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The Effect of The Activities Carried out in Out-Of-School Learning Environments Based on Socio-Scientific Issues on The Decision-Making of The Students

Sosyobilimsel Konulara Dayalı Okul Dışı Öğrenme Ortamlarında Yürütülen Etkinliklerin Öğrencilerin Karar Verme Becerilerine Etkisi

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Öz

Bu çalışmada sosyobilimsel konulara dayalı okul dışı öğrenme ortamlarında yürütülen etkinliklerin 7.sınıf öğrencilerinin karar verme becerilerine etkisini belirlemek amaçlanmıştır. Araştırmada karma desenlerden iç içe desen kullanılmıştır. Araştırmaya bir ortaokulda öğrenim görmekte olan 21 yedinci sınıf öğrencisi katılmıştır. Veri toplama aracı olarak Ergenlerde Karar Verme Ölçeği kullanılmış ve yarı yapılandırılmış görüşmeler yürütülmüştür. Karar verme ölçeğinden elde edilen verilerin analizinde Friedman Testi ve Wilcoxon İşaretli Sıralar Testi kullanılmıştır. Yarı yapılandırılmış görüşmelerden elde edilen veriler ise; içerik analizi ile çözümlenmiştir. Araştırma sonucunda; sosyobilimsel konulara dayalı okul dışı öğrenme ortamlarında yürütülen etkinliklerin öğrencilerin karar vermede özsaygı düzeylerinin yükselmesinde ve karar vermede olumlu başa çıkma stili olan ihtiyatlı seçici davranmasında etkisi olduğu tespit edilmiştir. Ayrıca araştırma kapsamında ortaya çıkan nitel bulguların da bu araştırma sonucunu desteklediği sonucuna ulaşılmıştır.

Anahtar Kelimeler

okul dışı öğrenme *ortamları*
sosyobilimsel konular
karar verme becerisi

Abstract

Determining the effects of the activities carried out in out-of-school learning environments based on socio-scientific issues on the decision-making of the 7th grade students is the aim of this study. The embedded research design which is one of the mixed research design method was used. Twenty-one 7th grade students studying at a secondary school were included in this study. While "Adolescent Decision-Making Questionnaire" was used as the data collection tool, semi-structured interviews were held. Friedman Test and Wilcoxon Signed Ranks Test were used to analyze the data obtained from the adolescent decision-making scale. Content analysis was used to analyze data obtained from the semi-structured interviews. At the end of the research, it was confirmed that the activities carried out in out-of-school learning environments based on socio-scientific issues affect the decision-making processes, self-esteem levels and vigilance which is a positive coping style for decision-making of the students. Besides, it was concluded that the qualitative findings of the study supported the obtained results of the study as well.

Keywords

out-of school learning environments
socio-scientific issues
decision-making skills

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1. Introduction

Decision-making is one of the main crucial abilities of an individual which is needed in every aspect of one's life. Therefore, the lives individuals of all ages are full of decision-making processes. However, making a decision on any subject is not very easy (Grace, 2009). Contrarily, it is a critical and a complex process requiring thinking among the alternatives (Welton and Mallan, 1999). In the simplest sense decision-making is making a choice to reach the best solution within the information obtained according to the existing choices (Chatoupis, 2007). Decision-making process starts with the awareness of the individual on the very situation. Then, the individual collects various and complex data not only on the situation but also on the possible alternatives and analyzes this information according to the targets and the priorities. If necessary s/he can organize the obtained information by receiving feedbacks on the examined data. Later on, he creates some alternatives depending on this background information, concentrates on this and completes the process by choosing one of them (Certo and Certo, 2006; Viola, Jennings, Witham Bednadz, Schug, Cortes and White, 2005; Adair, 2000). Therefore, it can be stated that decision-making process consists of many interrelated phases that should be run carefully and seriously. As each individual from any age range has to make some qualified decisions on some environmental or social issues which are closely associated with the society from time to time, an individual should be taught to have decision-making skills for efficient and right decisions from a very early age.

