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Research Article

Investigation of 9th Grade High School Students' Attitudes towards Science Course

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Abstract: In this study, ninth grade students' attitudes towards science were investigated in terms of self-regulation strategies, motivational beliefs and gender variables. The sample of this study includes 322 male and 296 female in total 618 students from 3 different high schools (Science high school, Anatolian high school, and Vocational high school) in center district of Amasya city. To collect the data, the researchers employed "Motivated Strategies for Learning Questionnaire" which has been developed by Pintrich and De Groot in 1990, adapted into Turkish by Uredi in 2005 and consists of 44 items and "Colorado Learning Attitudes about Science Survey (CLASS)" has been developed by Adams and others in 2006, adapted into Turkish by Bayar and Karamustafaoğlu in 2015 and consists of 36 items. For data analysis, mean, standard deviation, independent t-test and correlation were addressed. The results of this study show that there are statistically significant relationships between 9th grade students' attitudes towards science and self-regulation strategies, motivational beliefs, and gender.

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1. INTRODUCTION

Knowing the whole character of learners including psychological, cognitive, social, and emotional development is very important for educators to access the success in education. Due to the fact that the research studies in education place so much emphasis on cognitive development of learners and ignore other development levels including emotional development (Akbaş, 2004; Selvi, 1996). Educators consider the cognitive learning as the basement for their instruction and disregard emotional learning (Bacanlı, 1999; Bilen, 2001). Especially, by the beginning of 2000s, it is understood that intellectual factors are not solely enough for students' learning and academic achievement. In addition to intellectual factors, it has been accepted that emotional factors are important for students' learning and academic achievement. Since, emotional learning is the tool for cognitive learning (Demirbaş & Yağbasan, 2004). At this point, it is worth mentioning various definitions of "attitude" which is one of the aspects of the emotional learning. Attitude is identified as the tendency consisting of both negative and positive behaviours towards any object, events, or people (Eagly & Chaiken, 1993; Petty, 1995; Turgut, 1997). In Ulgen's (1997) points of view, the attitude is a phenomenon that influences

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individuals' decision-making process. On the other hand, some intellectuals (Ajzen & Fishbein, 1980; Safran, 1993) discuss the attitude with its cognitive, sensual, and behavioral characters. Individuals' interests and attitudes are important aspects for identifying the characters of individuals. Knowing their interest and aspects might help anticipate future actions of individuals (Tekin, 1996).

In science education, attitude is the tendency to evaluate facts, events, and objects related to science (Gardner, 1975). Examining the body of research in science education about attitudes shows that attitudes of learners towards science education and their scientific attitudes are widely elaborated by researchers (Byrne & Johnstone, 1988; Koballa, 1988). While cognitive factors are emphasized in scientific attitudes, sensual aspects are paid more attentions in attitudes towards science education (Hamurcu, 2002). The results of the studies exploring learners' attitudes towards science education and physics education are very similar to each other. Even though physics is a relevant and applicable area to the everyday life, students think physics is very boring and challenging (Sarı, 2015; Tekbıyık & Akdeniz, 2010). The main prerequisite to teach physics effectively is to take attention of students to science or physics and suggest them to alternative learning strategies (Whitelegg & Parry, 1999; Zacharia, 2003). In a study, Ulgen (1997) explores students' beliefs about physics education. Participants' responses to the question that "Do you think physics course must be compulsory in high schools?" varies and as following: **a)** students fail physics, therefore it must not be taught in schools **b)** I hate physics **c)** Physics is a beneficial class, I apply what I learn in physics class to everyday life**. d)** I like doing physic homework **e)** Learning physics is essential for everybody, **f)** It does not matter for me whether physics is taught in schools or not. Among students' responses, b represents students' negative feelings, d represents positive feelings of students and c represents students' beliefs on cognitive side of physics. In physics classes, the questions like "Why do I have to learn all these facts" or "Where and when would I use what I learn in Physics class" come to students' minds. To prevent negative feelings and attitudes towards science and physics, it is necessary to teach children why science is important and a requirement for their lives. In the new science education program updated in 2013, the importance of beliefs and attitudes towards science education is emphasized in order to attract students to science classes (MONE, 2013). One of the purposes of the new science education program is to help students develop positive attitudes towards science. It is discussed that showing children the relationship among science, technology, environment, and community might increase students' interests in science. It is also argued that new research should be conducted to explore the factors influencing students' attitudes.

