kullanarak fen bilgisi öğretmen adaylarına sosyal modeller olabilirler (Dembo, 2001).

Ancak bu çalışma sonuçları genelleme açısından bir takım sınırlılıklar içermektedir. Öncelikle elde edilen veriler sadece ölçeklere dayanmaktadır. Sonuçları daha iyi anlamak ve daha iyi açıklamalar sağlamak için gelecek çalışmalarda nitel araştırma yöntemleri kullanılabilir. Bu yöntemler beklenmeyen sonuçların ne derece kültürlerle açıklanabildiğini belirlemede yardımcı olur. Bu düşünce doğrultusunda bu çalışma farklı kültürlerde de tekrarlanabilir. Ayrıca, bu çalışmada bazı değişkenlerin açıklanabilen varyansı düşük çıkmıştır. Bu modeli geliştirmek için başkalarının yaşantılarına bakılarak başarısızlıklarına şahit olunma durumunu gösteren yani sosyal modeller tarafından sağlanan dolaylı yaşantılar; meslektaşlar, aile tarafından yapılan sözel iknalar; heyecanlanmak, korkmak gibi fiziksel ve duygusal durumlar ve başarı/başarısızlık gibi yaşanabilen tüm deneyimler gibi öz-yeterlik inanç kaynakları çalışmaya entegre edilebilir.

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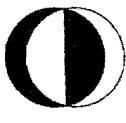
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" Kişilik Özellikleri, Akademik Öz-Düzenleme Becerileri ile Öğretmeye İlişkin Öz-Yeterlik İnançları Arasındaki Etkileşim " isimli araştırmanız "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

10/05/2008

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