Since school years can be considered as the best time when individuals can be taught on effective decision-making skills, habits and responsibilities (Mann et al., 1989 cit. Goloğlu 2009),activities developing decision-making skills within the education and training system is crucial. For instance, contradictive current events can be used as a tool for developing decision-making skills (Viola et al., 2005). Likewise, socio-scientific issues have a key role for developing decision-making skills of the children. Eventually, socio-scientific issues are up-to-date contradictive and conflicting topics from the real life, which encourage critical thinking, and which are decision-making oriented both individually and socially (Ratcliffe and Grace, 2003). Choosing these issues from the real life let the ideas of the students come out more easily and effectively as these issues attract their attention. Hence, this choice helps developing the decision- making skills of the children (Goloğlu, 2009). With socio-scientific issues helping the students make decisions by evaluating the evidences on the contradictive scientific issues via ethical thinking is aimed (Powell, 2014). In sum, students' facing with contradictive current events from the real life would play a crucial role both in the development of their decision-making processes and for creating awareness on socio-scientific issues. In other words, an individual with an advanced decision-making skill can decide logically not only throughout his own life but also for the social events. People who are successful in decision-making are the ones to consider all the information and realities (Smith, 2000). Because there is information search for generating or evaluating the alternative(s) related to the topic throughout the decision-making process. Based on this information it can be emphasized that there is a learning environment out of the school that can support this search for the students.

Out-of-school learning environments are the institutions and settings which are outside the physical boundaries of the school building where the educational activities are carried out in a planned way and systematically to fulfill specific targets and the outcomes which are parallel to the curriculum throughout the school year (Salmi, 1993). It can be underlined that these types of social areas facilitate the education and training activities since learning and teaching activities within the frame of formal education has been run in a way which is not related to the real world and connected to symbols instead of the events, facts and objects of real life. Whereas, planned and systematic utilization of the out-of-school learning environments throughout formal education leads to complete and meaningful learning due to the interaction with concepts and objects for the science subjects (Ramey-Gassert, 1997). Carried out studies emphasized that utilization of out-of-school learning environments for teaching science topics within the context of science classes contribute to better and easier understanding and comprehension of the topics (Melber, 2006), concretization of the concepts and meaningful, effective, efficient and permanent learning of the students (Gerber et al., 2001; Randler et al., 2012; Salmi 1993; Ramey-Gassert, 1997; Wellington, 1990). Besides, these environments offer different learning opportunities that cannot be provided within the classroom and let the students learn according to their learning rate and the most appropriate learning system (Melber and Abraham, 1999). Hence, it can be implied that such environments can be regarded as significant resources enabling self-learning of the students and generating reliable and valid information during the data collection phase on the targeted subject in science lessons.

Children, who are the prospective adults, might face with contradictive and inconclusive real life issues anytime and anywhere in their future lives. Therefore, it is vital for them, who are expected to be science literate individuals, to have background information on the socio-scientific issues and accordingly to have their own decisions. Likewise, it is believed that focusing on the decision-making skills of the students is essential for allowing them to develop sturdy ju-

dgement son the problems to be encountered in real life. Despite some studies on examining the decision-making skills of the secondary school students based on socio-scientific issues in the literature (Maloney and Simon, 2006; Gologlu, 2009; Papadouris, 2012; Lee and Grace, 2012), there are almost no studies discussing socio-scientific issues and out-of-school learning environments together, both of which allow the students develop their decision-making skills. Yet, decision-making skills is a learnable and an improvable skill. Considering the wide range of the socio-scientific issues, it was underlined that the number of the studies on identifying the pedagogical researches carried out for developing decision-making skills of the students should be increased (Lee and Erdogan, 2007). Accordingly, utilization of out-of-school learning environments for making decisions on current issues containing dilemmas and contradictions such as socio-scientific issues is essential.

In this sense the lack in the literature on discussing both socio-scientific issues and out-of-school learning environments together and defining the effect on the decision-making skills of the students can be filled with this study. Thus, determining the effect of the activities on the decision-making skills of the 7th grade students based on socio-scientific issues throughout out-of-school learning environments and determining the opinions of the students are aimed in this study.

2. Method

Research Design

Since the effects of the activities on the decision-making skills of the 7th grade students based on socio-scientific issues throughout out-of-school learning environments and determining the opinions of the students are aimed in this study, a mixed design enabling collecting, analyzing and compounding both qualitative and quantitative data were used. Within this concept, examining the cause and effect relationship between the activities based on socio-scientific issues carried out in out-of-school learning environments and the decision-making skills of the students via experimental method are aimed in this study. The study was designed according to time series design, which is a quasi-experimental design. According to time series design decision-making skills test was performed before and after the three practices With the qualitative part, the opinions of the students on decision-making process for the activities based on socio-scientific issues carried out throughout out-of-school learning environments and how this process affects the decision-making skills of the students were analyzed.

