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COMPARING THE SCIENCE FESTIVAL ATTITUDES OF STUDENTS PARTICIPATING AS OBSERVERS IN SCHOOL SCIENCE FAIRS

Gonca Keçeci, Fikriye Kırbağ Zengin, Burcu Alan

Abstract: In Turkey, science festivals have become more widespread and have begun to be organized especially in secondary schools. The aim of this research was to determine and compare the science festival attitudes of students participating as observers in 4006- TUBITAK science fairs organized at schools. In the research, descriptive survey was employed. The sample of the research consisted of 531 (268 female, 263 male) secondary school students of four different schools in different provinces of Turkey. Data were collected with the students of two schools in Elazığ, a school in Malatya and a school in Diyarbakır, using science festival attitude scale. Data were analyzed by using the one-way analysis of variance (ANOVA). The results show that students participating in the science fairs have moderate attitude to science festivals. The attitudes of the different school students to science festivals were significantly different. This situation was interpreted as the fact that the workshops taking place at the fairs were varied and different approaches of the teachers and administrators in charge. The attitudes of the students can be raised from moderate to high with the increase of the number of fairs in which students exhibit their projects without competition environment.

Key words: Science fair, secondary school students, attitudes

1. Introduction

In recent years, globally, countries have given importance to studies on improving science education. It is important to educate science literate individuals who dominate the skills of the 21st century at an early age. Non-school learning environments can support students' development of transferable 21st century skills and help them to be educated as science literate individuals. Non-school learning environments such as science festivals, science olympiads and science fairs support the lifelong learning skills of students (Bruce & Bruce, 2000). These events are organized in different definitions and contents from country to country. Science festivals are big organizations including exhibitions, fairs, stage shows, demonstrations and science shows, street presentations, outdoor activities, interviews, workshops, etc. (Durant, 2013). Science festivals can be organized locally in small groups or in the form of large organizations across the country (Bultitude, McDonald & Custead, 2011). Science fairs, are mostly smaller events than science festivals, where the students present their studies with their teachers, friends, parents, scientists and other people in the society. Unlike science fairs, science olympics are organizations that team work is the significant rather than individual experiences (Abernathy & Vineyard, 2001). Although their contents are different, the purpose of these activities is usually the same. Acquiring a better comprehension of the processes of science, developing critical thinking skills, promoting interest in science, group learning and teamwork, increasing scientific literacy, improving student's scientific knowledge, contributing to positive developments in the perspectives of the participants on knowledge, scientific studies and scientists with various applications and to facilitate participation in a scientific community are among the purposes of these organizations in literature (Wartinger, 1999).

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Science activities as science festivals, science fairs, science olympiad are encouraged by many researchers. The numbers of these organization that are aimed to provide students to participate scientific research process, to support their development in line with their interests and skills, to gain the features of thinking, curiosity and inquiry, and participants participating in these organizations has globally increased (Yaşar & Baker, 2003). Science fairs, as fun places, offer students the occasion to examine, predict, explicate and find new things (Abernathy & Vineyard, 2001, Huddleston, 2014; Tortop, 2014). Science fairs improve students' attitude towards the science (Blenis, 2000; Durmaz, Dinçer & Osmanoğlu, 2017; Finnerty, 2013; Yıldırım & Şensoy, 2016). According to Schmidt (2014), science olympiad and science fairs may have an effect encouraging students' STEM career pipeline. Students who exposure to science at the middle and even younger grades will benefit from their experience in the future (Bellipanni & Lilly, 1999; Tai, Liu, Maltese & Fan, 2006). Science fairs promote interest in science (Vazquez, France & Perkins, 1994) and give students the opportunity to interact with other students interested in science (Grote, 1995). Science fairs support students to make experiments at the point of creativity and help them to be scientific literate person (Fisanick, 2010; Mernoff et al, 2017; Jensen & Buckley, 2014; Tortop, 2013a).

Although the positive impacts of science fairs, negative impacts especially due to the competition environment are also indicated. It is noticed that the number of students receiving prizes in science fairs is very little compared to the number of students participating in science fairs. This causes students feel disappointment, doubt about "equal opportunity" and fairness (Kankelborg, 2005; Syer & Shore, 2001; Yaşar & Baker, 2003; Tortop, 2013b). Competition reduce from the learning experience by dividing participants into two groups: winners and losers (Blenis, 2000). The competition platform also induces students to feel apprehensive and stressed and gets up their anxiety level (Fisanick, 2010; Wang & Yang, 2003). According to Hampton and Licona (2006), especially border students have negative attitudes to science fairs and this situation prevent them from enjoying science and achieving science understanding.

It is noticed that there are different forms of science fairs of countries. In Turkey, Ministry of National Education (MNE) and Scientific and Technological Research Council of Turkey (TUBITAK) promote various projects. These projects are 2202-2203-National and International Science Olympics and 2201-National Primary School Mathematics Olympiad. Another of these projects is the 2204-Secondary School Students Research Projects Competition, also known as "This is My Work". There are two different programs, called 4006 and 4007, that have received much demand in recent years. The purpose of 4006-TUBITAK Science Fairs Call Program is to give support to the science fairs which provide an environment where secondary school students can show the results of their studies on the basis of their interests. The purpose of 4007-Science Festival Support Program is to spread science communication and scientific culture to extensive areas of society, to increase interest of the society, to encourage children and young people to make a career in all scientific fields, to integrate different sections with scientists and to transmit scientific knowledge in an amusing environment exhibitions, workshops, lab workshops and preferably interactive applications such as thematic games, competitions, stage shows, demonstrations, interviews.

When the researches about science festivals and fairs in Turkey are examined, it is recognized that the studies are mostly about "This is My Work" project (Bolat, Bacanak, Kaşıkçı & Değirmenci, 2014; Oğuz Ünver, Arabacioğlu & Okulu, 2015; Özel & Akyol, 2016; Tortop, 2014; Tortop, 2013a, 2013b, 2013c). There are some other studies examining the effects of science festivals and science fairs (Akay, 2013; Durmaz, Dinçer & Osmanoğlu, 2017; Şahin, 2012; Şahin & Çelikkanlı, 2014; Tezcan & Gülperçin, 2008; Yayla & Uzun, 2008; Yavuz, Büyükekşi & Işık Büyükekşi, 2014; Yıldırım & Şensoy, 2016). There are limited studies about 4006 TUBITAK science fairs, where projects are being carried out by more and more schools in Turkey in recent years. There is a need for more researches on science fairs. Students' attitudes towards science fairs can be used an important measure in determining the impact of science fairs when it is thought students share their learning attainments in their school projects. This research is important because to determine the attitudes of the students who participate in science fairs which are started to take place in schools more and more every year in Turkey. 4006-Science Fair is usually carried out by one of the school teachers and the students exhibit their projects without the competition environment. The results of the research can contribute to

researchers and teachers who conduct science fairs. This research was conducted to determine students' attitudes to science fairs. The following questions are answered in the research.

What is the science festival attitude level of the students participating in science fairs?

Is there a meaningful difference between the mean scores of science festival attitude scale of secondary school students of secondary schools in different cities?

2. Method

In this research, descriptive survey method was employed to investigate and compare the secondary school students' science fair attitudes. Such studies are used to analyze issues, groups, programmes, methods and materials in order to measure, contrast, classify, interpret the entities and the events or describe any generalized features (Cohen, Manion & