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The Contribution of Motivational Beliefs to Students' Metacognitive Strategy Use

Öğrencilerin Güdüsel İnançlarının Üst-Biliş Strateji Kullanımına Katkısı

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Abstract

This study aimed at investigating how well elementary students' self-efficacy and achievement goals (mastery approach, mastery avoidance, performance approach, and performance avoidance goals) predict their metacognitive strategy use in science. For the specified purpose, Achievement Goal Questionnaire and Motivated Strategies for Learning Questionnaire were administered to 115 elementary school students. Results showed that the elementary students who feel self-efficacious in science and study for the reasons of learning and understanding (mastery approach goals) the course material tend to use metacognitive strategies at higher levels. In line with the findings, specific suggestions were made for science teachers to help development of adaptive motivational beliefs and effective strategy use.

Keywords: Self-efficacy; achievement goals; metacognitive strategy use.

Öz

Bu çalışmanın amacı, ilköğretim öğrencilerinin özyeterlik algıları ve hedef yönelimlerinin (ustalık yaklaşma, ustalık kaçınma, başarım yaklaşma, başarım kaçınma) Fen ve Teknoloji dersindeki üst-biliş strateji kullanımlarıyla olan ilişkisini araştırmaktır. Bu amaçla, 115 ilköğretim öğrencisine Hedef Yönelimi Anketi ve Öğrenmede Güdüsel Stratejiler Anketi uygulanmıştır. Sonuçlar, Fen ve Teknoloji dersinde başarılı olabilecekleri ve öğrenebileceklerine dair inançları yüksek olan ilköğretim öğrencileri ile derse öğrenmek,anlamak için çalışan ilköğretim öğrencilerinin (ustalık yaklaşma hedef yönelimine sahip öğrenciler) üst-biliş stratejilerini daha üst seviyelerde kullandığını göstermiştir. Sonuçlar doğrultusunda, ilköğretim öğrencilerinin Fen ve Teknoloji dersindeki motivasyonlarının ve üst-biliş strateji kullanımının geliştirilebilmesi için öğretmenlere önerilerde bulunulmuştur.

Anahtar Sözcükler: Özyeterlik algısı,hedef yönelimi, üst-biliş strateji kullanımı.

Introduction

At the beginning of 1970s, following Flavell's suggestion that brain takes active role in learning, metacognition was started to be studied extensively in the educational research area (Moseley, Elliot, Gregson and Higgins, 2005). Related studies demonstrated that metacognition has important roles in students' learning (Pintrinch, 2002). The basic definition of metacognition is "thinking about thinking" (Livingston, 2003). This term also includes knowledge about the

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nature of cognitive processes of learners, different cognitive tasks and strategies that can be used in these tasks. Moreover, it also includes monitoring skills (Flavell, 1999). Therefore, researchers see metacagnition as a tool that not only makes students involve in the learning process, but also gives them responsibity for own their learning (Georghiades, 2000). Indeed, according to Flavell (1979) metacognition can be defined as "cognition of cognition" (Flavell, 1979). Based on this definition, metacognition entails representation of cognition and this representation also controls decisions (Efklides, 2009). In other words, metacognition involves learners' knowledge about their cognition and their ability to control it (Forrest-Pressly & Waller, 1984). Based on this idea Flavell (1992) proposed that metacognition can be taxonomically categorized as metacognitive knowledge and metacognitive experience. Metacognitive knowledge includes knowledge about person, task, and strategy variables. More specifically, person variable involves the learners' knowledge about their strength and weaknesses while the task variable comprises knowledge about task characteristics and demands. Additionally, knowledge about what strategies involves knowledge about what strategies will be more useful in achieving what goals and under which situations. Metacognitive experience, on the other hand, includes cognitive or affective conscious experiences relevant to ongoing cognitive processes. Metacognitive experiences are expected to happen in situations that promote emergence of thoughts and feelings about learners' own thinking. Therefore, metacognition, which refers to conscious and intentional control of learners' cognitive processes, help students plan, monitor, and evaluate their learning in a way that directly improves their academic performance (Schraw & Moshman, 1995).

