



Participatory Educational Research (PER)
Vol. 5(1), pp. 31-42, June, 2018
Available online at <http://www.perjournal.com>
ISSN: 2148-6123

Students' Perceptions and Attitudes of Self -Efficacy Oriented by Research-Inquiry

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Article history

Received:
02.04.2018

Received in revised form:
25.05.2018

Accepted:
28.05.2018

Key words:

Inquiry-based learning,
Attitude, Science culture

The purpose of this research is to determine whether there is a meaningful relationship between secondary school students' attitude and perception levels of self-efficacy oriented by research-inquiry and as well whether students' attitude and self-efficacy levels differ according to grade and gender. The working group of the study consist of 234 secondary school students. The descriptive model of one of the quantitative research methods was used in this research. The data of the study was collected with Perception Scale of Self-Efficacy Oriented by Research-Inquiry and Attitude Scale Oriented by Research-Inquiry. Percentages, mean, Anova, Schieffe and t tests have been benefited in this study. According to data obtained from the study, it has been concluded that students' attitude and self-efficacy levels oriented by research-inquiry were in a high level, it hasn't differed according to gender, there was a significant difference against the 8th Grade students between Grade 8 and Grade 5 and 7 regarding to the attitude level, there was a significant difference against the 8th Grade students between Grade 8 and Grade 6 and 7 regarding to self efficacy level, there was a positive and meaningful relationship between the levels of attitude and self - efficacy at a high level.

Introduction

In today's world, where science and technology are becoming increasingly important, it can be said that the main objective of our education system is that students structure the information rather than receive ready information and are raised as scientific literates (Bozdoğan, 2016). Qualified people who produce, reach and use the information are required for this (Ün Açıkgöz, 2011). Undoubtedly, there are many variables in achieving this objective. It is possible to say that science teaching is among them. Thus, it is also emphasised that science teaching programs and science lessons are also quite important in this sense (Arslan, 2005). With science lessons, individuals get the opportunity to have experiences regarding scientific processes and science, and adapt the information they obtain from these experiences into their lives in different situations (Yaşar & Yıldız-Duban, 2007). Together

with providing these opportunities from pre-school up to the end of higher education, science education;

- Helps students in obtaining the information and skills that will be beneficial for them throughout all their lives.
- Increases their life quality by ensuring that they learn to think critically, solve problems and make decisions.
- Increases their interest and sensitivity towards environmental problems and ensures that they take more responsibility in these subjects.
- Guides them towards participating in a universal society consisting of science literate individuals (Krajcik et al., 1999, p. 15-16).

Arousing curiosity among students, helping them understand the subjects that they will learn in a more detailed way in coming years, contributing to their gaining the skills that are necessary for them to learn these subjects, and guiding students towards making research by thinking within the framework of cause and effect relationships are among the properties that the training programs used in giving science education must possess (NRC, 2006; Victor and Kellough, 1997, p. 13). Taking these justifications into consideration, many countries developed science and technology teaching programs that will raise their citizens as science and technology literates. These programs developed suggest that students are effectively included in learning environments, are able to make changes and innovations and make new designs (Çepni, 2005). In these countries, inquiry-based learning is addressed as one of the most important components of program development studies. According to the National Science Education Standards published in the USA, there is a consensus that the objective of educators should be included in research-based education program, and the studies conducted have shown that research-based learning is more effective than traditional methods (Wilson, Taylor, Kowalski and Carlson, 2010; Colburn, 2006; Geier et al., 2008). In Turkey, secondary school Science and Technology Lesson Curriculum was changed in 2013 as “Science” Lesson Curriculum. One of the most striking innovations that are brought about by the change in this program is that the research and inquiry-based approach is taken as a basis (MNE, 2013). It is seen that the discussions and research on the improvement of science teaching and what good science teaching should be in the recent period gradually and increasingly focus on the importance of research and interrogation (Anderson, 2002).