In the relevant literacy in science education, the issue regarding whether gender influence students' attitudes towards science is widely discussed. While some studies (Demirci, 2004; Güngör & Eryılmaz, 2006; Osborne, Simon & Collins, 2003) consider gender as one of the important factors influencing students' attitudes towards science, other studies make opposite arguments (e.g Barrington & Hendicks, 1988; Çakır, Şenler & Taşkın, 2007; Sorge, 2007). Şengören, Tanel and Kavcar (2006) found in their study that the students' attitudes towards optics, that is one branch of physics or science, were not changed by gender differences. In another study, Çakır, Şenler and Taşkın (2007) have found that there is no relationship between students' attitudes towards science and gender. To make a further investigation about students' attitudes towards science education, various scales were developed. However, these scales are mostly developed to assess attitudes of secondary or university students. (Bilgin, Özarslan & Bahar, 2006; Bozdoğan & Yalçın, 2005; House & Prison, 1998; Kind, James & Barmby, 2007; Nuhoğlu, 2008; Nuhoğlu & Yalçın, 2004; Pell & Jarvis, 2001; Reid & Skrybina, 2002). Limited number of scales in literature is available to evaluate high school students' attitudes in science classes.

Self-regulation and motivation are two important emotional factors that affect learning. When the relevant literature examined different definitions of self-regulation have been found. For the first time, the concept of self-regulation has been raised by Albert Bandura in 1986. Accordingly, the meaning of self-regulation is that a person has active role on his or her learning and examines the status of teaching-learning process. Çiltaş (2011) described self-regulation as "to determine your own personal learning aims and in accordance with its principles to motivate yourself cognitively (p:3)". Pintrich (2000) defined that the concept of self-regulation is describing own personal learning purposes and actively participating in teaching-learning process in order to achieve these described purposes. In a similar vein, Kauffman (2004) identified the concept of self-regulation as editing students' different learning activities, controlling and managing all situations. In this regard, individuals are responsible for their own learning and arrange learning-teaching activities based on their own needs. This creates a new learning approach, which is named as self-regulated learning. According to that, self-regulated learning approach provides active participation opportunities for learners and meets with individuals' needs. As a result, self-regulated learning approach can be described as learning process that motivates individuals for learning (Altun & Erden, 2006). Çiltaş (2011) identified self-regulated learning approach as "the way of knowing yourself and all processes, techniques, tactics, and strategies that can be used for personal learning" (p:3). As understood from above statements, the keyword of self-regulation means the learners actively involve teaching and learning process.

The aim of this study was to examine ninth grade students' attitudes towards science in terms of self-regulation strategies, motivational beliefs and gender variables. In order to reach the aim of this study, the researchers have addressed the following research questions:

1) What are the level of 9th grade students' self-regulation strategies and motivational beliefs with attitudes towards science?
2) Do the 9th grade students' self-regulation strategies and motivational beliefs with students' attitudes towards science change by gender?
3) Is there any relationship between 9th students' self-regulation strategies, motivational beliefs and students' attitudes toward science?

2. METHOD

2.1. Research Model

In this descriptive study, survey model has been used. According to Karasar (2009), survey has been identified as research approaches that aim to describe past or present situation as it is or was. In this study, the relationship between a dependent variable (students' attitudes towards science) and independent variables (students' self-regulation strategies, motivational beliefs, and gender) has been tested.

Within the scope of survey model, "Motivated Strategies for Learning Questionnaire" and "Colorado Learning Attitudes about Science Survey (CLASS)" have been applied to collect data. Motivated Strategies for Learning Questionnaire has been developed by Pintrich & De Groot in 1990. Its original form was translated into Turkish by Uredi in 2005 and consists of 44 items. Colorado Learning Attitudes about Science Survey (CLASS) has been developed by Adams and others in 2006. Its original form was translated into Turkish by Bayar and Karamustafaoğlu in 2015 and consists of 36 items.

2.2. Study Group

This study has been conducted in the city center of Amasya, Turkey recruiting participants in different type of high schools (Science High School, Anatolian High School, and Vocational High School) governed by Ministry of National Education. Of 618 high school

students selected by a convenience sampling participated in the study, 96 are in Science High School, 277 are in Anatolian High School, and 245 are in Vocational High School. The sample of the study is consisting of 322 (52.1%) male and 296 (47,9%) female students who are taking physics course in 9th grade at these schools. The distributions of students according to high school types and gender have been shown in Table 1.

Table 1. Distributions of students according to gender and high school types

High School Types	Male	Female	Total
Science High School	42	54	96
Anatolian High School	126	151	277
Vocational High School	154	91	245
Total	322	296	618

2.2. Data Collection Tools

To collect data, three different data collection tools have been used for this study. These are: 1. Personal Information Form, 2. Motivated Strategies for Learning Questionnaire, and 3. Colorado Learning Attitudes about Science Survey (CLASS).

Personal Information Form

The researchers have used "Personal Information Form" to collect data regarding students' gender and high school type variables.

