Special Topics In Science Education Research

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PREFACE

Special Topics In Science Education Research is written for applied researchers of science education. The aim of the these chapter studies was to foster existing and scientific discussion as well as to provide a forum for the exchange of ideas and experience between specialists in the fields of science education.

Special Topics In Science Education Research is organized into ten (10) distinct sections that provide comprehensive coverage of important topics. The sections are: (1) A Two-Phased Conceptual Test to Help Reveal the Misconceptions About the Topic of "Work", (2) Adaptation of the Teacher Attitudes Towards Self-Regulated Learning Scale to Turkish, (3) Comparison of Students At Eco-Schools, Eco-Schools With Green Flag and Ordinary Primary Schools in Terms of Environmental Literacy, (4) Developıng Some Character and Values for Preservice Biology Teachers With a Socioscientific Program , (5) Educational Studies About Evolution in Turkey: A Thematic Review of the Literature, (6) Examination of Higher Order Thinking Skills in Bology Education, (7) Factors Affecting the Motivation Levels of Secondary School Students for Science Learning, (8) Investigation of the Effects of Stem Education Approach on Secondary School Students' Attitude Towards Science, Interest in STEM Professions and Scientific Process Skills, (9) The Effects of Prediction-Observation-Explanation and Concept Cartoon Methods on the Students' Academic Achievement and Attitudes, (10) The Views of Science and Technology Teachers Over the Effect of Constructivist Educational Approaches on Students.

All contributed chapters were rigorously reviewed. The organized sections were inspected by plagiarism checker software.

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CONTENTS

CHAPTER 7

FACTORS AFFECTING THE MOTIVATION LEVELS OF SECONDARY SCHOOL STUDENTS FOR SCIENCE LEARNING

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Hilal KOÇAN[3]

1. INTRUDUCTION

A vision of science and technology course is regardless of their individual differences all students are trained as science and technology literate. Science and technology literacy will be explained with a general definition; It is a combination of science-related skills, attitudes, values, understandings and knowledge required for individuals to develop research-inquiry, critical thinking, problem-solving and decision-making skills, life time learning and maintain a sense of curiosity about their environment and the world (TTKB, 2006). Teachers should not only motivate their students according to their students' interests, but also help science literacy (Talib, Luan, Azhar & Abdullah, 2009). Motivation is known as an important factor that affects students' creativity, learning styles and academic success (Kuyper, Van der Werf & Lubbers, 2000). Motivation is a driving force for students to succeed, work hard and learn (Martin, 2001). Motivation is a force to satisfy a need, and this force refers to the internal factors that activate the individual and external factors that encourage the individuals to behave (Walterman, 2005).

It is known that successful teachers motivate their students at certain levels. However, arousal that causes anxiety, can cause decrease in performance (Öncü,

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2002). The enthusiastic, empathetic behavior of the teacher affects students' motivation (Bacanlı, 2001). Although the effects of motivation on learning and behavior are known, the knowledge about how to use it and what it means is unknown (Dede, 2003).

Motivation is accepted as an important factor contributing to students' school success (Pinttrich, 2003). It is stated that motivation has an important role in science education and achievement, development of conceptual change, critical thinking and scientific process skills (Garcia & Pintrich, 1992; Pintrich, Smith, Garcia, & McKeachie, 1993; Tuan, Chin & Shieh 2005). Students ' interests for subjects, their perceptions of duty and their success in scientific interpretations are affected by their motivation (Tuan, Chin & Shieh, 2005).

Motivation is one of the most important factors affects learning and success. Because highly motivated students tend to show more effort and determination in classroom activities and assignments than low motivated students (Wolters & Rosenthal, 2000). Motivation can affect the performance of learning new things, previously learned skills, strategies and behaviors. Motivation affects not only how and what students learn, but also the frequency and duration of learning activities (Schunk, 1991).

The students' learning goal is also important for construction of their science knowledge, based on learning value and learning strategies (Tuan, Chin & Shieh, 2005). One of the factors that affect students' achievement is motivation (Guay, Chanal, Ratelle, Marsh, Laroseve Boivin, 2010). Highly motivated students' learning is more efficient (Senemoğlu, 2007). It tends to deal with motivated individuals' learning activities (Zimmerman, 2000). Motivation has a complex nature that is influenced by student motivation, curriculum, learning - teaching methods, personal characteristics of teachers and students (Lee & Brophy, 1996).

Students ' interest in the subjects and their grades in the classroom, students' perceptions of duty, their success and failure in acquiring scientific knowledge, the general goals and orientations and achievements of meaning the science are some of the factors that affect their motivation base on scientific researches (Tuan, Chin & Sheh, 2005).