Questioning in science education covers a process that includes providing students with the opportunities to create questions in achieving the information that they will structure within the learning process, structuring the research process, revealing the results and sharing the data obtained with other people (Lin Tuan, 2005). Inquiry-based learning showed up as an approach that helps students learn the learning that is effective in developing their higher-order thinking skills and the constructivist theory as a basis (Minner, Levy and Century, 2009). In NSES determined by the National Research Council [NRC] in the USA in 1996, the research-based learning approach was expressed as a multi-dimensional process of research-based learning, in which students ask questions and make observations, try to verify the information they have using their sources, and information is collected and analysed using the tools compared with the findings obtained from the experiments (NRC, 2000). In other words, this approach is an approach in which individuals use their creativity in the process of obtaining information by asking questions and doing research (Llewellyn, 2002; Burden and Byrd, 2003; Hammerman, 2006; Bass, Contantand Carin, 2008). Research-based learning is a process that consists of the activities, experiments, and explorations that students make in groups or by themselves, which ensure that the information is significant (Tatar and Kuru,



2006). As can be understood, this approach includes a learning process in which students are active (Çalışkan, 2009) and present solution suggestions for the problems they encounter in their life and try to achieve the result by establishing the cause and effect relationship. The research-based learning approach may include case study activities, social activities, invention-based or project-based studies as it is also stated by Werner (2007). At the same time, in this approach, the student encounters the problem at the beginning of the learning process, then he/she presents solution suggestions, investigates these solution suggestions, implements them, and the process ends when the student finds the solution. In short, learning in this approach is a process that supports and develops the research skills, research knowledge, intellectual, spatial and personal skills and attitudes (Moore, Bramhall, Clarke and Craig, 2008).

Despite many advantages of inquiry-based learning, when the literature was examined, no sufficient study was encountered on the measurement or depicting of the attitudes and self-sufficiency of secondary school students regarding research and inquiry-based learning. It is seen that the studies carried out are more on the determination of understanding and research competence levels (Balım and Taşköyan, 2007). It is interesting that attitude studies are generally performed as attitudes towards social sciences or science (Demirbaş and Yağbasan, 2005; Oruç and Ulusoy, 2008; Yücel, 2004). It is seen that self-sufficiency studies are generally aimed at examining the self-sufficiency of teachers and preservice teachers in regard to science teaching (Ramey and Shroyer, 1992; Akbaş and Çelikkaleli, 2006; Duran, Ballone-Duran, Haney and Beltyukova, 2009; İnaltekin and Akçay, 2012). In this framework, the objective of this study is to depict the attitudes and self-sufficiency of students regarding research and inquiry and reveal the relationship between them.

Objective of the Study

The objective of this study is to determine the attitude and self-sufficiency levels of the students in regard to research-inquiry.

- (1) What are the attitudes and self-sufficiency levels of the students in regard to research-inquiry in general?
- (2) Do the attitude and self-sufficiency levels of the students in regard to research-inquiry vary by gender?
- (3) Do the attitude and self-sufficiency levels of the students in regard to research-inquiry vary by grade level?
- (4) What kind of a relationship is there between the attitude and self-sufficiency levels of the students in regard to research-inquiry?

Method

Research Model

This study is a descriptive study. It was carried out in the screening model. In this context, it was attempted to determine the self-sufficiency perceptions and attitudes of the students towards research-inquiry-based learning.

Study Group

234 secondary school students studying at 5th- 8th grades in Amasya Taşova in the second semester of the 2015-2016 academic year make up the study group of this study. The distribution of the study group by gender is summarized in Table 1.