Working Group

The working group of the study consists of twenty-one 7th grade students studying at a secondary school in Hendek, Sakarya during the 2014-2015 academic year. In order to find an answer to the problem of the study, criterion sampling method, which is one of the purposeful sampling methods, was used for determining the students to be included in the study. Thus, the students in the working group are chosen according to the following predetermined criterion: Being a 7th grade student, Being able to participate in the activities to be carried out in the out-of-school learning environments, Having basic knowledge and interest on the socio-scientific issues and out-of-school learning environments. To determine the students to be included in study group all the 7th grade students were given a form in which there are two questions on the socio-scientific issues and out-of-school learning environments and one question on the volunteerism aspect of the students. According to the data obtained from this form 47 of 169 students who were volunteer and answered properly were chosen. Then, 21 students were selected among these 47 students based on the permission of the parents for the school trips to be organized to out-of-school learning environments and based on the attitudes of the teachers on the profile of the students.

The demographic information of the 21 participants selected based on qualitative and quantitative data are given in Table 1.

Table 1. The demographic information of the students in the working group

Variable		Students	
		Frequency (f)	Percentage (%)
Sex	Female	11	52.38
	Male	10	47.62
	Total	21	100

Variable		Students	
		Frequency (f)	Percentage (%)
Profession of the Mother	Housewife	16	76.19
	Worker	1	4.76
	Civil Servant (Teacher)	3	14.28
	Retired	1	4.76
	Total	21	100
Profession of the Father	Worker (electrical technician, electrician, sales representative, quality control officer, taxi driver, farmer)	11	52.38
	Retired	3	14.28
	Civil Servant (Teacher, architect, imam)	7	33.33
	Total	21	100
Monthly Income	1.000 and Less	2	9.52
	1.001-2.000	9	42.86
	2.001-3.000	6	28.57
	3.001-4.000	4	19.05
	Total	21	100

Data Collection Tool

Adolescent Decision-Making Questionnaire

In order to determine the self-esteem in decision-making and decision-making styles of the students "Adolescent Decision-Making Questionnaire" (ADMQ) which was developed by Mann, Harmony and Power and adapted to Turkish by Çolakkadıoğlu (2003) was used. There are 30 questions in the questionnaire which includes two parts, self-esteem in decision-making and decision-making styles, and five subscales (self-esteem, panic, cop-out, complacency and vigilance-selectivity). In this study Cronbach Alpha coefficient of each subscale -self-esteem, vigilance, panic, cop out and complacency - was found as .81, .91, .77, .78 and .70respectively.

Interview

In order to find an answer to the research problem some interviews which are among the verbal communication method were carried out. Interview sessions were held before and after the three practices carried out in out-of-school learning environments with the students included in the working group. Questions revealing the opinions of the students on decision-making skills concepts determining the impacts of the experimental study were included in the interview form.

Practice

The administration of the study were performed according to the activities carried out in the appropriate out-of-school learning environments (hydroelectric plant, dialysis center and TÜBİTAK Gebze Marmara Research Center) based on the determined socio-scientific issues (GMO, HEP and Organ Donation) during the planned days and school hours with the participation of the twenty-one 7th grade students included in the working group in accordance with the permissions taken from the Ministry of National Education, the school principal and the teachers. Some necessary information on the predetermined issue and a booklet were given to the students who were asked to fill some of the parts. Interview sessions were carried out with the students before and after the activities and the trips to the out-of-school learning environments Besides, "Adolescent Decision-Making Questionnaire" was applied four times as before the first practice (HEP visit), after the first practice (HEP visit),before the second practice (dialysis center visit), after the second practice (dialysis center visit),before the third practice (TÜBİTAK Gebze Marmara Research Center visit), after the third practice (TÜBİTAK Gebze Marmara Research Center visit).

