Pre-Service Science Teachers' Perceptions of Self-Regulated Learning in Physics

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ABSTRACT

The purpose of this study was to examine the effects of gender and academic achievement scores on pre-service science teachers' self-reported use of motivational strategies and learning strategies. The present study also investigated the relationship between motivational strategies and learning strategies. Data were collected by using Turkish version of Motivated Strategies for Learning Questionnaire (MSLQ) and personal information sheet during 2010-2011 spring semester. MSLQ which was originally developed as a self-report questionnaire, comprised of two main dimensions as motivation and learning strategies including 81 items with a 7 point-Likert scale format. The present study was designed as cross-sectional. A total 104 pre-service science teachers voluntarily participated in the study. Results revealed that pre-service science teachers who had higher academic achievement scores in physics, also had higher self-efficacy for learning beliefs. It was also found that there were no statistically significant mean differences among motivational beliefs, self-regulated learning variables with respect to gender. Lastly, the subdimensions in the motivational and learning strategies sections were found to be positively correlated as specified by the theory.

Keywords: self-regulated learning, motivation, learning strategies, pre-service science teachers

Fen Bilgisi Öğretmen Adaylarının Fizik Dersine Yönelik Özdüzenleme Becerilerine Yönelik Algılarının İncelenmesi

ÖZET

Bu çalışmanın amacı; cinsiyet ve dönem sonu fizik notunun gibi değişkenlerin, fen bilgisi öğretmen adaylarının fizik dersine yönelik özdüzenleme becerilerine nasıl etkilediğini araştırmaktır. Bu araştırmada, ayrıca güdüsel ve öğrenme stratejileri arasındaki ilişki de araştırılmıştır. Araştırmada veri toplama aracı olarak Güdülenme ve Öğrenme Stratejileri Ölçeği (GÖSÖ) ile Kişisel Bilgi Formu kullanılmış olup, veriler 2010-2011 bahar yarıyılında toplanmıştır. GÖSÖ, 7'li Likert tipte 81 madde içermektedir ve 'Güdülenme' ile 'Öğrenme Stratejileri' olmak üzere iki bölümden oluşmaktadır. Araştırmada, ilişkisel tarama yöntemlerinden "kesit alma" yaklaşımı kullanılmıştır. Çalışmaya bir devlet üniversitesinde öğrenim görmekte olan 104 fen bilgisi öğretmen adayı gönüllü olarak katılmıştır. Çalışmanın sonuçları, öğretmen adaylarının özyeterlik algılarının, dönem sonu fizik notlarına göre değişiklik gösterdiğini ortaya koymuştur. Ayrıca cinsiyet faktörünün öğretmen adaylarının güdüsel stratejiler ve öğrenme stratejileri kullanımını etkilemediği sonucuna ulaşılmıştır. Son olarak, güdüsel stratejiler ve öğrenme stratejileri bölümlerinde yer alan alt boyutların ölçeğin geliştirildiği orijinal formuna uygun bir şekilde ilişkili olduğu bulgusuna ulaşılmıştır.

Anahtar Kelimeler: özdüzenleme becerileri, motivasyon, öğrenme stratejileri, fen bilgisi öğretmen adayları

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GENİŞLETİLMİŞ ÖZET

Etkili öğrenme; bilişsel ve duyuşsal boyutlar içermektedir ve bu boyutlar, özdüzenleyici öğrenme ile yakından ilişkilidir (Pintrich ve De Groot, 1990; Garcia ve Pintrich, 1995). Tüm yaş grupları için önemli olan özdüzenleyici öğrenme, öz yeterlilik algılarına dayalı akademik hedefleri gerçekleştirmede kullanılan stratejiler olarak tanımlanmıştır. Özdüzenleyici öğreniciler de kendi öğrenme süreçlerini ve çabalarını yönlendiren ve bilgi ve beceri kazanmak için çaba harcayan bireyler olarak tanımlanmıştır (Zimmerman, 1990).

Öğrencilerin öğrenme ortamlarını nasıl seçtikleri ve organize ettikleri ve öğrenme süreçlerini nasıl kontrol ettikleri, özdüzenleyici öğrenme bağlamında sıklıkla vurgulanmaktadır (Zimmerman, 1990). Bu hususlar, aynı zamanda etkili öğrenme için de hedeflendiği için (Pintrich ve De Groot, 1990; Garcia ve Pintrich, 1995), bu kavramları ölçen ölçekler geliştirilmiştir. Bu ölçeklerden en kapsamlı olanı Pintrich, Smith, Garcia ve McKeachie (1991) tarafından geliştirilen 'Güdülenme ve Öğrenme Stratejileri Ölçeği (GÖSÖ)'dir. Bu ölçek, farklı katılımcılarla (öğretmen adayları, öğrenciler, üniversite öğrencileri) gerçekleştirilen pek çok farklı çalışmada kullanılmıştır (Baker ve Olson, 1997; Bassili, 2008; Cavallo, Rozman, ve Potter, 2004; Lynch, 2006; Lewis ve Lithcfield, 1999; McClendon, 1996; Mattern, 2005; Matuga, 2009; Mousoulides ve Philippou, 2005; Senler ve Sungur, 2012; Yükseltürk ve Bulut, 2007; 2009). Ayrıca Credé ve Philips (2011) tarafından yapılan bir meta-analiz çalışmasında, GÖSÖ'nin akademik başarıyı tahmin etmede başarılı olduğu bulgusuna ulaşılmıştır.