Motivated Strategies for Learning Questionnaire

The data has been collected applying Motivated Strategies for Learning Questionnaire, adapted to Turkish by Uredi in 2005 from its original form developed by Pintrich and De Groot in 1990. The Turkish version of scale, which has been employed to collect data in this study, consists of 44 items and uses a 7-point Likert-type scale. The 1-3 interval represents low level, 3-5 average level and, 5-7 high level.

This questionnaire consists of two sub-factors which are self-regulation strategies and motivational beliefs. These sub-factors separately have 22 items. By the process of adopting to Turkish version of this questionnaire, Cronbach's Alpha coefficient values have been calculated between .81 and .92 (Üredi, 2005). Similarly, the researchers have calculated the overall Cronbach's Alpha coefficient value and found it as .87, indicating strong internal consistency. Furthermore, the researchers have computed each sub-factors' internal consistency coefficient values and found them as .83 and .88 respectively.

Colorado Learning Attitudes about Science Survey (CLASS)

The data has been collected applying Colorado Learning Attitudes about Science Survey (CLASS), adapted to Turkish by Bayar and Karamustafaoğlu in 2015 from its original form developed by Adams et al., in 2006. They employed test-retest technique for the reliability of scale and found that the scale is reliable. Also, the Turkish form of the scale's internal consistency reliability has been found between .72 and .84 for each sub-factors and test-retest reliability coefficients varied between .85-.93 (Bayar & Karamustafaoğlu, 2015). The Turkish version of scale, which has been used to collect data in this study, consists of 36 items. The researchers have calculated the overall Cronbach's Alpha coefficient value and found it as 0.91, indicating strong internal consistency.

The scale consists of 8 sub-factors. The researchers have also analyzed each subfactor's internal consistency coefficients value and found it as .83 for Real world connection subscale,

as .78 for Personal interest subscale, as .80 for Sense making/effort subscale, as. 88 for Conceptual connections subscale, as .81 for Applied conceptual understanding, as .82 for Problem solving general subscale, as .83 for Problem solving confidence subscale, as .76 for Problem solving sophistication subscale. These findings clearly show that each sub-factor has strong internal consistency.

2.2. Data Analysis

The data has been collected by paper-based of *Colorado Learning Attitudes about Science Survey (CLASS) and Motivated Strategies for Learning Questionnaire* with 618 students in 9th grades at three different high schools. On the day of each survey administration, the researchers have personally visited each participating school and individually administered the paper-based survey utilizing "group administration" techniques during the school day. Once data collection was completed, the collected data had been analyzed using SPSS Version 21.0 statistical software.

In the process of data analyzing, first, the descriptive statistics such as mean and standard deviation has been examined. Then, in order to determine whether there is any relationship between gender, self-regulation strategies and motivational beliefs with students' attitudes towards science, independent *t* test has been addressed. Furthermore, in order to find the relationship between self-regulation strategies and motivational beliefs with students' attitudes towards science correlation has been applied. The researchers have considered the *p* value level of 0.05.

3. FINDINGS

The purpose of this current study is to examine whether there is any relationship between 9th grade students' attitudes towards science with self-regulation strategies, motivational beliefs, and gender variables. In this regard, to answer the first research question of this study "What are the level of 9th grade students' self-regulation strategies and motivational beliefs with attitudes towards science?", the average of each item and standard deviation have been calculated and shown in Table 2.

Table 2. The Scores of Students on Motivated Strategies for Learning Questionnaire and Colorado Learning Attitudes about Science Survey (CLASS)

Survey	n	X_{avg}	Min.	Max.	sd
Self-regulation strategies	618	4,75	1,00	6,89	0,83
Motivational beliefs	618	4,01	1,45	6,26	0,72
Attitudes towards science learning	618	3,16	1,87	5,24	0,68

As seen in Table 2, the average of 9th grade students on self-regulation strategies (x_{avg} = 4,75, sd = 0,83) is higher than the average of 9th grade students on motivational beliefs (x_{avg} = 4,01, sd = 0,72). Moreover, 9th grade students' self-regulation strategies and motivational beliefs scores are on average. As shown in Table 2, 9th grade students' attitudes towards science scores (x_{avg} = 3,16, sd = 0,68) are on average. In the light of these results, it can be said that 9th grade students' self-regulation strategies, motivational beliefs, and attitudes towards science learning are on average.

Furthermore, the second research question of this study has been asked for serving the purpose of study. In order to answer the second research question of this study, "Does the 9th grade students' self-regulation strategies and motivational beliefs with students' attitudes towards science change by gender?", the data has been analyzed and the findings of t-test have been shown in Table 3.