Analysis of the Data

Descriptive statistical techniques and Shapiro-Wilk Test analysis were used to determine the general distribution of the answers -or whether these answers display a normal distribution- obtained from the Adolescent Decision-Making Questionnaire. Since both the data were non parametric and the measurements were carried out to the four groups simultaneously, Friedman Test was used to statistical significance of the first, second, third and the fourth test measurements obtained from the decision-making questionnaire. Wilcoxon Signed Ranks Test was used for the significant distributions obtained after this test. Thus, determining the source of the difference found out after Friedman Test was aimed. After the distributions for the first, second, third and the fourth test measurements were compared, for which measurement the

difference is significant was established with Wilcoxon Signed Ranks. Within these analysis the formula generated with the effect size z score and the number of the individuals in the working group was calculated as r and shown with "r" (Field, 2009). For interpreting the effect sizes the cut points of the effect sizes were as follows: 0,01 for low level, 0,3 for medium level and 0,5 for higher level (Cohen, 1988). SPSS 18.0.0 software was used to analyze the quantitative data of the study, to define the effect of the independent variable on the dependent variable and for the descriptive statistics. Throughout the study the significance level for all the analysis was regarded .05

The qualitative data obtained from the semi-structured interviews performed for the study are analyzed via content analysis. By iterative review of interview the data, first code list was generated and then some notes were taken. For each generated code recurrence frequency and frequencies of the students were checked and then these frequencies were recorded. Finally, themes containing these code lists were generated and both the codes and the themes were interpreted by illustrating with tables.

3. Findings

The Findings on the Effect of the Activities Carried out in Out-Of-School Learning Environments based on Socio-Scientific Issues on the Decision-Making Skills

Within the concept of the study which focuses on the effects of the activities carried out in out-of-school learning environments based on socio-scientific issues on the decision-making skills of the students included in the working group the scores of the first, second, third and the fourth tests of each subscale in the decision-making scale of the students were compared with Friedman Test. The results of the analysis are given in Table 2.

Table 2. Friedman Test Results of Scores of the students in the working group for the first, second, third and the fourth tests of Adolescent Decision-Making Questionnaire

Subscales	Measurements of Adolescent Decision-Making Questionnaire	N	Mean Rank	X^2	P
Self-esteem in decision-making	First ADMQ	21	2.05	8.38	.039
	Second ADMQ	21	2.26		
	Third ADMQ	21	2.79		
	Fourth ADMQ	21	2.90		
Vigilance	First ADMQ	21	2.26	12.21	.007
	Second ADMQ	21	1.98		
	Third ADMQ	21	2.60		
	Fourth ADMQ	21	3.17		
Panic	First ADMQ	21	2.33	1.24	.743
	Second ADMQ	21	2.71		
	Third ADMQ	21	2.45		
	Fourth ADMQ	21	2.50		
Cop-out	First ADMQ	21	2.48	2.42	.490
	Second ADMQ	21	2.79		
	Third ADMQ	21	2.24		
	Fourth ADMQ	21	2.50		
Complacency	First ADMQ	21	2.67	3.08	.380
	Second ADMQ	21	2.74		
	Third ADMQ	21	2.21		
	Fourth ADMQ	21	2.38		

On examining Table 2, a significant difference betweenthe first, second, third and the fourth test scores of the self-esteem in decision-making subscale [$X^2_{(3)}$ =8.38, p<0.05] and the first, second, third and the fourth test scores of the vigilance subscale of Adolescent Decision-Making Questionnaire [$X^2_{(3)}$ =12.21, p<0.05] was detected. On the other hand, no significant difference between the first, second, third and the fourth test scores of panic [$X^2_{(3)}$=1.24, p>0.05], cop-out [$X^2_{(3)}$=2.42, p>0.05] complacency [$X^2_{(3)}$=3.08, p>0.05], which are the other subscales of the Adolescent Decision-Making Questionnaire was seen.

The results of the Wilcoxon Signed Ranks Test carried out as post hoc test were given in Table 3.