Öğrencilerin güdülenme düzeyleri onların şimdiki ve gelecekteki akademik başarıları ile ilişkili olduğundan (Baker & Olson, 1999), öğrencilerin kullandıkları öğrenme stratejilerinin ve güdüsel stratejilerin belirlenmesi önem kazanmaktadır. Ayrıca bu araştırmada kullanılacak diğer bir değişken olan cinsiyetin, özdüzenleyici öğrenmeyle ilişkisi, sıklıkla incelenmiştir (örneğin; Bidjerano 2005; Campell, 2009; Cavallo, Rozman ve Potter, 2004; Hargittai ve Shafer, 2006; Lee, 2002; Yukselturk ve Bulut, 2009; Zimmerman ve Martinez-Pons, 1990). Ayrıca Cavallo ve arkadaşları (2004), özdüzenleme stratejilerine uygun şekilde yapılandırılmış fizik derslerinde, erkek öğrencilerin özdüzenleme becerilerinden olan özyeterlilik algılarının ve fizik kavramlarını anlama düzeylerinin kız öğrencilerden daha yüksek olduğunu rapor etmiştir. Bu bağlamda, fizik dersinde alınan başarı notlarının ve cinsiyetin fizik dersinde kullanılan öz düzenleme becerileri ile olan ilişkisinin belirlenmesi, bu değişkenler arasındaki ilişkilerin açıklanmasında ve öğrenme ortamlarının özdüzenleyici öğrenme stratejilerine uygun şekilde yapılandırılmasında yardımcı olabilir. Ayrıca, GÖSÖ kullanılarak elde edilecek veriler, üniversite öğrencilerinin öğrenme stratejileri ve güdüsel stratejileri kullanımlarını belirlemede faydalı olabilir. Bu çalışmanın hedef kitlesi olan öğretmen adayları düşünüldüğünde, öğretmen adaylarının kendilerinin öğrenme stratejilerini yeterli bir şekilde kullanıyor olarak mezun olmaları önemlidir. Böylece bu öğretmen adayları, gelecekte kendi öğrencilerinin başarılarını sağlayacak öğrenme stratejilerini ve güdüsel stratejileri öğrencilerine öğretebilecek ve öğrencilerine bu stratejileri belirlemelerine yardım edebileceklerdir (Lenne, Abel, Trigsno, & Leblanc, 2008). Buradan yola çıkılarak; bu araştırmada, bir devlet üniversitesinde öğrenim görmekte olan fen bilgisi öğretmen adaylarının cinsiyet ve akademik başarılarının GÖSÖ'nün alt boyutlarıyla olan ilişkilerinin incelenmesi amaçlanmıştır ve aşağıdaki sorulara cevap aranmıştır:

1. Fen bilgisi öğretmen adaylarının kullandıkları güdüsel stratejiler ve öğrenme stratejileri arasında bir ilişki var mıdır?

2. Cinsiyet ve dönem sonu fizik notlarının, fen bilgisi öğretmen adaylarının güdüsel ve öğrenme stratejileri kullanımlarında etkisi var mıdır?

Araştırma, ilişkisel tarama deseninde olup, verilerin toplanmasında "kesit alma" yaklaşımı izlenmiştir (Fraenkel ve Wallen, 2006; Karasar, 2009). Veri toplama aracı olarak ise Güdülenme ve Öğrenme Stratejileri Ölçeği (GÖSÖ) ile Kişisel Bilgi Formu kullanılmıştır. GÖSÖ, 5'li Likert tipte 81 madde içermektedir ve *Güdülenme* ile *Öğrenme Stratejileri* olmak üzere iki bölümden oluşmaktadır. Öğrenme stratejileri bölümünde; *Yineleme*, *Düzenleme*, *Açımlama*, *Eleştirel Düşünme*, *Yardım Arama*, *Akran İşbirliği*, *Metabilişsel özdüzenleme*, *Çaba Yönetimi* ve *Zaman ve Çalışma Ortamı* altboyutları bulunmaktadır. Güdülenme stratejileri bölümünde ise *İçsel Hedef Düzenleme*, *Dışsal Hedef Düzenleme*, *Görev Değeri*, *Öğrenmeye İlişkin Kontrol İnancı*, *Öğrenme ve Performansla İlgili Özyeterlik Algısı* ve *Sınav Kaygısı* altboyutları bulunmaktadır. Kişisel bilgi formunda; cinsiyet, dönem sonu fizik notu değişkenleri yer almaktadır. Veri toplanma aşamasında, üniversitede öğrenim görmekte olan sadece 1. ve 2. sınıf fen bilgisi öğretmen adayları bulunduğu için her iki sınıfta öğrenim gören öğrencilerin daha önceki dönemlerde almış oldukları ders olan Genel Fizik 1 dersi notu,

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araştırmanın değişkeni olarak kullanılmıştır. Veriler 2010-2011 bahar yarıyılında toplanmıştır. Çalışmaya bir devlet üniversitesinde öğrenim görmekte olan 104 fen bilgisi öğretmen adayı gönüllü olarak katılmıştır. Çalışmanın 1. Araştırma sorusuna yönelik olarak yapılan korelasyon analizi GÖSÖ'nün güdüsel stratejiler ve öğrenme stratejileri boyutlarında yer alan alt boyutların geliştirildiği orjinal formuna benzer şekilde anlamlı ve pozitif olarak ilişkili olduğu göstermiştir. Ancak zaman ve çalışma ortamı ile dışsal hedef düzenleme altboyutları arasında ($r=0,19$, $p>0,05$) ve içsel hedef düzenleme ile çaba yönetimi alt boyutları arasında ($r=0,00$, $p>0,05$) anlamlı bir ilişki bulunamamıştır. Benzer şekilde sınav kaygısı altboyutunun; açımlama stratejileri ($r=0,03$, $p>0,05$), düzenleme stratejileri ($r=0,10$, $p>0,05$), içsel hedef düzenleme stratejileri ($r=.09$, $p>.05$), içsel hedef düzenlemesi ($r=0,01$, $p>0,05$), akran işbirliği ($r=0,16$, $p>0,05$) ve yardım arama ($r=0,12$, $p>0,05$) altboyutlarıyla istatistiksel olarak anlamlı bir ilişki içinde olmadığı sonucuna ulaşılmıştır. Bu araştırmada GÖSÖ altboyutları arasındaki ilişkiler, GÖSÖ kullanılarak yapılan bazı çalışmalarla benzerlikler göstermektedir (örneğin; Sungur ve Tekkaya, 2006; Yükseltürk ve Bulut, 2009). Cinsiyetin GÖSÖ'nün altboyutlarıyla olan ilişkisini incelemek amacıyla çoklu varyans analizi yapılmıştır. Çoklu varyans analizi sonuçları cinsiyetin motivasyon boyutunda $F(6, 97)= 0,48$, $p= 0,82$; Wilks' $\lambda = 0,97$ ve öğrenme stratejileri boyutunda $F(9, 94)= 1,15$, $p=0,34$; ; Wilks' $\lambda = 0,90$ istatistiksel olarak anlamlı bir fark oluşturmadığını göstermiştir. Bu sonuçlar; Yükseltürk ve Bulut (2009) ve Hargittai ve Shafer'in (2006) yaptıkları çalışmalarla benzerlik göstermekle birlikte Cavallo ve arkadaşlarının (2004) yaptıkları ve erkek öğrencilerin özdüzenleme becerilerinden olan özyeterlilik algılarının ve fizik kavramlarını anlama düzeylerinin kız öğrencilerden daha yüksek olduğunu rapor ettiği çalışmayla çelişmektedir. Yine Lee (2002), Senler ve Sungur (2012) de çalışmalarında cinsiyet farkı rapor etmişlerdir. Ancak, bu araştırmada görülen bu durum; yapılan çalışmanın küçük bir katılımcı kitlesi ile gerçekleştirilmesinden ve özdüzenleme stratejilerine yönelik yapılandırılmış bir ünite verilmediğinden kaynaklanıyor olabilir. Çünkü Cavallo ve arkadaşları (2004) ve Matuga (2009), özdüzenleme stratejilerine yönelik yapılandırılmış ders içeriklerinin öğrencilerin akademik başarılarının yanı sıra kullandıkları özdüzenleyici öğrenme stratejilerini etkileyebileceğini belirtmişlerdir.