Table 3. The Independent t-test Results of 9th Grade Students on Motivated Strategies for Learning Questionnaire and Colorado Learning Attitudes about Science Survey (CLASS) by Gender

Survey	Gender	n	X_{avg}	sd	t	p
Self-regulation strategies	Male	322	4,55	0,86	2,185	0.00*
	Female	296	4,96	0,80		
Motivational beliefs	Male	322	3,90	0,75	1,981	0.01*
	Female	296	4,13	0,71		
Attitudes towards science learning	Male	322	3,03	0,70	1,976	0.01*
	Female	296	3,33	0,66		

As seen in Table 3, the difference about the average of 9th grade male and female students on self-regulation strategies has been compared by t-test (t= 2,185; p<.05) and found it as statistically significant in favor of female students. The difference concerning the average of 9th grade male and female students on motivational strategies has been compared by t-test (t= 1,981; p<.05) and found it as statistically significant in favor of female students. Furthermore, the difference regarding the average of 9th grade male and female students' attitudes towards science learning has been compared by t-test (t= 1,976; p<.05) and found it as statistically significant in favor of female students.

The results of correlation analysis explaining the relationship of 9th grade students' scores on *Motivated Strategies for Learning Questionnaire and* Colorado Learning Attitudes about Science Survey (CLASS) have been shown in Table 4.

Table 4. The results of correlation analysis explaining students' scores on *Motivated Strategies for Learning Questionnaire and* Colorado Learning Attitudes about Science Survey (CLASS)

Survey	n	r	p
Self-regulation strategies - Motivational beliefs	618	0,59	.000
Self-regulation strategies - Attitudes towards science learning	618	0.49	.000
Motivational beliefs - Attitudes towards science learning	618	0,42	.000

r: correlation coefficient, p<.05

As seen in Table 4, there is moderately relationship on 9th grade students' self-regulation strategies and motivational beliefs (r=0,59, p<.05). In a similar vein, there is moderately relationship on 9th grade students' self-regulation strategies and attitudes towards science learning (r=0,49, p<.05). Moreover, there is moderately relationship on 9th grade students' motivational beliefs and attitudes towards science learning (r=0,42, p<.05). When the correlation coefficients examined, it can be clearly seen that there is a positive and linear relationship on 9th grade students' scores on *Motivated Strategies for Learning Questionnaire and* Colorado Learning Attitudes about Science Survey (CLASS).

4. DISCUSSION, CONCLUSION AND SUGGESTIONS

This study has been conducted in Amasya, Turkey recruiting participants, 9th grade high school students, in three different types of high schools. In this study, the researchers have examined students' attitudes towards science course by comparing self-regulation strategies, motivational beliefs and gender variables. It has been seen that there is a statistically significant

relationship students' attitudes towards science course, self-regulation strategies, motivational beliefs and being male or female.

The results of this study about self-regulation strategies and motivational beliefs indicate that there is a statistically significant relationship between students' attitudes towards science with self-regulation strategies and motivational beliefs. When the related literature has been scrutinized, there are some studies that emphasize the importance of relationship between students' attitudes towards science and physics with self-regulation strategies and motivational beliefs (Demir, Öztürk & Dökme, 2012; Mujtaba, & Reiss, 2013; Pendergast, Lieberman-Betz & Vail, 2017; Reid & Skryabina, 2002; Uzun & Keleş, 2012; Yamaç, 2011; Yaman & Dede, 2007; Yenice, Saydam & Telli, 2012; Zhang, Ding, & Mazur, 2017).

Furthermore, the results of this study related to gender variable show that there are differences between male and female students' scores on Colorado Learning Attitudes about Science Survey (CLASS). In literature, while some of the previous studies support the findings of this study that have determined the relationship between student attitudes towards science/physics and gender (Hançer, 2008; Lowery, Bowyer & Padilla, 1980; Özyürek & Eryılmaz, 2001), other studies have opposite argument (Kaya & Böyük, 2011; Murphy & Whitelegg, 2006; Yeşilyurt, 2004). The potential reason for these differences can be expressed that students might have different attitudes towards different branches of science/physics (Şengören, Tanel & Kavcar, 2006).

Considering the findings of this study, one of the important tasks of science teachers is to take students' attention to science. They should explain students the importance of science and its contribution to students' daily lives. It is essential to announce students that science is not only required for exams, rather science is a part of life and knowing science facilitates individuals' daily action and behaviors. Also, teachers should tell students that science is a necessary course for everybody not only for students in science-mathematics education. Science teachers should explain students that science is not just consisting of complicated formulas, conversely, it is helpful for everyone to understand how world works.

This study is conducted considering self-regulation strategies, motivational beliefs and gender as variables. Different variables- such as high school types, subject area, different grades, and age- might be used for future studies. Moreover, the target population and sample of this study might be thought as limited. To take away this thought, a further study might be done in multiple cities with more diverse participants.

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