INVESTIGATING THE EFFECT OF SECONDARY SCHOOL STUDENTS' LEVEL OF SCHOOL ENGAGEMENT AND SUBJECTIVE WELL-BEING IN SCHOOL ON THEIR MOTIVATION TO LEARN SCIENCE

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ABSTRACT

This study aimed to investigate the effects of school engagement and subjective well-being in school on students' motivation to learn science. The universe consisted of middle school students attending school in Erbağ district center of Tokat Province. Data collected from 1308 students were analyzed. The following tools were used to collect data in this study: School Engagement Scale (SES), developed by Fredricks, Blumenfeld, Friedel,and Paris (2005) and adapted into Turkish by Çengel et al. (2017); Brief Adolescents' Subjective Well-Being in School Scale (BASWBSS) developed by Tian et. al. (2015) and translated into Turkish by Özdemir and Sağkal (2016) and A Questionnaire for Motivation toward Science Learning developed by Dede and Yaman (2008). In addition, a personal information form prepared by the researchers was included among data collection tools. SPSS 20 package program was used in data analysis. Multiple regression analysis technique was used to determine whether school engagement predicted motivation for science learning while simple regression analysis technique was used to determine whether subjective well-being in school predicted motivation to learn science. The study determined that with its cognitive, affective and behavioral dimensions, school engagement was a significant predictor of motivation to learn science. In addition, subjective well-being in school was found to significantly predicted the motivation to learn science. The results of this study demonstrated that school engagement and subjective well-being in school were significant predictors of students' motivation to learn science. Science activities combined with programs that support subjective well-being in school in the light of a strong school culture and a positive school climate will increase students' motivation and create a healthier and safer basis for academic achievement.

Keywords*: School engagement, subjective well-being in school, motivation to learn science, middle school students*

INTRODUCTION

Science education aims to enable all students to comprehend the basic science concepts by improving their scientific literacy, to help them understand the nature of science and to ensure that they voluntarily continue science studies in or out of school by realizing the relationship between their lives and science and technology (National Research Council [NRC] 1996). For this reason, it is important to take into account not only cognition but also the affective components of cognition in science learning and teaching. Among affective components, motivation is of great importance because students' motivation plays a critical role in conceptual change processes (Pintrich et. al. 1993). Motivation refers to the process of engaging in specific behaviors that will provide satisfaction or lead to a goal to meet various needs (Sabuncuoğlu & Tuz, 1998). Motivation is the causality of behavior and explains the behavior (Lefrançois, 1995). Due to its positive educational outcomes, motivation for learning has become one of the subject areas that draw attention and interest in educational research. Motivation has a positive relationship with cognition and learning and it should be kept in mind that motivating factors have a critical role in determining students' future goals. It is believed that students' attitudes and achievements towards science will affect their future plans and preferences (Singh et al.2002). Low student motivation and lack of participation in academic studies have always been a concern for teachers and school administrators. It is especially necessary to provide counseling to students and to include practices and classroom activities which will improve attitudes towards science learning and provide the opportunity to gain positive experiences (Singh et al.,2002).

Based on the previous studies conducted on learning motivation, it can be argued that factors such as self-efficacy perception, test anxiety, intrinsic goal orientation, self-regulation skills, task orientation and learning strategies affect individuals' learning motivation (Garcia 1995, Garcia & Pintrich 1995). Motivation theories suggest that repeated failures in learning tasks facilitate task-avoidance, i.e. the tendency to avoid difficulties or to give up when faced with difficulties while positive experiences facilitate task-oriented behavior of achievement (Guthrie & Klauda, 2016). This suggests that it would be worth addressing the relationship between motivation to learn and school engagement and subjective well-being at school, which may affect learning motivation. School engagement includes students' positive perceptions and feelings about the school, their teachers, and their friends and their active participation in school activities and learning processes (Furlong et. al., 2003). In addition, school engagement is also associated with students' social, behavioral and academic outcomes (Covell, 2010). Fredericks et al. (2004) stated that general school engagement is perceived as a meta-structure that includes behavioral, affective and cognitive processes. Behavioral engagement includes pro-social behaviors such as participation in school and learning activities, engagement with tasks and obeying the rules or performing the expected behaviors. Affective engagement includes affect, interest, identification with school and belonging while cognitive engagement focuses on self-regulation, strategic thinking and psychological investment (Archambault et. al., 2009; Fredricks et. al., 2004). While