Table 3. The analysis results of the Wilcoxon Signed Ranks Test based on the scores of the first, second, third and the fourth tests for the self-esteem in decision-making subscale of Adolescent Decision-Making Questionnaire obtained from the students in the working group

Second-First Test	n	Mean Rank	Total Rank	Z	p	R
Negativerank	7	7.50	52.50	-1.144	.253	0.249
Positive rank	10	10.05	100.50			
Equal	4					
Third-First Test	n	Mean Rank	Total Rank	Z	p	R
Negative rank	4	4.50	18.00	-2.624	.009	0.572
Positive rank	12	9.83	118.00			
Equal	5					
Fourth-First Test	n	Mean Rank	Total Rank	Z	p	R
Negative rank	2	2.50	5.00	-2.683	.007	0.585
Positive rank	10	7.30	73.00			
Equal	9					
Third-Second Test	n	Mean Rank	Total Rank	Z	P	R
Negative rank	3	2.50	7.50	-2.290	.022	0,500
Positive rank	8	7.31	58.50			
Equal	10					
Fourth-Second Test	n	Mean Rank	Total Rank	Z	P	R
Negative rank	5	9.50	47.50	-1.715	.086	0.374
Positive rank	13	9.50	123.50			
Equal	3					
Fourth-Third Test	N	Mean Rank	Total Rank	Z	P	R
Negative rank	6	8.75	52.50	-.517	.605	0.112
Positive rank	7	5.50	38.50			
Equal	8					

The results in Table 3 displays that while there was a significant difference among the third-first test scores (Z= 2.624, $p<0.05$, r=0.572), fourth-first test scores (Z=2.683, $p<0.05$, r=0.585) and third-second test scores (Z=2.290, $p<0.05$, r=0.500) of the self-esteem in decision-making subscale of Adolescent Decision-Making Questionnaire received from the students in the working group, there wasn't any significant differences among the second-first test scores (Z=1.144, $p>0.05$, r=0.249), the fourth-second test scores (Z= 1.715, $p>0.05$, r=0.374) and the fourth-third test scores (Z=.517, $p>0.05$, r=0.112).

Regarding the mean rank and total rank of the difference scores of the working group it was observed that while the first difference was in favor of the positive ranks, which is the third test, the next one is in favor of the positive ranks which is the fourth test and the last one is in favor of the positive ranks which is the third test. According to these results it can be implied that the activities carried out in out-of-school learning environments based on socio-scientific issues have a remarkable effect on developing their levels of self-esteem in decision-making of the students included in the working group. Thus, it can be implied that the activities carried out in out-of-school learning environments based on socio-scientific issues have a remarkable effect on developing their levels of self-esteem in decision-making of the students included in the working group.

The results of the Wilcoxon Signed Ranks Test carried out as post hoc test were shown in Table 4.

Table 4. The analysis results of the Wilcoxon Signed Ranks Test based on the scores of the first, second, third and the fourth tests for thevigilance subscale of Adolescent Decision-Making Questionnaire obtained from the students in the working group

Second-First Test	n	Mean Rank	Total Rank	Z	P	R
Negative rank	10	9.40	94.00	-.845	.398	0.184
Positive rank	7	8.43	59.00			
Equal	4					
Third-First Test	N	Mean Rank	Total Rank	Z	P	R
Negative rank	5	6.10	30.50	-1.425	.154	0.310
Positive rank	9	8.28	74.50			
Equal	7					

Fourth-First Test	N	Mean Rank	Total Rank	Z	P	R
Negative rank	4	5.63	22.50	-2.590	.010	0.565
Positive rank	13	10.04	130.50			
Equal	4					
Third-Second Test	N	Mean Rank	Total Rank	Z	P	R
Negative rank	3	5.00	15.00	-2.164	.030	0.472
Positive rank	10	7.60	76.00			
Equal	8					
Fourth-Second Test	N	Mean Rank	Total Rank	Z	P	R
Negative rank	2	4.50	9.00	-3.100	.002	0.676
Positive rank	14	9.07	127.00			
Equal	5					
Fourth-Third Test	N	Mean Rank	Total Rank	Z	P	R
Negative rank	4	7.88	31.50	-1.664	.100	0.363
Positiverank	11	8.05	88.50			
Equal	6					

Examination of Table 4 displays that despite a significant difference among the fourth-first test scores (Z= 2.590, $p<0.05$, r=0.565), the third-second test scores (Z=2.164, $p<0.05$, r=0.472) and the fourth- second test scores (Z=3.100, $p<0.05$, r=0.676), no significant difference among the second-first test scores (Z= .845, $p>0.05$, r=0.184), third-first test scores (Z=1.425, $p<0.05$, r=0.310) and the fourth-third test scores (Z= 1.664, $p>0.05$, r=0.363).