A lot of research has been done to determine the motivation levels of primary school students for learning science (Bozanoğlu, 2004; Dalgety, Coll & Jones, 2003; Tuan, Chin & Shieh, 2005; Yenice, Saydam, & Telli, 2012). When the local literature is searched; levels of elementary school students from science lesson according to demographic characteristics (Aydın, 2007), developing the motivation scale for learning science (Dede & Yaman, 2008; Yılmaz & Çavaş, 2007), the effect of grade level and gender on primary school students' motivation for sci-

ence learning (Güvercin, 2008), the effects of variables such as gender, classroom and parental education on the motivation levels of primary school students for learning science (Uzun & Keleş, 2010), relationship between 6th and 7th grade students' attitudes and motivations towards science (Azizoğlu & Çetin, 2008) and the relationship between teaching profession and motivation resources (Yazıcı, 2009) can be found.

In this study, it is aimed to determine the motivation levels of middle school students towards learning science. Does the motivation of primary school students (5, 6, 7, 8th grade) for learning science differ according to the following parameters?

a) Gender
b) Class levels
c) Father's educational status
d) Father's profession status
e) Mother 's profession status
f) Mother's education status

2.METHOD

2.1. Research Model

This research was carried out with 400 middle school students in 5th, 6th, 7th and 8th grades in 2015-2016 academic year. In this section, the research model, working group, data collection tools and data analysis methods are discussed. This research is based on a descriptive relational screening model.

2.2. Working Group

The study group of the research consists of 400 students studying in the 5th, 6th, 7th, and 8th grades in the 2015-2016 academic year. The gender of the students participating in the research is 199 males and 201 females (Table 1). Information about grade level, number of people living at home, number of siblings, father's profession, father's educational status, mother's profession, mother's educational status and family income level are given in Table 1 and Table 2.

Table 1. Gender distribution of the study group by grade level

GENDER	GRADE									
	5th grades		6th grades		7th grades		8th grades		Total	
	N	%	N	%	N	%	N	%	N	%
MALE	24	12.1	42	21.1	49	24.6	84	42.2	199	100.0
FEMALE	17	8.5	47	23.4	51	25.4	86	42.8	201	100.0

Table 2. Demographic Information of Secondary School Students Participating			
Demographic Information	**Group**	**Frequency**	**Percentage (%)**
Grade	5th grades 6th grades 7th grades 8th grades	41 89 100 170	10.3 22.3 25.0 42,5
Number of People at Home	1-5 6-10 11-..	61 286 53	15.3 71.5 13.3
Number of Siblings	1-5 6-10 11-…	201 176 23	50.2 44.0 5.8
Father's Profession	Freelance Officer Worker Other	189 42 18 151	47.3 10.5 4.5 37.8
Father's Education	Primary School Secondary School High School Faculty Other	109 134 75 29 53	27.3 33.5 18.8 7.2 13.3
Mother's Profession	Housewife Officer Worker Other	387 2 6 5	96.8 0.5 1.5 1.3
Mother's Education	Primary School Secondary School High School Faculty Other	152 75 12 28 133	38 18.8 3 7 33.3
Family Income	750-1000 TL 1001-2000 TL 2001-3000 TL 3001-4000 TL 4001 TL and above	281 76 25 10 8	70.3 19.0 6.3 2.5 2.0

2.3. Data Collection Tool

As a data collection tool, "Motivation Scale for Learning Science" (Dede & Yaman, 2008) was used. The answer options of the items in the scale were determined as "5 = Strongly Agree", "4 = Agree", "3 = Undecided", "2 = Disagree" and "1 = Strongly Disagree". The fact that the scores in the scale are close to 5.00 indicates that the students' participation level in the proposition is high. Likewise, close to 1.00 indicates that participation level is low. It is a "5-point Likert-type scale" developed by Dede and Yaman (2008), consisting of 23 items, with options ranging from "Strongly agree: 5" to "Strongly disagree: 1". This scale consists of 5 dimensions: "Motivation for Research", "Performance Motivation", "Communication Motivation", "Cooperative Study Motivation" and "Participation Motivation". "Cronbach alpha" measurement reliability coefficient of the scale was calculated as 0.82.

2.4. Data Analysis

In this study, the data obtained from the students were evaluated with the SPSS package program. "Independent t test" was used to determine the effect of gender on the motivation levels of students to learn science, "One Way ANOVA" was used to determine the effect of the family's income status.

4. Results

it is examined whether the motivation levels of students to learn science differ significantly according to variables such as gender, class level, parental occupational status, parental education level and family income status. In this section, the responses of elementary school students to the motivation scale for learning science are evaluated.