Benzer şekilde gerçekleştirilen ve dönem sonu fizik notunun bağımsız değişken olarak kullanıldığı varyans analizi sonucunda, dönem sonu fizik notunun sadece motivasyon boyutunda etkili olduğu sonucunu ortaya koymuştur $F(6, 99)= 1,83$, $p=0,006$; ; Wilks' $\lambda = 0,5$. Bonferroni düzeltme katsayısı kullanılarak yapılan post-hoc analizleri dönem sonu olarak BA (87,5) alan öğretmen adaylarının öğrenme ve performansa yönelik özyeterlik algılarının diğer dönem sonu notlarından istatistiksel olarak anlamlı bir şekilde farklılaştığını ortaya koymaktadır $F(1,106)= 3,29$, $p=0,007$, $\eta^2=0,14$. Bu sonuca paralel olarak Mousoulides ve Philippou (2005) ve Lynch (2006) da özyeterlik algısının akademik başarının önemli bir göstergesi olduğu sonucuna ulaşmışlardır. Oysaki, McClendon (1996) görev değerinin akademik başarının önemli bir göstergesi olduğu sonucuna ulaşırken Yükseltürk ve Bulut (2009) özdüzenleme stratejilerinin öğrencilerin başarılarını açıkladığı bulgusuna ulaşmıştır. Çalışmanın küçük bir örneklem ile ve sadece fen bilgisi öğretmen adaylarıyla gerçekleştirilmesinden dolayı akademik başarının GÖSÖ boyutlarıyla olan ilişkisinin çalışmalara göre değişiklik göstermesi beklenen bir durumdur.

Üniversite hocaları için öğrencileri motive eden ve öğrenme süreçlerinde yer almalarını sağlayan faktörlerin belirlenmesi önemlidir (Mattern, 2005). Benzer şekilde; GÖSÖ'den elde edilen bilgiler, öğrencilerin öğrenmelerinin niteliğinin arttırılmasında önemlidir (Lynch, 2006). Bu bağlamda, üniversite hocalarının geleceğin öğretmenleri olarak yetiştirdikleri öğretmen adaylarının güdüsel ve bilişsel stratejiler kullanım düzeylerini belirlemeleri ve bu stratejilerin kullanımı konusundaki farkındalıklarını arttırmaları gerekmektedir. Böylece, geleceğin öğretmenlerini, kullandıkları güdüsel ve bilişsel öğrenme stratejilerinin fakında özdüzenleyici bireyler olarak yetiştirebileceklerdir. Öğretmen adaylarının özdüzenleme becerilerinin daha geniş örneklemlerde ve farklı branşlarda gerçekleştirilecek ilişkisel-tarama çalışmalarıyla incelenmesine ve aynı zamanda özdüzenleme becerilerinin öğretimine yönelik yapılan deneysel çalışmalarla desteklenmesine ihtiyaç duyulmaktadır..

INTRODUCTION

Effective learning has motivational and cognitive components. These motivational and cognitive components are also accepted as important indicators of academic performance (Garcia & Pintrich, 1995; Pintrich & De Groot, 1990). Besides, these components are closely related to self-regulated learning (SRL). SRL is a broad term that consists of many aspects which are related with Piaget's constructivist theory, Vygotsky's sociocultural theory, social learning theories and information processing theories (Paris, & Paris, 2001). SRL includes using specific strategies to achieve academic goals based on self-efficacy perceptions (Zimmerman, 1989). Due to this reason, it is important for all ages and disciplines (Paris, & Paris, 2001). The term "self-regulated learners" has been introduced with the SRL. Self-regulated learners can take part in their own learning processes as metacognitively, motivationally and behaviorally. They are also assumed to direct their own learning process and develop skills for acquiring knowledge and skills (Zimmerman, 1989). Another important characteristic of self-regulated learners is that they are aware of what they know and what they do not know and also, how to achieve their goals by regulating their knowledge and using specific learning strategies (Anderton, 2006; Zimmerman, 1990). Also students who perceive themselves as self-regulated learners are aware of their learning process; can control their actions for attaining learning goals and can easily overcome contextual difficulties caused by classroom contexts or the nature of learning tasks (Wolters & Pintrich, 1998).

The present study included two main components of SRL as cognitive strategies and motivational strategies. Cognitive strategies included the use of *cognitive strategies* for covering the classroom material and *the metacognitive and regulatory strategies* for controlling and monitoring this process. Motivational strategies included *self-efficacy*, *intrinsic* and *extrinsic goal orientation*, *control of learning beliefs*, *task value* and *test anxiety* (Zimmerman, 1990). These components help students to engage in the learning tasks.

Two points are strongly emphasized in self- regulated learning: first, it highlights how students select, organize and create their learning environments for themselves. Second, how they plan and control the learning tasks (Zimmerman, 1990). Since stated issues are required for effective learning (Garcia & Pintrich, 1995; Pintrich & De Groot, 1990), the instruments for assessing these issues were developed. One of the most comprehensive instruments is the Motivated Strategies for Learning Questionnaire (MSLQ) which was developed by Pintrich, Smith, Garcia and McKeachie (1991). MSLQ was used as a data collection tool in numerous studies (Baker & Olson, 1997; Bassili, 2008; Cabı & Gülbahar, 2008; Çalışkan & Sezgin-Selçuk, 2010; Lynch, 2006; Lewis & Litchfield, 1999; Lynch, 1996; McClendon, 1996; Mattern, 2005; Mousoulides & Philippou, 2005; Neber, He, Leu, & Schofield, 2008; Saad, Tek, & Baharom, 2009; Yukselturk & Bulut, 2007; 2009) in different settings with different participants such as pre-service teachers (Cabı & Gülbahar, 2008; Çalışkan & Sezgin-Selçuk, 2010; McClendon, 1996; Lewis & Lithcfield, 1999; Senler & Sungur, 2012) or college students (Al Khatip, 2010; Mattern, 2005; Matuga, 2009; Saad et al. 2009, Yukselturk & Bulut, 2009). For instance, Bassili (2008) reported that most of the components of MSLQ are correlated with academic performance. Similarly, Lynch (2006) investigated the associations between motivational factors and course grades of college students and reported that self-efficacy and effort regulation were strong predictors of achievement. Yukselturk and Bulut (2009) reported that successful students generally used self-regulated learning strategies and indicated that self-regulation strategies and success were significantly correlated. Similarly, Yukselturk and Bulut (2007) reported that self-regulation explained a significant amount of variance in students' success. Al Khatip (2010) reported that intrinsic goal orientation, self-efficacy, test anxiety, and meta-cognitive self-regulated learning as significant predictors of college students' performance. Likewise, McClendon (1999) reported that the task value is the best predictor of course grade of pre-service teachers. In a study conducted with pre-service science teachers, academic achievement was reported as significantly but not strongly associated with pre-service science teachers' use of self-regulation strategies (Senler & Sungur, 2012). Also a meta-analytical study reported that the subscales of MSLQ had the predictive utility for academic performance (Credé & Philips, 2011). All the aforementioned studies indicated that MSLQ was a useful tool for determining students/learners' self-regulated learning strategies and the relationship between self-regulated learning strategies and other variables such as academic achievement or gender.