Nevertheless, according to Bandura (1993), students do not use metacognitive strategies such as planning and monitoring on a regular basis. In fact, motivational variables are found to be significantly linked to the level and quality of students' metacognitive activities (Coutnho, 2007; Kanfer & Ackerman, 1989; Pintrich & DeGroot, 1990; Sungur & Şenler, 2009). For example, in a study conducted by Coutnho, (2007), it was demonstrated that while there was a positive relationship between mastery approach goals and metacognition, a negative relationship was found between performance avoidance goals and metacogniton. Moreover, in other studies, self efficacy was found to play an important role in student metacognition (Kanfer & Ackerman, 1989; Sungur, 2007).

Self Efficacy

Self efficacy can defined as the judgments of students about their academic performance and how well they can do the task (Baundra, 1981), Self efficacy can influence people's choice of tasks and persistence in these tasks (Baundra 1977). If students feel that they cannot handle a task, they tend to experience a fear and avoid from the task. On the other hand, if students believe that they can succeed a task, they accept the responsibility of that task, put forth more effort to complete the task and persist longer in the face of difficulties and distracters (Baundra 1977, 1981; Hoy, 2004). According to theorists, one of the reasons of motivational problems in schools is low self-efficacy that makes students give up the task quickly (Margolis, & McCabe, 2003).

Self efficacy is found to be significantly associated with metacognition. For example, Kanfer and Ackerman (1989) showed that students who have high self-efficacy were more likely to use metacognitive strategies when working on a task than those with low self-efficacy. Similarly, Bouffard-Bouchard, Parent, and Larivee (1993) concluded that students with high self-efficacy used more metacognitive skills than students with low self-efficacy. Pajares (2002) points out that regardless of prior achievement, higher self-efficacy is related to greater use of cognitive and metacognitive strategies.

Achievement Goals

Achievement goal theory was proposed in the late 1970's and early 1980's (Elliot& Harackiewicz, 1996; Shih, 2005). Early researches based on this theory distinguished two achievement goals namely, mastery goals and performance goals. While mastery goals concern learning and understanding the task, and improving the competence skills, performance goals focus on demonstrating competence, or ability (Elliot & Harackiewicz, 1996; Church & Elliot, 1997; Pintrich, 2000; Linnenbrink & Pintrich, 2002; Pintrich& Conley& Kemper, 2003; Shih 2005). Later researchers suggest that an achievement goal can be for desiring a positive possibility as an approach goal, or can be avoiding a negative possibility as an avoiding goal (Elliot & Thrash, 2001). Combining these two orientations, mastery versus performance; approach versus avoidance, researches offered 2× 2 form of achievement goals: mastery approach, mastery avoidance and performance approach, performance avoidance. Mastery approach goals refer to attempting to access success in the task, whereas, mastery avoidance goals refer to avoiding failure and not understanding. For instance, if students adopt mastery approach goals, they study for the reasons of improving their knowledge or skills, on the other hand, if students hold mastery avoidance goals, they study for the reason of avoiding not learning and understanding. Concerning performance goals, while students with performance approach goals study a task to show their ability to others and look smart, students with performance avoidance goals study to avoid looking dumb or getting the worst grades.

Relevant literature showed that achievement goals are significantly related to metacognition. For example, Middlebrooks' (1996) study that examined whether metacognitive activity is affected by students' achievement goals revealed that, in a problem solving task, mastery goal orientated students tend to be aware of their prior knowledge facilitating their problem solving and learning process at higher levels. Moreover, they appeared to use strategy monitoring during the early attempts to solve the problem, as well as to have a higher levels of an awareness for the strategy effectiveness after the solution. On the other hand, performance goal oriented students were found to be less likely to utilize metacognitive strategies. In addition, Cointho (2007) found that students with mastery goals have superior metacognitive skills and strategies that they use to master information than students who have peformance goals.