As a result of the findings obtained in the research; the mean score of female students was higher than male students in the motivation of secondary school students for learning science (Table 3). In the study, it was determined that there was no statistically significant difference between the motivation points of middle school students for learning science by gender (Table 4).

Table 3. Scores of the study group by gender

		N	$\bar{x}$	SD
GENDER	Male	201	4.045	0.6578
	Female	199	3.861	0.8605

SD: Standard Deviation

Table 4. Change of Motivations for Science Learning by Gender					
GENDER	**N**	**$\bar{x}$**	**SD**	**SE**	**P**
MALE **FEMALE**	201 199	4.045 3.861	0.6578 0.8605	0.046 0.061	.017

SD: Standard Deviation; SE: Standard Error

In this study; at the grade level of 5th, 6th, 7th and 8th grade students, it was determined that the motivation points were close to each other, and the lowest motivation point average was the 6th grade students when the average of motivation points for learning science was examined (Table 5). It was determined that the motivation levels of the 5th, 6th, 7th and 8th grade students in this study did not differ significantly between the grade levels (Table 6).

Table 5. Scores of the study group by grade level				
		N	**$\bar{x}$**	**SD**
GRADES	5th	41	3.867	0.8005
	6th	89	3.977	0.7345
	7th	100	3.932	0.8265
	8th	170	3.975	0.7511

SD: Standard Deviation

Table 6. Change of motivations for learning science to grade level					
	Sum of squares	**df**	**Mean square**	**F**	**P**
Between groups	0.482	3	.161	.270	.847
Within group	236.103	396	.596		
Total	236.585	399			

It was determined that the students' highest motivation levels for learning science were the workers with the highest father profession and the lowest average score was self-employed when the data obtained in the study were examined (Table 7). In the study, it was not determined that the science motivation scores of the students did not differ according to the father's professional status (Table 8).

Table 7. Score status according to father's profession				
		N	**$\bar{x}$**	**SD**
Father's Profession	Freelance	189	3.906	0.8309
	Officer	42	4.139	0.4840
	Worker	18	4.185	0.3807
	Other	151	3.934	0.7823

SD: Standard Deviation

Table 8. Change of motivations for learning science to father's profession					
	Sum of squares	**df**	**Mean square**	**F**	**P**
Between groups	2.905	3	.968	1.641	.179
Within group	233.680	396	.590		
Total	236.585	399			

In the study, it was determined that the students' highest level of science motivation for learning science was in individuals with high school graduate father education status (Table 9). It was found that the science motivation levels of the students did not differ according to the education level of the father when the data obtained in the study were examined (Table 10).

Table 9. Score status according to father's education				
		N	**$\bar{x}$**	**SD**
Father's Education	Primary School	109	3.936	0.7858
	Secondary School	134	3.890	08730
	High School	75	4.181	0.3704
	Faculty	29	3.839	0.8381
	Other	53	3.890	0.8043

SD: Standard Deviation

Table 10. Change of motivations for learning science to father's education					
	Sum of squares	**df**	**Mean square**	**F**	**P**
Between groups	5.038	4	1.259	2.148	.074
Within group	231.548	395	.586		
Total	236.585	399			

In the research, it was determined that the mother profession group of the students who had the lowest level of science motivation for learning science was the housewife (Table 11). It was found that the science motivation levels of the students did not differ statistically according to the status of the mother when the data obtained in the study were examined (Table 12).

Table 11. Score status according to mother's profession

		N	$\bar{x}$	SD
Mother's Profession	Housewife	387	3.949	0.7792
	Officer	2	4.369	0.2766
	Worker	6	4.391	0.2893
	Other	5	4.478	0.5598

SD: Standard Deviation

Table 12. Change of motivations for learning science to father's profession

	Sum of squares	df	Mean square	F	P
Between groups	0.454	3	.151	.254	.858
Within group	236.131	396	.596		
Total	236.585	399			

In the research, it was determined that the highest level of science motivation for learning science was among individuals whose mother education level was high school graduates (Table 13). It was determined that the science motivation levels of the students did not differ statistically according to the education level of the mother when the data obtained in the study were examined (Table 14).

Table 13. Score status according to mother's education

		N	$\bar{x}$	SD
Mother's Education	Primary School	152	3.979	0.7465
	Secondary School	75	3.965	0.7518
	High School	12	4.095	0.5246
	Faculty	28	4.037	0.7527
	Other	133	3.887	0.8309

SD: Standard Deviation

Table 14. Change of motivations for learning science to mother's education					
	Sum of squares	**df**	**Mean square**	**F**	**P**
Between groups	1.130	4	.283	.474	.755
Within group	235.455	395	.596		
Total	236.585	399			

In the research, it was determined that the highest level of science motivation for learning science was among the individuals with the highest income group (Table 15). It was found that there was no statistically significant difference between the students' science motivation levels towards learning science when the data obtained in the study were examined (Table 16).