engagement is conceptualized as a means for students to participate in learning in the classroom, motivation is defined as the psychological or physiological drive behaviors that precede students' learning (Patall et al., 2016).

According to studies, school engagement gradually decreases between primary school and high school years (Savi, 2011, Bellici, 2015, Eccles & Wang, 2012). In particular, interest in science, motivation and academic performance is observed to decrease more at the secondary school level (Quinn & Cooc 2015; Wang & Fredricks, 2014). This finding is extremely worrying since secondary school is a period where students clarify their academic activities and choices regarding their future professional careers (Tyson et al., 2007).

The concept of school engagement is crucial as a remedial way against undesired situations in the school and classroom environment such as low academic achievement, school dropout rates, alienation from school, and boredom (National Research Council & Institute of Medicine [NRCIM], 2004). Basically, it can be argued that school engagement activates the social and academic development underlying the future successful adulthood period for students (Furlong et. al., 2003).

Another factor influencing students' educational efforts and motivations is their subjective well-being (in school). Subjective well-being, which includes cognitive and emotional assessments of individual's own life (Lucas & Diener, 2008) is regarded as a structure related to several concepts such as happiness, satisfaction and positive affect (Diener, 2009). Subjective well-being in school addresses how students regard their lives at school subjectively and what they experience emotionally at school and it consists of elements such as school satisfaction, positive affect at school and negative affect at school. Positive affect at school includes students' subjective and cognitive assessments of school life on specific issues such as school satisfaction, academic learning environment and teacher-student relations and creates pleasurable emotions such as happiness, pleasure and relaxation at school; negative affect at school, on the other hand, refers to the unpleasant affective emotions experienced by students at school such as tension, anxiety, stress and depression (Tian, 2008). These cognitive and emotional elements that determine subjective well-being in school play an important role in students' school functions and in all aspects of their development (Tian et al.2013). Since the motivation for learning science includes the dimensions of research, performance, communication, collaborative work and active participation in the learning-teaching process, issues such as teacher-student relations, classroom relations and active participation can be related to students' subjective well-being. The most important determinant of happiness for children and adolescents is the solid relationships they establish in their schools rather than their academic achievement. If students experience a state of well-being in their home and school relations, if their sense of belonging to school increases and if the school climate is positive, then their life satisfaction increases as well. The way to address students holistically and to serve their developments is to support their educational, emotional, social and career development (Bilge, 2017).

Turkey ranked 54th in the science test among 72 countries in the PISA exam in 2015 while it ranked 39th among 79 countries in 2018. Monitoring and Evaluating Academic Skills 2018 results for 4th graders showed that 70% of 34554 students had intermediate or below intermediate level proficiency in the field of science (Tedmem,2020). Monitoring and Evaluating Academic Skills 2019 results were similar as well. These results suggest that the motivation for science learning and the variables that will emerge as a result which will subsequently affect science achievement should be considered not only from the cognitive aspect but also from the affective aspect. In this context, this study aimed to investigate the effects of school engagement and subjective well-being in school on students' motivation to learn science. It is believed that the results of this study, conducted on a topic with limited previous research, will make important contributions to the literature.