Table 1. The distribution of the study group by gender

Class	Gender		Total
	Female	Male	
5	20	28	48
6	37	29	66
7	28	28	56
8	32	32	64
Total	117	117	234

Data Collection Tool

The Self-Sufficiency Perception of Research-Inquiry Scale developed by Ebrin Ozan, Korkmaz and Karamustafaoğlu (2016) was used for the self-sufficiency perceptions of the students in the context of this study. The validity and reliability study of the scale was performed on 233 secondary school students. The construct validity of the scale was tested using the exploratory and confirmatory factor analysis. Furthermore, the item factor correlation and item discrimination analyses were also performed. The two equal semi-correlations of the scale were determined as ,712; the Spearman-Brown reliability coefficient was determined as ,832; the Guttman Split-Half value was determined as ,825; and the Cronbach's Alpha reliability coefficient was determined as,835. As a result of the analyses performed, the scale prepared in five-item Likert-type consists of 14 items and three factors. The construct validity results showed that the scale serves the purpose both in terms of each item and the whole. According to the t-test results, it is seen that the difference between the item scores of the upper and lower groups of 27% is significant, so the levels of discrimination are high. The results of the exploratory factor analysis showed that the structure of the scale is verified.

The Attitude Towards Research-Inquiry Scale developed by Ebrin Ozan, Korkmaz and Karamustafaoğlu (2016) was used for students' attitudes within the scope of this study. The validity and reliability study of the scale was performed with 233 secondary school students. The construct validity of the scale was tested using the exploratory and confirmatory factor analysis. The item factor correlation and item discrimination analyses were also carried out. The two equal semi-correlations of the scale were determined as ,491; the Spearman-Brown reliability coefficient was determined as ,659; the Guttman Split-Half value was determined as ,656; and the Cronbach's Alpha reliability coefficient was determined as ,756. As a result of the analyses performed, the scale prepared in five-item Likert-type consists of 13 items and three factors. The construct validity results showed that the scale serves the purpose both in terms of each item and the whole. According to the t-test results, it is seen that the difference between the item scores of the upper and lower groups of 27% is significant, so the levels of discrimination are high. The results of the exploratory factor analysis showed that the structure of the scale is verified.

Data Analysis

The raw scores obtained from the factors were turned into standard scores, the lowest of which is 20 and the highest is 100; and percentage, arithmetic average, Anova, Schieffe and t tests were used on the data in line with the sub-problems. The $p < 0,05$ level was considered sufficient as the level of significance of the difference and relationships. Furthermore, the scores between 20 and 53 were qualified as “low”; between 54 and 69 as “intermediate”, and higher than 70 were qualified as “high” as standard score equivalents.

Findings

Attitudes and Self-Sufficiency of the Students in regard to Research-Inquiry

The findings on the attitudes and self-sufficiency of the students in regard to research-inquiry are summarized in Table 2.

Table 2. Attitudes and self-sufficiency of the students

Variables		X	sd	Low (%)	Medium (%)	High (%)
Attitude	Inquisitiveness	86,1	13,7	2,1	17	212
	Negative overview	78,7	17,1	9	15,8	75,2
	Valuing	77,5	15,1	6,4	18,8	74,8
	Total	80,6	11,6	2,6	13,7	80,3
Self sufficiency	Avoidance	75,7	18,6	13,2	21,8	65
	Resume Research	83,8	13,2	1,7	11,1	87,2
	Personal evolution	84,7	15,1	3,4	6,8	86,8
	Total	80,1	13,1	2,6	19,7	77,8

When the attitudes and self-sufficiency of the students in regard to research-inquiry in Table 2 are examined, it is seen that the average score for the attitudes is 80,6 and 80,3% of the students have a high level of attitudes. In Table 2, it is seen that the same applies to the factors in terms of the attitude. All of the items in the negative opinion factor are negative, and they were inversely coded before conducting the analyses. Thus, an increase in the score in this factor also indicates a positive attitude. Accordingly, it can be said that the attitude levels of the students towards research-inquiry are quite high.

In Table 2, it is seen that the average score for self-sufficiency is 80,1 and 77,8% of the students have a high level of self-sufficiency. In Table 2, it is seen that the same applies to the factors in terms of self-sufficiency. All of the items in the avoidance factor are negative, and they were inversely coded before conducting the analyses. Thus, the increase in scores in this factor shows positive self-sufficiency. However, the lowest averages also belong to the Avoidance factor. Accordingly, it can be said that the self-sufficiency levels of the students in regard to research-inquiry are quite high.