As students' current and future academic achievements are strongly connected to motivation (Barker & Olson, 1999), determining students' use of learning strategies and motivational orientations becomes crucial. Thus, the information gained from MSLQ can be useful for undergraduate students to identify their use of learning strategies and motivational orientations. Specifically, pre-service teachers should be recruited in universities with adequate knowledge in self-regulated learning strategies. They also, should help their students in order to develop self-regulated learning strategies (Lenne, Abel, Trigano, & Leblanc, 2008). For achieving this, a study that investigates of pre-service science teachers' use of learning and motivational strategies by using MSLQ is needed.

The effects of gender on self-regulated learning have been reported in many studies (e.g., Bidjerano 2005; Cabı & Gülbahar, 2008; Campell, 2009; Cavallo, Rozman & Potter, 2004; Çalışkan & Sezgin-Selçuk, 2010; Hargittai & Shafer, 2006; Lee, 2002; Lych, 2010; Senler & Sungur, 2012; Yukselturk & Bulut, 2009; Zimmerman & Martinez-Pons, 1990). For instance, Yukselturk and Bulut (2009) reported while test anxiety explained a significant amount of variance in female students' achievement, self-efficacy for learning and performance and task value explained in male students' achievement. Similarly, Zimmemarn and Martinez-Ponz (1991) reported that male students had higher self-efficacy beliefs when compared with female students. In their study, Cabı and Gülbahar (2008) reported that gender was significantly correlated with external goal orientation and critical thinking skills. Saad et al. (2009) reported that female students in science groups had higher level of self-regulatory learning when compared with male students in Malaysian context. On the other hand, Neber et al. (2008) reported that self-efficacy beliefs of female students tended to be lower than female students in Chinese context. In Turkish context, however, Caliskan and Sezgin-Selcuk (2008) indicated that gender only made a small contribution to pre-service physics teachers' self-regulated learning. Senler and Sungur (2012) reported that female pre-service science teachers used metacognitive strategies such as self-regulation and effort regulation more than male pre-service science teachers. In contrast to the research findings that reported gender difference in self-regulated learning, Hargittai and Shafer (2006) reported no gender difference in self-regulated learning.

There have been numerous studies that investigated self-regulated learning in physics. For instance, Cavallo and her colleagues (2004) reported that self-efficacy beliefs predicted physics understanding. They also reported that male participants had higher self-efficacy beliefs, performance goals and a better understanding in physics when compared to female participants indicating that female students tended to use less meaningful learning in physics when compared to males. This study is consistent with Lynch's (2010) study. He also reported that male participants had higher self-efficacy beliefs and critical thinking skills than females and female participants had higher test anxiety when compared to males in physics course. In their study, Caliskan and Sezgin-Selcuk (2008) investigated pre-service physics teachers' self-regulated learning strategies with respect to gender and academic achievement and reported that gender was not an important predictor in self-regulated learning. In contrast, they indicated that achievement is influenced by use of self-regulated learning strategies. In another study conducted by Caliskan, Sezgin-Selçuk and Erol (2008), strategy instruction was reported as an effective tool for enhancing physics achievement, problem solving and strategy use. Even this study is not directly related with self-regulated learning research in physics, giving strategy instruction may also enhance self-regulated learning strategies in physics. Neber et al. (2008) investigated Chinese high school students' self-regulated learning in physics with respect to gender and reported that female students' self-efficacy beliefs were lower when compared with male students'. Since the aforementioned studies related with self-regulated learning in physics were conducted either with pre-service physics teachers (e.g., Caliskan & Sezgin-Selcuk, 2008) or with high school students (e.g., Neber et al. 2008), any study that investigate pre-service science teachers' self-regulated learning in physics with respect to gender and academic achievement was foreseen. Thus, the present study aimed to investigate pre-service science teachers' self-regulated learning strategies in physics with respect to gender and academic achievement. Specifically, the present study focused on following questions:

1. Is there a relationship between students' self-reported motivation and self-reported use of learning strategies?

2. What is the role of gender and academic achievement scores on students' self-regulation strategies in Physics course?

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METHOD

Since the aim of the current study was describing some aspects and characteristics of the sample, the survey design was used for data collection. Specifically, the present study was designed as a cross-sectional which the data was collected at one point in one time from the sample (Fraenkel & Wallen, 2006; Karasar, 2009). "Direct administration to a group" was utilized for collecting data. The main advantages of this approach are the high rate of response and low cost. The main disadvantage of this method is the selection of survey type and the total nonresponse that can threat validity of survey (Fraenkel & Wallen, 2006). For preventing total nonresponse, the researcher was present at the time of data collection in order to explain the aim of the study and to answer respondents' questions.

Subjects of the Study

In this study, convenience sampling method was utilized due to time and financial constraints and obvious advantage in accessibility of the sample (Fraenkel & Wallen, 2006). A total of 108 pre-service science education teachers (PSTs) from a public university participated in this study. Since Multivariate Analysis of Variance (MANOVA) is too sensitive to outliers, after checking the assumptions of MANOVA 4 cases (ID 31, ID 40, ID 58 and ID 80) were excluded from the present study. Thus, 104 PSTs were included in the statistical analysis. Of 104 pre-service science teachers in the sample, 74 were female (71,2%) and 30 were male (28,8%); 76 were freshmen and 28 were sophomores (see, Table 1). Age of PSTs ranged from 18 to 23 with a mean age of 19,75 (*SD*= 1,15). As the science teacher education program was a recently opened program in the university, there were only freshmen and sophomore students at the time of data collection and all the freshmen and sophomore students voluntarily participated in the study.