In this context, this study sought answers to the following questions:

1. Do secondary school students' school engagement levels significantly predict their motivation to learn science?

2. Do secondary school students' subjective well-being levels significantly predict their motivation to learn science?

METHOD

Universe of the Study

The universe consisted of middle school students attending school in Erbağ district center of Tokat Province. The total number of students in the district center was 12166 and 6 secondary schools from different parts of the district were included in the study. One of these schools was a boarding school, one was an imam-hatip (religious secondary school), two of them were from the district center and two of them were from the rural neighborhoods of the district. Data collected from 1308 students were analyzed (N=1308). Accordingly, 27.5% of the participants attended fifth grade, 17.9% sixth grade, 22.8% seventh grade and 31.8% attended eighth grade. 51.1% of the students were male and 48.9% of them were female.

Table1. Distribution of Students According to their Demographic Characteristics

		f	%
Gender	**Female**	640	48,9
	Male	668	51,1
Grades	**5th Grade**	360	27,5
	6th Grade	234	17,9
	7th Grade	298	22,8
	8th Grade	416	31,8
TOTAL		1308	100

Data Collection Tools

The following tools were used to collect data in this study: School Engagement Scale (SES), developed by Fredricks, Blumenfeld, Friedel,and Paris (2005) and adapted into Turkish by Çengel et al. (2017); Brief Adolescents' Subjective Well-Being in School Scale (BASWBSS) developed by Tian et. al. (2015) and translated into Turkish by Özdemir and Sağkal (2016) and A Questionnaire for Motivation toward Science Learning developed by Dede and Yaman (2008). In addition, a personal information form prepared by the researchers was included among data collection tools.

Brief Adolescents' Subjective Well-Being in School Scale consists of a total of 8 items on achievement, school management, teacher-student relationships, peer relationships, teaching, academic learning, positive affect and negative affect. The Cronbach Alpha internal consistency coefficient was calculated to be .71, .65 and .62 for School Satisfaction and Affect at School subscales and the total Subjective Well Being in School, respectively. Subjective Well-being in School total score was used in this study. The Cronbach Alpha internal consistency coefficient of the scale was determined to be .90 for this study.

A Questionnaire for Motivation toward Science Learning includes 23 items. Exploratory factor analysis was conducted to determine the validity of the scale. Factor analysis results showed that the scale had five factors explaining 47% of the total variance. In addition, the reliability coefficient (Cronbach Alpha) of the scale was found to be 0.80. In this study, the total scale score was used. The scale includes motivation dimensions for research, performance, communication, collaborative work and participation. For this research sample, the Cronbach Alpha internal consistency coefficient of the scale was found to be.95.

School Engagement Scale: School Engagement Scale developed by Fredricks et al. (2005) and adapted to Turkish by Çengel et al. (2017) was used in this study. The scale has a total of 19 items in three dimensions: behavioral (5 items), affective (6 items) and cognitive (9 items). The Cronbach alpha coefficients of the subscales of SES range between 0.68-0.80. For this research, the Cronbach alpha coefficients of the scale were found to range between .69 and .81.

Data Analysis

SPSS 20 package program was used in data analysis. Multiple regression analysis technique was used to determine whether school engagement predicted motivation for science learning while simple regression analysis technique was used to determine whether subjective well-being in school predicted motivation to learn science.

RESULTS

Results Regarding the First Sub-Problem: The study investigated whether secondary school students' level of school engagement was a significant predictor of their motivation to learn science. Table 2 presents the results of the multiple regression

analysis conducted to examine whether students' school engagement levels significantly predicted their motivation towards learning science.

Table 2. Regression Analysis Results on Motivation to Learn Science and School Engagement

	Variable	B	Standard Error	β	t	p	Binary r	Partial r
Motivation to Learn Science	Constant	34,662	3,737	-	9,276	,000	-	-
	Behavioral	,756	,238	,115	3,171	,002	,087	,081
	Affective	,529	,159	,122	3,323	,001	,092	,085
	Cognitive	,677	,121	,196	5,608	,000	,153	,144
	R=0,377	R²=0,142	F=71,992	P=,000				