Table 15. Score status according to family income				
		N	**$\bar{x}$**	**SD**
Family Income	750-1000 TL	281	3.966	0.7340
	1001-2000 TL	76	3.914	0.8395
	2001-3000 TL	25	3.899	0.9074
	3001-4000 TL	10	3.782	1.1235
	4001 TL and above	8	4.293	0.2035

SD: Standard Deviation

Table 16. Change of motivations for learning science to family income					
	Sum of squares	**df**	**Mean square**	**F**	**P**
Between groups	1.453	4	.363	.610	.656
Within group	235.133	395	.595		
Total	236.585	399			

5. DISCUSSION AND CONCLUSION

In this study, it was determined that the motivation levels of students for learning science did not show a statistically significant difference according to variables such as gender, class level, parental professional status, parental education

level and family income status (Table 3-16). According to the data obtained in the research; It was stated that the motivation levels of students for learning science were high (Table 3). In many studies, it has been stated that students have high level of motivation for learning science (Glynn, Taasoobshirazi & Brickman, 2009; Yenice, Saydam, & Telli, 2012).

In this study, it is seen that there is no significant difference between the motivation levels of male and female students. Different studies also show that gender is independent of students' level of science motivation (Çetin & Kırbulut 2006; Yaman & Dede, 2007; Güvercin, 2008; Zeyer & Wolf, 2009 Yenice, Saydam, & Telli, 2012). In 7th grade students, there was a significant difference in motivation levels for learning science in favor of women (Demir, Kılınç, & Doğan, 2012).

In the case of father education, it was determined that the motivation of students towards learning science had a significant difference only in motivation for performance (Demir, Kılınç, & Doğan, 2012). In terms of the mother education status variable, it was determined that there was no significant difference between students' motivation to learn science (Demir, Kılınç, & Doğan, 2012).

In the case of monthly income, it is stated that there is a significant difference in motivation for science learning, motivation for collaborative work and motivation for participation (Demir, Kılınç, & Doğan, 2012).

In the study, it was determined that the motivation levels of students for learning science did not differ significantly from the grade level (Table 6). Yenice, Saydam, & Telli (2012) report that motivation levels for learning science differ in terms of grade levels. In the literature, it was determined that the level of student motivation decreased as the grade level increased (Aydın, 2007; Güvercin, 2008). Tseng, Tuan & Chin (2009) states that high motivation students have high achievements. It is reported that as the grade level increases, their success increases with motivation (Tseng, Tuan & Chin, 2009).

It was determined that the motivation levels for learning science did not differ significantly according to the status of the mother's profession and education, father's education and education, and family income (Table 8,10,12,14 and 15). Miquelon (2007) determined that the motivation levels of secondary school students for learning science did not differ significantly according to parental education, parental profession and family income.

Demir, Kılınç, & Doğan, (2012), in the case of father education, it was determined that students' motivation for learning science had a significant difference only in motivation for performance. In terms of the mother education status variable, it was determined that there was no significant difference between students'

motivation to learn science (Demir, Kılınç, & Doğan, 2012). In the case of monthly income, it is stated that there is a significant difference in motivation for science learning, motivation for collaborative work and motivation for participation (Demir, Kılınç, & Doğan, 2012).

Lavigne, Vallerand & Miquelon (2007) stated that the support of science teachers positively affects students' self-management and self-efficacy perceptions; It stipulates that there is a direct relationship between the perception of competence and intention to pursue science education, and that the high level of competence is to maintain the high level of intentions. Talib, Luan, Azhar, & Abdullah (2009) stated that the choice of strategies suitable for science learning, having certain skills, and the interaction between teachers and peers positively affect the motivation to learn, as a result of the research in which students define the underlying conditions of their motivation for learning science.

The students participating in the research stated that they wanted more detailed information while explaining the subject. In addition, the students stated that they were undecided in lending their books and lecture notes about science to their classmates and in group studies, and in items that reveal their status of caring about their friends' opinions. The students stated that they wanted to get the highest grade in science lesson exams, and they had close positive results in their class discussions to reveal the best ideas and choose their friends to work while doing group activities. Success, recognition and praise from their teacher are among the motivating factors. Yajima, Sato & Arai (1996) revealed that there is a causal relationship between academic achievement and motivation for learning science as a result of the study in which they examined the relationship between motivation for learning science and factors affecting academic success.

Motivation self-efficacy, focus on task, effort and control (Garcia, 1995); It was determined as a result of the researches that it was related with variables such as gender age, own library, parental education level, and socio-economic level of the family (Katrancı, 2015; Smith, 1996; Yıldız & Kaman, 2016).

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