Attitudes and Self-Sufficiency of the Students in regard to Research-Inquiry by Gender

The findings on the attitudes and self-sufficiency of the students in regard to research-inquiry by gender are summarized in Table 3.

Table 3. Attitudes and self-sufficiency of the students in regard to research-inquiry by gender

		Variables	N	X	Ss	t	sd	p
Attitude	Inquisitiveness	Female	117	84,1	14,3	-2,094	232	,037
		Male	117	87,9	12,8			
	Negative overview	Female	117	77,9	16,1	-,686	232	,494
		Male	117	79,5	18,1			
	Valuing	Female	117	77,8	15,4	,302	232	,763
		Male	117	77,2	14,8			
Total	Female	117	79,8	11,3	-1,024	232	,307	
	Male	117	81,4	11,9				
Self sufficiency	Avoidance	Female	117	73,8	19,5	-1,503	232	,134
		Male	117	77,5	17,8			
	Resume Research	Female	117	83,1	13,2	-,795	232	,428
		Male	117	84,5	13,2			
	Personal evolution	Female	117	85,1	14,9	,316	232	,752
		Male	117	84,4	15,3			
	Total	Female	117	79,	13,4	-1,289	232	,199
		Male	117	81,2	12,9			

When the attitudes of the students towards research-inquiry by the gender status are examined in Table 3, it is seen that the attitude levels do not vary both in terms of the total score ($t(2-232)=-1,024$; $p>0,05$) and the two factors (Negative Opinion: $t(2-232)=-,686$; Valuing: $t(2-232)=,302$; $p>0,05$). However, it is observed that the Curiosity: $t(2-232)=-2,094$; $p<0,05$ factor varies in favour of male students in terms of gender. Accordingly, it can be said that gender is only effective in terms of the Curiosity factor of the students, and it has no effect for other factors and the total score. In Table 3, it is seen that the self-sufficiency levels of the students do not vary both in terms of the total score ($t(2-232)=-1,289$; $p>0,05$) and the factors (Avoidance: $t(2-232)=-1,503$; Maintaining the Research: $t(2-232)=-,795$; Personal Development: $t(2-232)=,316$ $p>0,05$) upon examining their self-sufficiency in regard to research-inquiry by the gender status. Accordingly, it can be said that gender has no effect on the self-sufficiency levels of the students.

Attitudes and Self-Sufficiency of the Students in regard to Research-Inquiry by Grade Level

The findings on the attitudes and self-sufficiency in regard to research-inquiry by grade level are summarized in Table 4.

Table 4. The attitudes and self-sufficiency in regard to research-inquiry by grade level

		Attitudes							
		Inquisitiveness		Neg. Overview		Valuing		Total	
Class	N	\bar{X}	Sd	\bar{X}	Sd	\bar{X}	Sd	\bar{X}	Sd
5.	48	88,8	12,7	82,4	16,1	82,3	16,9	84,3	12,1
6.	66	85,2	13,9	76,2	20,7	77,2	15,1	79,3	12,9
7.	56	89,6	8,7	84,6	11,9	81,3	11,5	85,1	7,7
8.	64	81,6	16,4	73,4	15,9	70,9	14,3	75,1	10,1
Total	234	86,1	13,7	78,7	17,1	77,5	15,1	80,6	11,6
		Self-sufficiency							
		Avoidance		Res. Research		Per. evolution		Total	
Smiflar	N	\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S
5.	48	79,3	18,1	86,9	13,4	85,9	16,9	83,5	13,9
6.	66	74,1	19,6	84,9	12,5	82,6	17,8	78,8	14,8
7.	56	82,7	16,2	86,4	12,5	89,8	10,2	85,3	11,1
8.	64	68,4	17,7	77,9	12,7	81,5	13,3	74,4	9,5
Total	234	75,7	18,7	83,8	13,2	84,7	15,1	80,1	13,1