Table 1: Distribution of Sample with Respect to Gender and Grade level

Variable	N	%
Gender		
Male	30	28,8
Female	74	71,2
Grade Level		
1	76	73,1
2	28	26,9
Total	104	100

Instrumentation

Motivated Strategies for Learning Questionnaire (MSLQ)

PSTs' motivation and use of learning strategies were measured by 81-item Motivated Strategies for Learning Questionnaire (MSLQ). This questionnaire was reported as having strong validity with pre-service teachers (McClendon, 1996). The questionnaire was a self-report questionnaire and was specifically developed for assessing undergraduate students' motivation and their self-regulated learning towards a specific course (Garcia & Pintrich, 1995; Duncan, & McKeachie, 2005).

The questionnaire was designed as a 7-point Likert scale format, ranging from 1 (not all true of me) to 7 (very true of me). Eight items were reversed in case of higher mean scores indicating higher use of learning strategies and possessing higher motivational beliefs. The questionnaire was comprised of two sections as "motivation" and "learning strategies". The "motivation" section included 31 items in 6 subscales for assessing students' goals and value beliefs for a specified course, beliefs about their ability to succeed in a course and test anxiety about tests in a course. The "learning strategies" section of MSLQ included 50 items in 9 subscales for assessing students' use of cognitive-metacognitive strategies and resource management strategies. Each section included specified sub-sections (components) as presented in Table 2 (Garcia, & Pintrich, 1995; Pintrich et al., 1991, 1993; Sungur, & Tekkaya, 2006). The number of questions in each dimension description and components of dimensions and were presented in Table 2.

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Table 2: Total item number in each dimension and descriptions

Part 1: Motivation subscale

Sub-section	Scale	#item	Dimension description
Value component	1.Intrinsic Goal Orientation	4	Students' perceptions of the reasons of engaging in a task for their own curiosity or challenge
	2.Extrinsic Goal Orientation	4	Complementary of intrinsic goal orientation, perceptions of engaging in task for rewards or grades
	3. Task Value	6	Students' personal evaluation of a task (e.g., how a task is interesting or useful)
Expectancy component	4. Control of Learning Beliefs	4	Students' beliefs about their efforts which will result in positive outcomes
	5.Self-Efficacy for Learning & Performance	8	Students' self- assessment of their own ability to achieve a task
Affective component	6. Test Anxiety	5	Students anxiety about tests in a course
Total		**31**	

Part 2: Learning strategies subscale

Sub-section	Scale	#item	Dimension description
Cognitive and metacognitive strategies	1. Rehearsal	4	Reciting or memorizing items from a list, usually used for sample tasks
	2. Elaboration	6	Storing information in long-term memory by using paraphrasing or summarizing
	3. Organization	4	Selecting and constructing connections among the information to be learned
	4. Critical Thinking	5	Applying students' previous experience or knowledge into new situations in order to solve problems
	5.Metacognitive Self-Regulation	12	Refers to the awareness, knowledge and control of cognition.
Research management strategies	6.Time/Study Environmental Management	8	Students' management and regulation of their time and study environment
	7. Effort Regulation	4	Students' own ability to control their effort and attention when dealing with uninteresting or distracting situations
	8. Peer Learning	3	Students' collaboration with their peers
	9. Help Seeking	4	Students' help seeking from other students or the teachers
Total		**81**	

Adapted from "A manual for the use of motivational strategies for learning questionnaire (MSLQ)" by Pintrich et al., 1991

The reliability and validity studies of instrument reported that the MSLQ has good reliability in terms of internal consistency and show reasonable predictive validity (Pintrich et al., 1993). The scale was translated and adapted into Turkish by Büyüköztürk, Akgün, Özkahveci and Demirel (2004). Cronbach's alpha internal consistency coefficients ranging from 0,62 to 0,93 for the motivation section and from 0,52 to 0,80 for the learning strategies section was reported by Pintich et al. (1991). The alpha values for translated and adapted version was reported as ranging from 0,54 to 0,89 for the motivation section and from 0,61 to 0,81 for the learning strategy section (Sungur & Tekkaya, 2006). The internal consistency coefficients for the present study were computed as ranging from 0,50 to 0,85 for motivation section and 0,53 to 0,82 for learning strategies section.

Personal Information Sheet

Personal information sheet including information about participants' age, gender, grade level and academic achievement scores in General Physics-I lesson was collected. Since freshmen had taken General Physics-I course one semester ago and sophomore students had taken the same course two semester ago, academic achievement score of a shared course (in this case, General Physics I) was asked in personal information sheet. Since the MSLQ was designed to asses undergraduate students'

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motivation and their self-regulated learning towards a specific course (Garcia et al., 2005), General Physics course was chosen as specific course for the present study.

Procedure

In each class, the participants were informed about the purpose of the study and the confidentiality of their responses. After this short explanation, the questionnaires were distributed to all volunteer participants. About 30-minutes were given to students for completing the questionnaire. Then, the questionnaires were gathered by the researcher.

Data Analysis

Data analysis consisted of two parts. The first part of data analysis involved using simple correlations for investigating relationships between subscales of MSLQ. Second part consisted of multivariate analysis of variance (MANOVA) for identifying gender and academic achievement score differences in respondents' self-reported motivation and self-reported use of learning strategies. In this analysis, gender and achievement score were considered as independent variables and dimensions of MSLQ scores were considered as the dependent variables. The statistical analysis was performed by using PASW 18 package program with the significance level of 0,05. Since MANOVA was too sensitive to outliers (Pallant, 2007), prior to examining multivariate effects, multivariate normality and homogeneity of variance and covariance matrices assumptions of MANOVA were checked. Shapiro-Wilk test which is considered as most powerful test in detecting departures from normality, was used for examining univariate normality of observations on each variable (Stevens, 2002; p.236). Results indicated that dependent variables were normally distributed ($p > 0,05$). The nonsignificant F tests from Box's M statistics indicated that homogeneity of variance and covariance matrices were not violated ($p > 0,05$). Also dependent variables were not found to be highly correlated as indicated in Table 4. Thus, it was concluded that the multicollinearity assumption was not violated (Pallant, 2007, p. 282).

RESULTS

Descriptive statistics

The mean scores, standard deviations, skewness and kurtosis values for each variable in the model were presented in Table 3. Examination of skewness and kurtosis values revealed that all the observed variables were normally distributed (in the range of between +2 and -2 which was stated as indicators of normal distribution as stated by Pallant, 2007). Descriptive statistics of motivation and learning strategies sections of the MSLQ were presented in Table 3.