Considering the mean rank and total rank of the difference scores of the working group it was found out that the first difference was in favor of the positive ranks, which is the fourth test, the second one is in favor of the positive ranks which is the third test and the last one is in favor of the positive ranks which is the fourth test. According to these results it can be implied that the activities carried out in out-of-school learning environments based on socio-scientific issues have a least medium effect on developing their levels of vigilant decision-making skills of the students included in the working group. Hence, it can be indicated that the activities carried out in out-of-school learning environments based on socio-scientific issues have a least medium effect on developing their vigilant decision-making skills of the students included in the working group.

Findings on the Opinions of the Students on the Decision-Making Process Regarding the Activities Carried out In Out-Of-School Learning Environments Based On Socio-Scientific Issues

The question of "What will you consider if you have to decide about a topic?" was addressed to the students within the context of the study. The codes and the themes generated regarding the answers of the students and recurrence frequencies and the percentages of these codes are presented in Table 5.

Table 5. Opinions of the students on decision-making

Theme	Codes	Frequency	Percentage	Percentage
Definition	Type of the Topic	3	3.26	3.26
Different opinions and thoughts	Opinions of the peers	3	3.26	21.73
	Opinionsof the parents	2	2.17	
	Opinionsof the others	8	8.69	
	Opinionsof the scientists and experts	7	7.61	
Possible Effects	Effects of the positive/negative results	6	6.52	22.82
	Effects to everyone	7	7.61	
	Effects to him/herself	8	8.69	
Scientific Process Skills	Research	15	16.30	18.48
	Observation	1	1.09	
	Hypothesize	1	1.09	
Data Collection based on the Topic	Effort for reaching reliable information	2	2.17	13.03
	Obtaining infirmation (İnternet, book etc.)	8	8.69	
	Consulting an expert	2	2.17	
Mental Activities	Thinking	12	13.04	19.56
	Questioning	2	2.17	
	Evaluating the varibales	1	1.09	
	Comparision	2	2.17	
	Comprehension	1	1.09	
Total		92	100	100

In Table 5 when the answers of the students for `What will you consider if you have to decide about a topic?` question was examined it can be said that 22.82% of them used expressions about "possible effects". On examining the expressions of the students it was seen that most of them mentioned that they consider the possible effects of the decision based on the topic during the decision-making process.

Some quotations from the pre-interviews with the student: "*Well! I would think whether it is good for everyone or not. Then, I try to get information on the topic as much as possible. I make research. Then, I think from my perspective, question the topic and make a decision*."(S2)

Within the context of the research the students were asked "Did the out-of-school trips affect your decision on the topics taught throughout the field trips?" with which determining whether the activity carried out in out-of-school learning environments affect the decision-making processes of the students on the socio-scientific issues taught during these trips was aimed. On examining the answers of the students it was found out that all the students presented a positive opinion on the effect of the activity carried out in out-of-school learning environments.

The follow-up questions of "If so, what affected you?" and "How" were also addressed to the students. Table 6 presents not only the codes and themes generated via the answers of the students but also the frequencies and percentages of these codes.

Table 6. The opinions of the students on how the activity carried out in out-of-school learning environments affected their decision-making processes regarding the socio-scientific issues taught during these trips

Theme	Codes	Frequency	Percentage	Percentage
Data Collection based on the Topic	Informing	12	21.05	57.89
	Detailed information	4	7.02	
	Expert Opinion	5	8.77	
	Learning the Different Aspects	12	21.05	
	Given examples	1	1.75	
Mental Activities	Chance of comparinf the real and dream	1	1.75	22.80
	Thinking	3	5.26	
	Checking the decision (Verification)	6	10.53	
	Analyzing the Information	1	1.75	
	Chance of evaluation	2	3.51	
Affecting the person	Görme imkanı	7	12.28	17.54
	İkna edici olma	1	1.75	
	İlgi çekici olma	2	3.51	
Total		57	100	100

In Table 6 examination of the answers of the follow-up question - If so, what affected you?" and "How" -it is seen that 57.89% of the students used expressions in accordance with "data collection based on the topic". Likewise, most of the students expressed that the activity carried out in out-of-school learning environments provided the opportunity of collecting data for evaluating the decision-making process regarding the socio-scientific issues taught during these trips.