Considering the findings of the aforementioned studies, the current study aimed to investigate the contribution of motivational beliefs in the prediction of students' metacognitive strategy use in science lessons. Self efficacy and achievement goals are selected as motivational beliefs. Although, there is a considerable research on student metacognition in relation to self-efficacy and achievement goals, in the present study achievement goals was examined in terms of approach and avoidance goals. Previous studies mainly focus on the mastery and performance goal dichotomy without making a distinction between approach and avoidance forms of the achievement goals. Moreover, the current study, was conducted with Turkish elementary students. Majority of the studies in this field were conducted in Western countries. However, there is need for examining student metacognition in relation to contextual factors and some student characteristics such as motivation and affect in different cultures and countries (Veenman, Van-Hout-Wolters, Afflerbach, 2006) to be able to develop theoretical models of metacognition generalizable across different cultures and countries. Therefore, the present study can be considered as an important step in order to achieve this end.

Method

Participants

Participants of the study were 115 7th grade students attending public elementary schools. There were 61 boys and 54 girls. Their mean science achievement grade in the previous year was 3.53 out of 5. There were no substantial differences across schools with respect to previous science grades. In general, students in different schools and classes had similar characteristics and experienced similar learning environments.

Instruments

The Achievement Goal Questionnaire (AGQ)

It is a 5-point Likert type instrument developed by Elliot and McGregor (2001) to assess students' achievement goals. It includes 15 items in 4 subscales that assess students' mastery approach goals (3 items), performance approach goals (3 items), mastery avoidance goals (3 items), and performance avoidance goals (6 items) in science. The AGO was translated and adapted into Turkish by Şenler and Sungur (2007). The sub-scale reliabilities found in the current study and sample items are presented in Table 1.

Table 1.
Sub-scale Reliabilities and Sample Items

	Sample Item	Cronbach's alpha
Mastery approach goals	It is important for me to understand the content of this course as thoroughly as possible	.69
Performance approach goals	It is important for me to do better than other students	.60
Mastery avoidance goals	I worry that I may not learn all that I possibly could in this class	.66
Performance avoidance goals	My goal for this class is to avoid performing poorly	.59
Metacognitive self-regulation	When reading for this course, I make up questions to help focus my reading	.74
Self efficacy	I'm confident I can learn the basic concepts taught in this course	.79

Motivated Strategies for Learning Questionnaire (MSLQ)

It is a self-reported questionnaire developed by Pintrich, Garcia, and McKeachie (1991). Students rate themselves on a seven point Likert scale from "not at all true of me" to very true of me" concerning different aspects of their motivation and learning strategy use. In the present study, a Turkish version of the MSLQ, translated and adopted in to Turkish by Sungur (2004), was used to assess students' self efficacy (8 items) and metacognition (12 items) in science. The reliabilities of self-efficacy and metacognitive self-regulation sub-scales were found to be .79 and .74, respectively (see Table 1).

Results

Descriptive Statistics

Mean and standard deviation for students' achievement goals, self-efficacy, and metacognitive self-regulation are presented in Table 2.

Table 2.
Descriptive Statistics

	M	SD
Mastery approach goals	4.56	.61
Performance approach goals	4.15	.74
Mastery avoidance goals	3.19	1.03
Performance avoidance goals	3.45	.78
Metacognitive self-regulation	5.02	.98
Self efficacy	5.41	1.14

As seen in Table 1, elementary students appear to have higher levels of approach goals compared to avoidance goals. This implies that, in science classes, students tend to study for the reasons of learning, understanding, showing their abilities to others, and getting the highest grades rather than avoiding misunderstanding or looking dumb. Moreover, the mean scores for metacognitive self-regulation and self-efficacy which are well-above the mid-point of 7-point Likert scale suggest that elementary students use strategies that help them control and regulate their own cognition at reasonable levels and they appear to be self-efficacious in science learning.

Inferential Statistics

In order to examine how well elementary students' achievement goals and self-efficacy predict their metacognitive self-regulation in science, multiple linear regression analysis was conducted. Prior to the analysis, multicollinearity, outliers, normality, linearity, homoscedasticity, and independence of residuals assumptions were checked. For the multicollinearity assumption, the VIF and tolerance values were examined. The VIF value less than 10 and the tolerance value more than .20 indicated that that there was no violation of the multicollinearity assumption. Outliers were checked by inspecting Mahalanobis distances. Two cases were found to exceed the critical value of 20.52 Tabachnick & Fidell, 2007). Considering both the sample size and the fact that these two cases were not influential data points with Cook's distances less than 1, these two cases were retained in the analysis. Then, linearity, homoscedasticity and independence of residuals assumptions were checked by examining the standardized residuals, and it was found that all the assumptions were met.