Table 3: Descriptive Statistics of Motivation and Learning Strategies Sections of the MSLQ (N=104)

Variable Motivation section	Mean (M)	Standard Dev. (SD)	Skewness	Kurtosis	Min.	Max.
Intrinsic goal orientation	5,13	0,93	-0,35	-0,12	2,50	7
Extrinsic goal orientation	4,91	1,13	-0,04	-0,66	2,25	7
Task value	5,00	0,98	-0,12	-0,55	2,83	7
Control of learning beliefs	5,58	0,97	-0,43	-0,32	2,50	7
Self-efficacy for learning and performance	4,90	1,09	-0,56	0,38	1,00	7
Test anxiety	4,66	1,14	-0,28	0,13	1,40	7
Variable Learning Strategies	Mean (M)	Standard Dev, (SD)	Skewness	Kurtosis	Min,	Max,
Rehearsal	5,10	1,21	-0,42	-0,18	1,75	7
Elaboration	5,10	1,00	-0,35	-0,01	2,50	7
Organization	5,38	1,10	0,24	0,47	2,75	7
Critical thinking	4,63	1,10	-0,06	-0,23	2	7
Metacognitive self-regulation	5,08	0,90	-0,27	-0,13	2,83	7
Time and study environment	4,93	0,86	0,16	-0,25	2,75	7
Effort regulation	4,62	0,94	0,01	-0,43	2,50	7
Peer learning	4,60	1,03	-0,25	0,96	1,50	7
Help seeking	4,87	1,04	-0,50	-0,19	2,33	7

According to Table 3, all the mean scores seemed to be above the mid-point of the 7-point Likert scale indicating that participants had mid to high mean scores in each abovementioned constructs. The participants' mean scores in intrinsic goal orientation (*M*=5,13, *SD*=0,93) were found to be higher than

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the mean scores in extrinsic goal orientation (*M*=4,91, *SD*=1,13) indicating that they are motivated to learn physics for their own curiosity and more focused on mastery goals rather than studying for getting higher grades or getting approval from others. The participants had the highest mean scores in control of learning beliefs (*M*=5,58; *SD*=0,97) implying they believed that their own effort for learning will have positive outcomes rather than being affected by external factors. Mean score in task value subscale (*M*=5.00; *SD*=0.98) is found to be close to mean scores in self-efficacy for learning subscale (*M*=4.90; *SD*=1.09). Lastly, they had a mean score of 4,66 in test anxiety dimension (*SD*=1,14) indicating they were more anxious in physics course than average. In terms of learning strategies part, it could be seen that participants' mean scores of rehearsal (*M*=5,10; *SD*=1,21) and elaboration (*M*=5,10; *SD*=1,00) strategies were found to be equal which indicated that they frequently used both rehearsal strategies (copying, underlining or shadowing the material) and elaboration strategies (paraphrasing, summarizing, creating analogies or generative note taking). Even the participants' mean score in use of organizational strategies (outlining, creating a hierarchy) (*M*=5,38; *SD*=1,10) is close to the mean score of rehearsal and elaboration strategies, it was found to be higher when compared the other strategies. PSTs' mean scores in effort regulation (*M*= 4,62; *SD*=0,94) and peer learning (*M*= 4,60; *SD*=1,03) subscales were found to be lowest when compared to other subscales in learning strategies dimension.

Zero-order Correlations Among subscales of MSLQ

In order to investigate first research question of the present study, Pearson-Product-Moment Correlations were calculated among the subscales of MSLQ. The results were presented in Table 4.

Table 4: Pearson-Product-Moment Correlations among Subscales of MSLQ

	Intrinsic goal or.	Extrinsic goal or.	Task value	Control of learn. beliefs	Self-eff for learn.	Test anxiety
Rehearsal	0,29**	0,30**	0,40**	0,32**	0,31**	0,31**
Elaboration	0,45**	0,34**	0,66**	0,36**	0,52**	0,03
Organization	0,35**	0,30**	0,58**	0,34**	0,45**	0,10
Critical thinking	0,44**	0,27**	0,60**	0,23*	0,48**	0,22*
Metacog. self-reg.	0,42**	0,36**	0,59**	0,41**	0,50**	0,09
Time and study en.	0,38**	0,19	0,43**	0,28**	0,33**	0,01
Effort regulation	0,26**	0,32**	0,29**	0,26**	0,23*	0,29**
Peer learning	0,20*	0,25*	0,37**	0,30**	0,25*	0,16
Help seeking	0,00	0,17	0,25*	0,08	0,07	0,12

* Correlation is significant at the 0,05 level (2-tailed), ** Correlation is significant at the 0,01 level (2-tailed)

The results of zero-order correlation analysis indicated that variables were related as specified by Pintrich et al. (1991) and in predicted directions expect a few points. Any statistically significant relationship between time and study environment and extrinsic goal orientation (*r* =0,19, *p*>0,05); intrinsic goal orientation and effort regulation (*r*=0,00, *p*>0,05) were detected. Likewise, test anxiety was not significantly correlated with elaboration strategies (*r* =0,03, *p*>0,05), with organizational strategies (*r* =0,10, *p*>0,05),with meta-cognitive self-regulation (*r*=0,09, *p*>0,05), with time and study environment (*r* =0,01, *p*>0,05), peer learning (*r* =0,16, *p*>0,05) and help seeking (*r*=0,12, *p*>0,05). Similarly, Sungur and Tekkaya (2006) also reported any statistically significant relationship between test anxiety and rest of dimensions in learning strategies section. In contrast to this finding, test anxiety was positively correlated with rehearsal strategies (*r* =0,31, *p*<0,05), with critical thinking (*r* =0,22, *p*<0,01) and with effort regulation (*r* =0,29, *p*<0,05) in the present study. Help seeking was found to be correlated with task value (*r* =0,25, *p*<0,05) indicating that the more students perceive task as interesting or useful, the more they tended to demand help from either their peers or their teachers. On the contrary, it was not correlated with the rest of subscales (*p*>0,05). Overall, these results indicated positive and significant associations between students' motivational constructs and use of learning strategies expect help seeking and test anxiety subscales.