Some quotations from the pre-interviews with the student: "*I knew some of the topics as much as I heard from the other people or the news. And to be honest I didn't look them up and I know as much as they know. As a result, my decision changed when an expert told everything in detail there*."(S14)

4. Results and Discussion

There was a significant difference between the first, second, third and the fourth test scores of the self-esteem in decision-making subscale and the first, second, third and the fourth test scores of the vigilance subscale of the Adolescent Decision-Making Questionnaire applied to some students within the context of this study which examines the effect of the activities carried out in out-of-school learning environments based on socio-scientific issues on the decision-making skills of the students included in the working group. However, no significant difference among the first, second, third and the fourth test scores of the panic, cop-out and complacency subscales of the same Questionnaire was found out. Thus, it was seen that the activities carried out in out-of-school learning environments based on socio-scientific issues affect the development of the self-esteem in decision-making levels and vigilance which is a positive coping style for decision-making.

Within this questionnaire self-esteem in decision-making was defined as self-confidence and awareness of the in-

dividual during the decision-making process (Friedman and Mann, 1993 cit. Çolakkadıoğlu, 2012). Therefore, it was concluded that these activities carried out in out-of-school learning environments are effective on the levels of confidence and awareness of the students during their decision-making processes regarding the socio-scientific issues of hydroelectric plants, organ donation and GMO. Likewise, vigilance was defined as consideration of the alternatives carefully and evaluation of the positive and negative aspects of these alternatives by the individuals during the decision-making process (Friedman and Mann, 1993 cit. Çolakkadıoğlu, 2012).Thus, it was figured out that these activities carried out throughout out-of-school learning environments can influence the evaluation of the students on the positive and negative aspects of some of the contradictive the socio-scientific issues such as hydroelectric plants, organ donation and GMO by making researches on them. The findings of the qualitative data collection tools support this result as well.

A science literate individual is expected to have an advanced decision-making skill for making the most appropriate choice when faced a personal or social occasion (MEB, 2013). Most of the studies revealed that school years are the best time periods for teaching the decision-making skill effectively (Mann et al., 1989 cit. Goloğlu 2009). In this sense, decision-making skills should be taught within the context of science classes (Kaptan, 1999).Therefore, including socio-scientific issues within the science curriculum is essential both for being prepared to the prospective decision-making occasions and making effective decisions (Lee, Abd-EIKhalick and Choi, 2006). Daily socio-scientific issues aim to help the individuals for their decision-making process after considering the clues on contradictive scientific events by using their moral and ethical principles (Powell, 2014). Therefore, regarding that some information is needed to make a decision on a topic, it can be inferred that out-of-school learning environments can offer opportunities for observing and examining the topic in its natural environment. The results of this study suggests that the practice carried out in out-of-school learning environments based on socio-scientific issues help developing the decision-making skills of the students. In parallel with these results Zeidler (2007) emphasizes that when the target of the science literacy for the students is making decision depending on their comprehension and knowledge of the complicated science topics, the students should be exposed to socio-scientific issues within informal learning environments.

The result of the Wilcoxon Signed Ranks Test in which paired comparisons were made to find out the source of the difference between the scores of the first, second, third and the fourth tests for the self-esteem in decision-making subscale presented that while there was a significant difference between the third-first test scores, fourth-first test scores and third-second test scores, there wasn't any significant differences between the second-first test scores, fourth-second test scores and fourth-third test scores of the self-esteem in decision-making subscale of the Adolescent Decision-Making Questionnaire. The result of the Wilcoxon Signed Ranks Test in which paired comparisons were made to find out the source of the difference between the scores of the first, second, third and the fourth tests for the vigilance subscale finds out that while there was a significant difference between the fourth-first test scores, third-second test scores and fourth-second test scores, there wasn't any significant differences between second-first test scores, third-first test scores and fourth-third test scores of the vigilance subscale of the Adolescent Decision-Making Questionnaire. By looking at these findings it was found out that the difference occurred in the self-esteem in decision-making and vigilance subscales resulted from the third and fourth test scores obtained from the tests applied after the activities carried out in out-of-school learning environments based on socio-scientific issues. This suggests that a sufficient time period is required for the development of self-esteem in decision-making skill and of positive coping style in decision-making. This time period for this study can be suggested as the practices carried out after the second trip. Decision-making is a dynamic process which includes the individuals and where they take active roles (Daft, 1994). Therefore, it is implied that the decision-making skills of the students cannot change within the short-period practices. On the contrary, as it was the case in this study, it is believed that studies carried out for a longer time in out-of-school learning environments would be more effective on the skills. However, Yavuz (2012) stated that although educational use of the zoos didn't have an effect on the anxiety levels of the students towards science, more extensive and longer studies might facilitate the observation of this effect. Similarly, Knapp (2000) indicated that the long standing out-of-school practices were significant for supporting the affective and cognitive skills of the students. Therefore, it is believed that the activities and practices carried out in out-of-school environments can be effective on decision-making which is a skill requiring higher-level thinking behavior only if these activities and practices are organized for a long period.