Table 2 shows that with their behavioral, cognitive and affective dimensions; secondary school students' school engagement levels had a significant relationship with students' motivation to learn science (R=0377, R^2=0,142) ($F_{(4-1308)}$=71,992, p<0,01). These variables together explain 14% of the change in motivation scores for learning science. According to the standardized regression coefficients, the relative importance order of predictor variables on motivation to learn science is cognitive commitment (β=0,196), affective commitment (β = 0.122) and behavioral commitment (β=0,115). Considering the significance level of the regression coefficients, it can be observed that all of the predictive variables were significant predictors of motivation for science learning (p <0.01, p <0.05). According to the results of the regression analysis, the regression equation for learning science can be expressed as follows:

Motivation to Learn Science= (0,756 x Behavioral Engagement)+(0,529 x Affective Engagement)+(0,677 x Cognitive Engagement)+(34,662)

Results Regarding the Second Sub-Problem

The study investigated whether secondary school students' level of subjective well-being in school was a significant predictor of their motivation to learn science. Table 3 presents the results of simple regression analysis regarding whether the subjective well-being levels of students at school significantly predicted their motivation to learn science.

Table 3. Regression Analysis Results on Motivation to Learn Science and Subjective Well-Being in School

	Variable	B	Standard Error	β	t	p
Motivation to Learn Science	Constant	47,524	2,560	-	18,561	,000
	Subjective Well-Being in School	,772	,053	,371	14,445	,000
	R=0,371	R²=0,138	F=208,650	P=,000		

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According to Table 3, secondary school students' levels of subjective well-being in school showed a significant relationship (R = 0371, R2 = 0.138) with their motivation to learn science (R=0371, R^2=0,138) ($F_{(1-1308)}$=208,650, p<0,01). Accordingly, subjective well-being in school explains 13% of the change in motivation scores for learning science. The significance test of the main predictor variable coefficient (B=0.722) in the regression equation also showed that subjective well-being in school was a significant predictor. According to the regression analysis results, the regression equation for science learning can be expressed as follows:

Motivation to Learn Science = (0, Subjective Well-Being in School)+(47,524)

DISCUSSION

The study determined that with its cognitive, affective and behavioral dimensions, school engagement was a significant predictor of motivation to learn science. When the relative order of importance of school engagement on motivation towards science learning was taken into consideration, it was observed that cognitive commitment had the strongest effect on motivation to learn science followed by affective and behavioral commitment, respectively.

Connel and Wellborn (1991) reported that students with high cognitive engagement are more enthusiastic and diligent about learning difficult subjects and that they do not give up in the face of difficulties. The study conducted by Arastaman (2009) with high school students on school engagement and learning motivation found that students' school engagement was more focused on getting to university and it had a non-resilient character when faced with difficulties and it fit the characteristics of students who studied enough just to get by. In addition, the items that students had the lowest scores such as 'I prefer homework and studies that are difficult in the classroom" and "I read other books to learn more about what we learn at school", showed that students' cognitive engagement was poor.

There are many studies showing that school engagement is positively related to academic achievement and motivation as well (Finn & Rock, 1997; Samdal et al.1999; Osterman, 2000; Murdock et al. 2001; Fredricks et al.2004; Chen, 2008; Dalun et al., 2011, Dotterer & Lowe, 2011, Roorda et. al. 2011; Wonglorsaichona et al.2014). Due to the expectation-value motivation (Eccles, 2009), students' motivational beliefs have a mediating effect between perceived school characteristics and engagement (Wang & Eccles, 2013). The study conducted by Bae and Lane (2019) with middle school students reported that science achievement was also related to the components of engagement.

Motivation to learn science includes the topics of research, performance, communication, collaborative work and participation. The scale items emphasize peer support and peer relationships as well as teacher-student relationships. According to Bakodorova and Raufelder (2017), the concept of school engagement is motivating by nature and therefore peers and teachers are of special interest in the roles of motivational supporters. Based on these theoretical assumptions, the developmental

process of school engagement can be viewed as the interplay of personal factors (i.e., school self-concept) and socio-motivational context. School engagement is an important factor in students' school careers as it can increase academic motivation and achievement (Fredricks et. al., 2004). On the other hand, low school engagement can lead to serious negative consequences such as dropping-out (Fall & Roberts, 2012; Henry et. al., 2012).