Multivariate Analysis of Variance Results with respect to Gender

In order to investigate second research question of the study, one-way multivariate analysis of variance (MANOVA) was performed. In the present study, gender was considered as independent variables. The subscales in motivation and learning strategies sections of the MSLQ were determined

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as dependent variable. The MANOVA analysis revealed no statistically significant difference between male and female participants in terms of motivation dimension (6 subscales) of MSLQ, $F(6, 97)= 0,48$, $p= 0,82$; Wilks' $\lambda = 0,97$ and for learning strategies dimensions (9 subscales) of MSLQ, $F(9, 94)= 1,15$, $p=0,34$; ; Wilks' $\lambda = 0,90$. In the result of this study, there was no statistically significant difference between the mean scores of male and female students with respect to motivational beliefs and self- regulated learning components reflected in learning strategies section.

Multivariate Analysis of Variance Results with respect to Academic Achievement Scores

In order to investigate the effect of academic achievement score on the subscales of motivation and learning strategies sections, MANOVA analysis was conducted. A statistical significant difference was detected in learning strategies dimension, $F(9, 94)= 1,56$, $p= 0,014$; Wilks' $\lambda = 0,50$; partial eta squared 0,13. When the result of dependent variables (subscales of learning strategies) were considered separately using a Bonferroni correction, no statistical significant difference was revealed in academic achievement scores of participants regarding learning strategies subscales. On the other hand, in terms of motivation subscales, there was a statistically significant difference $F(6, 99)= 1,83$, $p=0,006$; ; Wilks' $\lambda=0,5$. When the results of dependent variables were compared separately, the only difference that reached statistical significance, by using a Bonferroni adjusted alpha level of 0,008, was the self-efficacy $F(1,106)= 3,29$, $p=0,007$, partial eta squared=0,14. An inspection of mean score indicated that PSTs who have BA as academic score have higher self-efficacy for learning beliefs (see, figure 1) when compared to other academic achievement scores (M=5,75; SD= 0,75).
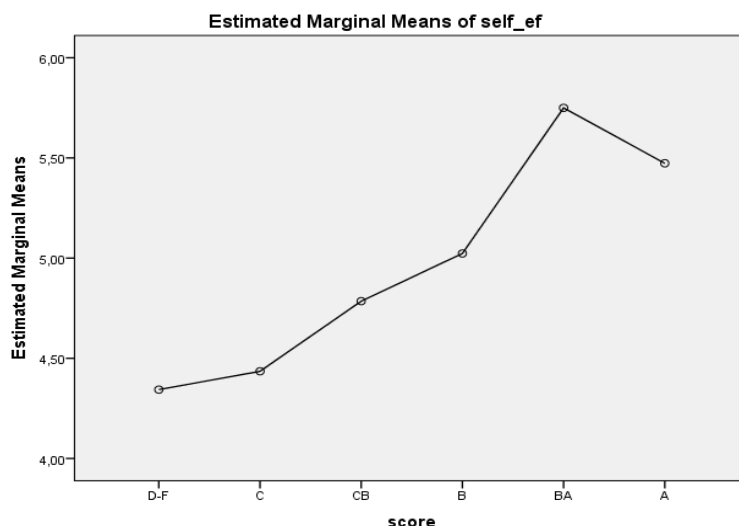

Figure 1: Interaction between Academic Achievement Scores with respect to Self-efficacy Beliefs

DISCUSSION and CONCLUSION

The aim of the present study was twofold. First, it was aimed to investigate the relationship between pre-service science teachers' self-reported motivational strategies and learning strategies using correlational analysis. Secondly, it was aimed to investigate the role of gender and academic achievement score on pre-service science self-regulated strategies in Physics course by using multivariate analyses of variance. For the first research question, Pearson- Product-Moment Correlations analyses of the MSLQ subscales indicated that variables in subscales were positively correlated in predicted directions as the original scale (Pintrich et al., 1991; 1993) expect help seeking and test anxiety subscales. Supporting this finding, Sungur and Tekkaya (2006) reported that test anxiety was not correlated with the rest of subscales in learning strategies section in their study.

According to the descriptive statistics, the pre-service science teachers used rehearsal strategies as frequent as elaboration and organizational strategies in physics course which was perceived as a difficult course (Aycan & Yumusak, 2002). Whereas, rehearsal strategies are accepted as simplistic strategies whish are primarily used for simple learning tasks and mostly used in the first years of schools (Pintrich et al., 1991; Weinstein & Mayer, 1986). Weinstein and Meyer (1986) emphasized that as the difficulty of learning tasks is increased, students' use of comprehensive learning strategies such elaboration or organizational strategies will also increase. In contrast to Weinstein and Meyer's

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(1986) statement, pre-service science teachers in the sample frequently used rehearsal strategies in comprehensive learning tasks.

For the second research question, no statistically significant mean difference was detected between male and female pre-service science teachers with respect to motivational beliefs and self- regulated learning components reflected in learning strategies section. This study is consistent with the findings of Caliskan and Sezgin-Selcuk (2010). In their study, they also reported no gender difference in self-regulation strategies in physics. Supporting this, Yukselturk and Bulut (2009) reported no significant gender difference between male and female students with respect to motivational beliefs and self-regulated learning components. Similarly, Hargittai and Shafer (2006) and Saat et al. (2009) reported no gender difference in self-regulated learning. In contrast to this finding, Cavallo et al. (2004) reported that male students had significantly higher self-efficacy performance goals and a better understanding in physics when compared to female students. Similar findings were reported by Lynch (2010). Similarly, Zimmerman and Martinez-Ponz (1991) reported that male students had higher self-efficacy beliefs when compared with female students. Also, Lee (2002) reported that female students experience more difficulties in self-regulated learning environment. Likewise, Lych (2010) reported that female had more test anxiety when compared to males in physics course. In their study, Cabı and Gülbahar (2008) reported male pre-service teachers have higher external goal orientation and have more critical thinking skills than females. Despite the aforementioned studies that reported males use self-regulation strategies more than females (Campell, 2009; Cavallo et al., 2004; Lee, 2002; Zimmerman & Martinez-Ponz, 2011), Senler and Sungur (2012) reported that pre-service science teachers' use of self-regulated learning strategies differ in terms of gender which implied female pre-service science teachers use metacognitive strategies such as self-regulation and effort regulation more than male pre-service science teachers. Even Saad et al. (2009) reported no gender difference in high school students' self-regulated learning as a whole, the result changed when they grouped science and mathematics students separately. They reported that females' self-regulatory learning was higher than males' in motivation and learning strategies dimensions. On the contrary, Neber et al. (2008) reported that female high school students had lower self-efficacy beliefs than male students in physics courses. Since the current study was conducted with a small sample size, it is likely to being not able to detect the possible gender differences between male and female pre-service science teachers' use of self-regulated learning strategies. As because any structured course related with self-regulated learning were offered to pre-service science teachers as Cavallo et al. (2004), Matuga (2009), Yukselturk and Bulut (2009) and Zimmerman and Martine-Pons (1991) did, it is also likely to not being able to detect the possible gender differences in the present study. Caliskan, Sezgin-Selçuk and Erol (2006) reported a significant relationship between self-regulated strategies and success. They also, reported that successful pre-service physics teachers tended to use more self-regulated strategies than unsuccessful students in physics courses and students' problem solving strategies in physics also enhanced after learning self-regulated learning strategies.