Upon examining the attitude total scores of the students by grade level in Table 4, it is seen that the highest average for the Curiosity factor is $\bar{x}=89,6$ in the 7th grade, and the lowest average is $\bar{x}=81,6$ in the 8th grade. The highest average for the Negative Opinion factor is $\bar{x}=84,6$ in the 7th grade, and the lowest average is $\bar{x}=73,4$ in the 8th grade. The highest average for the Valuing factor is $\bar{x}=82,3$ in the 5th grade, and the lowest average is $\bar{x}=70,9$ in the 8th grade. The highest average for the total attitude score is $\bar{x}=85,1$ in the 7th grade, and the lowest average is $\bar{x}=75,1$ in the 8th grade.

Upon examining the self-sufficiency total scores of the students by grade level in Table 4, the highest average for the Avoidance factor is $\bar{x}=82,7$ in the 7th grade, and the lowest average is $\bar{x}=68,4$ in the 8th grade. For the factor of maintaining the research, the highest average is $\bar{x}=86,9$ in the 5th grade and the lowest average is $\bar{x}=77,9$ in the 8th grade. The highest average for the Personal Development factor is $\bar{x}=89,8$ in the 7th grade, and the lowest average is $\bar{x}=81,5$ in the 8th grade. The highest average for the total self-sufficiency score is $\bar{x}=85,3$ in the 7th grade, and the lowest average is $\bar{x}=74,4$ in the 8th grade.

The results of the variance analysis performed in order to determine whether this differentiation between the attitude and self-sufficiency scores in regard to research-inquiry is significant are summarized in table 5.

Table 5. Results of the variance analysis

			Sum of Squares	df	Mean Square	F	Sig.	LSD
Attitude	Inquisitiveness	Between Groups	2369,919	3	789,973	4,408	,005	Between 8 and 7
		Within Groups	41219,076	230	179,213			
		Total	43588,996	233				
	Negative overview	Between Groups	4806,882	3	1602,294	5,792	,001	Between 8 and 5, 7
		Within Groups	63624,502	230	276,628			
		Total	68431,385	233				
	Valuing	Between Groups	4717,803	3	1572,601	7,466	,000	Between 8 and 5, 7
		Within Groups	48444,590	230	210,629			
		Total	53162,393	233				
	Total	Between Groups	3826,041	3	1275,347	10,68	,000	Between 8 and 5, 7
		Within Groups	27466,044	230	119,418			
		Total	31292,085	233				
Self-sufficiency	Avoidance	Between Groups	6936,020	3	2312,007	7,144	,000	Between 8 and 5, 7
		Within Groups	74439,176	230	323,649			
		Total	81375,196	233				
	Resume Research	Between Groups	3131,705	3	1043,902	6,457	,000	Between 8 and others
		Within Groups	37183,252	230	161,666			
		Total	40314,957	233				
	Personal evolution	Between Groups	2468,935	3	822,978	3,726	,012	Between 8 and 7
		Within Groups	50804,570	230	220,889			
		Total	53273,504	233				
	Total	Between Groups	4266,418	3	1422,139	9,105	,000	Between 8 and 6, 7
		Within Groups	35924,312	230	156,193			
		Total	40190,729	233				

Upon examining the students' attitudes towards research-inquiry by grade level in Table 5, it is seen that there is a significant difference among all attitude factors (Curiosity: $F(3, 230)=4,40$; Negative Opinion: $F(3, 230)=5,79$; Valuing: $F(3, 230)=7,46$) and the total score $F(3,230)=10,68$ in terms of grade levels, $p<0.05$. Accordingly, there is a significant difference

between the 7th and 8th grades in the Curiosity factor, and between the 8th grade and 5th and 7th grades in terms of other factors and the total score.