The pre-interviews on the decision-making process with the students presented that majority of the students considered the positive and negative effects of their decision both to themselves and to everybody in order to make a decision on something. The individual who is trying to make a decision tends to fulfill the requirements of his/her own inner and the environmental expectations (Sardoğan et al., 2006). Thus, feeling the responsibility of making the most appropriate decision towards oneself and to the others might be regarded as the reason for considering the possible effects of the decision throughout the decision-making process. Besides, most of the students mentioned that they ask the opinions and

thoughts of the others to make a decision on a topic. The reason of considering the possible effects and the opinions on the decision to be made can be interpreted as obtaining information on the very subject. Parallel with these findings Batı and Çalışkan (2012) found out that opinions of the families significantly influenced the knowledge and the perceptions of the students on swine flu. Hence, asking for the thoughts and opinions of different people might help developing the decisions of the students. During the last interview on the decision-making process while all of the students reported that the practice carried out in out-of-school learning environments affected their decision-making processes, most of them told that this practice influenced their decision-making processes by helping collecting data based on the topic for evaluation as it enables being informed and learning different aspects of socio-scientific issues. At the end of the practice the students underlined that this out-of-school practice contributed to the data collection based on the topic process for making an evaluation on the socio-scientific issues. Decision-making is defined as a sequence of actions run for determining the best alternative for the individual among many of them and the significance of collecting data on the alternatives is emphasized(Harris, 1998). Accordingly, it can be stated that the important point for making any decision within this process is collecting various and complicated data on the possible alternatives and examining this data. Since out-of-school learning environments contribute to do research in a setting where the students learn by living and experiencing (Dierking and Falk, 2004) and to collect data based on their own styles and speed (Melber and Abraham, 1999) by enabling them observing by themselves (Emmons, 1997) out-of-school learning environments are thought to be very ideal for researching on the possible alternatives and collecting data on socio-scientific issues. Besides, out-of-school learning environments lead to active learning due to exploration of the information (Türkmen, 2010). According to Açıkgöz (2003) active learning is a learning process where the learner bears the responsibility of the process, the learner is given the opportunities of self-regulation and making decisions on various aspects of the process and the learner is forced to use his/her cognitive skills throughout the process via complicated educational activities (cit. Akay, 2013: 327). By looking at this definition it can be implied that the decision-making processes of this practice carried out in out-of-school learning environments leads to self-confidence of the individual – i.e. the learner bears the responsibility of the learning process of the out-of-school practices.

Having a definite background knowledge and decisions on contradictive and unsolvable issues is crucial for the students considering that the prospective adults might encounter such issues in their daily, academic or professional lives. Hence, out-of-school learning environments are thought to be a significant source for decision-making process. As a matter of fact, Balkan Kıyıcı and Atabek Yiğit (2010) reported that technical trips are effective for collecting data and developing their interpretation skills by reaching a conclusion for the students in their study carried out with prospective teachers.

The results of this study proves that the activities carried out in out-of-school learning environments based on socio-scientific issues affect the development of the levels of self-esteem in decision-making and of the vigilant behaviors which is a positive coping style for decision-making of the students. Moreover, it is figured out that the activities carried out in out-of-school learning environments based on socio-scientific issues facilitates generating alternatives for the issue to be decided and collecting required data and information for making a selection among these alternatives. Besides, it was seen that the students consider the possible positive and negative effects of their decision both to themselves and to the others while making a decision and that the practice has an influence on their decision-making process as it contributes to their data collection process for evaluating the issues. Finally it can be suggested that studies allowing intergroup comparisons between control and experimental groups and focusing on different affective and cognitive skills of the students should be carried out in the future.

5. References

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