Findings only revealed a statistical significant difference among between academic achievement scores and self-efficacy subscale of MSLQ indicating that the PSTs who had BA as academic score for General Physics-I course, also had higher self-efficacy for learning beliefs when compared to other achievement scores. Supporting this result, Mousoulides and Philippou (2005) and Lynch (2006) also reported self-efficacy as a strong indicator of academic performance. Lynch (2010) also included intrinsic and extrinsic goal orientation and task value as correlated with grades besides self-efficacy. Caliskan and Sezgin-Selcuk (2008) reported a significant relationship between self-regulated learning strategies and academic achievement and indicated that successful pre-service physics teachers tended to use more self-regulated strategies in physics courses. Besides, Schunk and Zimmerman (1994) and Bassili (2008) reported a positive relationship between academic achievement and self-efficacy. As Mousoulines and Philippou (2005) stated that having strong self-efficacy beliefs influence to have high task value and to use cognitive and metacognitive learning strategies more actively which may result in high academic achievement. Contrasting this result, task value was found to be best predictor of academic achievement by McClendon (1996). Likewise, Lewis and Litchfield (1999) reported the control of learning beliefs and Yukselturk and Bulut (2007) reported self-regulation as the predictor of academic achievement. Al Khatip (2010) also reported that intrinsic goal orientation, self-efficacy, test anxiety, and meta-cognitive self-regulated learning as significant predictors of college students' performance. Since the current study was conducted with a small sample size and with only pre-

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service science teachers, the predictors of academic performance might change due to the aforementioned reasons. Also a meta-analytical study of MSLQ studies indicated that many of learning strategies (i.e., rehearsal, elaboration, organization, critical thinking, peer learning, and help seeking) appeared to be largely unrelated to academic performance. The reason of this low relationship might be due to curvilinear relationships or no need of use of learning strategies in getting college grades (Credè & Philips, 2011, p. 344). Although Bassili (2008) indicated MSLQ is a useful tool for determining college students' use of learning strategies and motivational constructs and Pintrich et al. (1993) indicated that the metacognitive and self-regulatory strategies reflected in MSLQ can influence students' academic achievement; Credè and Philips (2011) reported low correlations between subscales of MSLQ and academic achievement which is might be due to poorly constructed items, in their meta-analysis. Even the present study did not detect a significant relationship between motivation and academic achievement in physics, Caliskan and Sezgin-Selcuk (2008) reported contrasting findings in pre-service physics teachers. Likewise, Vanderstoep, Pintrich and Fagerlin (1996) reported the students who have higher academic achievement scores were more likely to have motivational beliefs.

Determining the factors that motivate students to engage in learning is important for university educators as Mattern (2005) highlighted. Therefore, this study has some implications for educators. Even conducted with a small sample size, the information gained in the present study may be useful for enhancing students' diagnosis of self-regulated learning strategies and influence learning effectiveness (Lynch, 2008). As the role of teacher educators considered, raising self-regulated learners (future teachers) is important. Thus, the future teachers can also, raise their students as self-regulated learners. In order to achieve this aim, effective inclusion of self-regulated learning in classrooms is recommended (Al Khatip, 2010; Cavallo et al., 2004; Chyung, Moll, & Berg, 2010; Matuga, 2009; Yukselturk & Bulut; 2009; Zimmerman & Martine-Pons; 1991). For instance, Chyung et al. (2010) reported that inclusion of self-regulated learning strategies in classrooms significantly improved students' intrinsic goal orientations and thus, made significant contribution to their academic achievement. Teaching of self-regulation to pre-service teacher will help them to be equipped in terms of pedagogical skills for teaching self-regulated learning more effectively to their students as Saad et al. (2009) and Lenne et al. (2008) indicated. Neber and his colleagues (2008) indicated that students' self-regulated learning in physics seemed to decline in higher grade levels. As their acquaintance with physics course is increased, a tendency to decline in self-regulated learning is physics was reported by Neber et al (2008). So, both pre-service science teachers and science teacher educators should be aware of this decline. In order to prevent this decline, modifications in physics learning environments is proposed by Neber et al. (2008). Çalışkan et al. (2006) indicated that pre-service physics teachers used superficial strategies in physics problem solving. As a modification, they proposed development of much deeper approach in physics problem solving. This can be achieved by using self-regulated learning strategies in physics courses and integrating them into physics classes. Also, teacher preparatory programs should considerer differentiated self-regulated learning environments (Lee, Teo, & Chai, 2010). Thus, pre-service science teachers will have more opportunities to develop self-regulated learning skills. Lee et al. (2010) also, reported that pre-service teachers who had more experience in terms of self-regulated learning had higher mean scores than those without teaching experience. Thus, further opportunities should be provided to pre-service teachers to experience teaching self-regulated learning strategies. This can be achieved by increasing the hours of School Experience courses in Turkish context. If pre-service science teachers have more opportunity to go cooperating schools and experience teaching with their cooperating teachers, it may help them to develop more self-regulated learning strategies. Also, Saad et al. (2009) recommended being aware of the possible gender difference in terms of self-regulated learning for teacher educators. Lynch (2006; 2010) also, recommended being aware of gender difference in terms of physics courses since female participants' self-efficacy was found to be lower than females in physics courses. Another suggestion for enhancing self-regulated learning in physics, is giving strategy instruction in pre-service science teacher education programs. Supporting this, Çalışkan et al. (2008) indicated that strategy instruction was as an effective tool for enhancing physics achievement, problem solving and strategy use.

Also PSTs' use of learning strategies and motivational constructs should be further investigated with a larger sample and with different disciplines of pre-service teachers as Vanderstoep et al. (1996) investigated. Another implication is the promotion of self-regulated learning environments by

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including behavioral, metacognitive, and motivational strategies in classroom settings which may inform students about self-regulated learning, use of effective learning strategies and motivational strategies (e.g, Cavallo et al., 2004; Matuga, 2009; Yukselturk & Bulut, 2009; Zimmerman & Martine-Pons, 1991). Lastly, the experimental studies which investigate the effectiveness of self-regulating learning strategies in classrooms are needed in order to determine how educators (both university educators and school teachers) integrate self-regulation in their classroom settings.

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