Upon examining the students' self-sufficiency in regard to research-inquiry by grade level in Table 5, it is seen that there is a significant difference among all grade levels $F(3,230)=9,10$ in terms of all of the self-sufficiency factors (Avoidance: $F(3, 230)=7,14$; Maintaining the Research: $F(3, 230)=6,45$; Personal Development: $F(3, 230)=3,72$) and the total score, $p<0.05$. Accordingly, there is a significant difference between the 8th and 5th and 7th grades in the Avoidance factor; between the 8th grade and other grades in Maintaining the Research factor; between the 8th grade and 7th grade in the Personal Development factor; and between the 8th grade and 6th and 7th grades in terms of the total score.

Relationship between the Attitude and Self-Sufficiency Levels of the Students in regard to Research-Inquiry

The findings on the relationship between the attitudes and self-sufficiency of the students in regard to research and inquiry are summarized in Table 6.

Table 6. Relationship between the attitudes and self-sufficiency of the students

	Avoidance	Resume Research	Personal evolution	Self-sufficiency
Inquisitiveness	,555	,450	,460	,607
Negative overview	,758	,497	,538	,816
Valuing	,603	,453	,486	,675
Attitude	,874	,628	,668	,955

$P<0,01, N=234$

Upon examining Table 6, it is seen that there is a significant difference between the attitudes and self-sufficiency of the students in regard to research and inquiry at a level of 0,955, $r=0,955, p<0.05$. This shows that there is a positive and significant relationship at a high level. It is also seen that there is a significant and positive relationship between the attitude factors and self-sufficiency factors. This can be interpreted as the self-sufficiency levels of the students will increase as their attitude levels towards research-inquiry increase.

Discussion and Conclusion

1. As a result of the study carried out, the attitudes and self-sufficiency of the students in regard to research and inquiry are quite high. Similarly, it is seen that there is a high relationship between the inquiry-based learning and the attitude levels of the students towards science in the literature (Akpullukçu, 2011; Alouf and Bentley, 2003; Lord and Orkwiszewski, 2006; Sakar, 2010; Tatar, 2006). Furthermore, it was determined in the study of Laipply (2004) examining the effect of inquiry-based learning practices on the attitude and self-sufficiency levels of students in regard to science, it was determined that the attitude and self-sufficiency levels of the students are high.

2. According to the result of the study carried out, gender does not have any effect on the attitude and self-sufficiency levels of the students in regard to research and inquiry. Similarly, the self-sufficiency levels of teachers concerning inquiry in the literature do not vary by gender (Çelikkaleli, 2006; Gerçek et al., 2006; Torkzadeh & Koufteros, 1994). Furthermore, in Evren's (2012) master's thesis investigating whether the attitude levels of the students towards inquiry vary by gender and grade level, it was concluded that the attitude levels of the students do not vary by gender.

3. According to the result of the study conducted, there is a significance difference between the attitudes and self-sufficiency of the students in regard to research and inquiry by grade level. There is a significant difference between the 8th grade and 5th and 7th grades in terms of attitude levels in favour of the 8th grades, and between the 8th grade and 6th and 7th grades in terms of self-sufficiency levels in favour of the 8th grades. However, in the literature, it was determined in Evren's (2012) master's thesis investigating whether the attitude levels of the students towards inquiry vary by gender and grade level, it was determined that the attitude levels of 8th-grade students are higher than those of 6th and 7th-grade students. This may result from other factors affecting the research performance. The interests, attitudes, worries, and wishes (Büyüköztürk, 1997; Saracaloğlu et al., 2005) of the individuals and research self-sufficiency (Bieschke, Bishop and Garcia, 1993; İpek et al., 2010) are among the factors affecting the research performance.

4. According to the result of the study carried out, there is a positive and high-level relationship between the attitudes and self-sufficiency levels of the students in regard to research and inquiry. It is seen in the literature that there is a relationship between the attitude and self-sufficiency levels in regard to research and inquiry. Research self-sufficiency affects the research effectiveness (Bard, Bieschke, Herbert and Eberz, 2000; Hollingsworth and Fassinger, 2002; Phillips, 1992; Phillips and Russell, 1994) and the attitudes and approaches towards the research (Bard et al., 2000).

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