The study by Smith et. al. determined that the sense of school belonging was a positive determinant of attitudes towards learning science. These findings highlight the importance of improving the school environments (Smith et al.2020). The decrease in emotional and behavioral school engagement in adolescence is a well-documented phenomenon in the modern world (Lam et. al., 2016). At the same time, it is difficult to specify the factors that may support the positive development of school engagement, as both are influenced by environmental factors (Fredricks et. al., 2004; Wang & Eccles, 2013). For example, students tend to be more interested in and value learning activities at school that offers opportunities to make choices, that have personal relevance and that are emotionally supported by both teachers and peers in learning (Wang & Eccles, 2013).

This study also found that subjective well-being in school was a significant predictor of motivation to learn science. The relationships between academic motivation and achievement and subjective well-being can be considered from two perspectives: process and product. In this context, the studies focusing on academic achievement center on the product variable, while studies examining the factors that create academic achievement center on process variables (Eryılmaz & Aypay, 2011). For example, examination of product-oriented studies showed that adolescents living in different countries exhibited successful academic performance but did not feel well subjectively (Broege et al.2006; Loveless, 2016). In addition, according to Whitley et. al. (2012), while positive emotions towards the school contributed to students' academic learning, students who were very unhappy with their school experiences tended to exhibit difficulties in various situations such as low academic achievement levels and student participation. In addition, positive emotions in regards to motivation play an important role in education. According to Froiland et al. (2012), intrinsic motivation causes positive emotions and a higher intrinsic motivation level is associated with more participation. Subjective well-being in school is also defined as an important determinant of academic achievement (Archambault et al.,2009). As a matter of fact, Miller et al. (2013) found in their study that students with high well-being had high achievement scores. Eryılmaz and Aypay (2011) investigated the relationship between adolescents' motivation to participate in class and their subjective well-being. According to the results of the study, the adolescents' motivation for participating in the lesson increased as their subjective well-being levels increased, as they received positive reactions from the environment and as they reacted positively to the environment.

In their study, Shoshani et. al. presented a 2-year longitudinal evaluation of a school-based positive impact within the scope of the effectiveness of the Maytiv school program. In the study, 2517 7th-9th graders in 70 classes were given positive psychology based interventions at the classroom level. Findings revealed the positive effects of the intervention on positive emotions, peer relationships, and emotional engagement at school. The research results demonstrated the crucial socio-affective and academic benefits of including the components of positive psychology in the school curriculum (Shoshani, Steinmetz, Kanat-Maymon, 2016).

CONCLUSIONS

The study determined that with its cognitive, affective and behavioral dimensions, school engagement was a significant predictor of motivation to learn science. In addition, subjective well-being in school was found to significantly predicted the motivation to learn science.

In the light of these results, it can be argued that it is necessary to improve the subjective well-being of students at school, to improve especially the relationships in the classroom between the teacher and the students and among the students and to respond to their needs in learning and teaching processes, and thus to support their positive feelings towards the school. Furthermore, a school culture that enhances cognitive, affective and behavioral engagement towards the school and classroom environment should be provided along with a positive school climate.

The results of this study demonstrated that school engagement and subjective well-being in school were significant predictors of students' motivation to learn science. In the perspective of the relevant literature, it can be argued that factors such as school engagement and subjective well-being in school should be taken seriously by teachers and school administrators in creating motivation for science curriculum and activities. Science activities combined with programs that support subjective well-being in school in the light of a strong school culture and a positive school climate will increase students' motivation and create a healthier and safer basis for academic achievement. Studies can be conducted to monitor the change in motivation towards learning science by implementing programs that improve subjective well-being in school.

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