After the assumption check, multiple linear regression analysis was carried out. Results showed that the linear combination of predictor variables significantly accounted for 50 % of variance in metacognitive strategy use, ($R= .70$, $F= 11.09$, $p< .05$). More specifically, it was found that self efficacy and mastery approach goals each made a statistically significant contribution to the prediction of students' metacognitive self-regulation ($p <0.05$), while other variables failed to achieve significance ($p > 0.05$). The size and direction of relationship indicate that students with higher levels of self-efficacy and mastery approach goals demonstrate higher levels of metacognitive self-regulation in science. Between these two significant predictors, however, self-efficacy appears to be more important in explaining the dependent variable, as indicated by the largest squared semipartial correlation for the self-efficacy ($sr^2= .34$). Beta coefficients, semi-partial correlation coefficeints and related significance values are presented in Table 3.

Table 3.

Contribution of Students' Achievement Goals and Self-efficacy to Metacognitive Self-regulation

Predictor variables	*β*	*p*	*sr*
Self efficacy	.653	.000	.579
Mastery approach goals	.224	.024	.245
Performance approach goals	-.071	.487	-.102
Mastery avoidance goals	.070	.533	.052
Performance avoidance goal	.063	.573	.023

Discussion and Conclusion

The present study investigated the relationship between Turkish elementary students' motivation (self-efficacy and achievement goals) and their metacognition in science classes. Results demonstrated that elementary students' mastery approach goals and self efficacy significantly predict their metacognitive strategy use in science classes. This finding implied that students who are self-efficacious in their science learning and study for the science courses for the reasons of learning and understanding tend to use metacognitive strategies such as planning, monitoring, and evaluating at higher levels. Research in the literature also indicates similar results about effects of motivational variables on the metacognitive strategy use. For example, concerning the role of self-efficacy in metacognitive strategy use, Pajares and Schunk (2001) reported that student self efficacy is significantly related to metacognitive strategy use. Pajares (2002) also pointed out that higher self-efficacy is associated with greater use of cognitive and metacognitive strategies. Therefore, it can be concluded that if students' judgment about their ability to learn and perform effectively (self-efficacy) is improved, this can lead to the effective use of metacognitive strategies by the students. Those students who can use metacognitive strategies effectively are expected to better plan their study, and monitor and evaluate their understanding resulting in better academic performance. Therefore, to improve student self-efficacy in science which is found to be significantly linked to metacognitve strategy use, it is suggested that science classes should be enriched with activities and tasks that can help students realize that their abilities to learn science can be improved through their effort and experience. Accordingly, in the classroom, specific suggestions should be made for student progress and the link between effort and accomplishments should be stressed. Moreover, teachers should emphasize that the difficulties experienced by the students in their learning do not indicate their failure or inadequate ability. Instead, students should be able to perceive these difficulties they face with as opportunities to use different strategies and to improve their ability to master the course material (Paulsen & Feldman, 2005; Schommer, 1994). Indeed, if students think that they can learn and understand with reasonable effort, they put forth greater effort, do not give up in the face of obstacles, and use a variety of strategies to achieve their goals (Hoy, 2004).

In addition, consistent with the previous findings (Coutnho, 2007; McWhaw & Abrami, 2001; Middlebrooks, 1996), present study revealed significant relationship between mastery approach goals and metacognitive strategy use. Therefore, to be able to help student use metacognitive strategies more effectively in science classes, it is suggested that teachers create learning environments focusing on learning and understanding rather than competition. Actually, although it was non-significant,, in the current study the direction of the relationship between performance approach goals and metacogniton was negative. This may imply that studying for the reasons of showing abilities to others, getting the highest grade, and looking smart tend to have negative impact on effective strategy use. For this reason, it is suggested that in science classes, teachers stress students' individual improvement, mastery, and progress and use variety of novel and interesting tasks requiring peer interaction (Pintrich & Schunk, 2002).

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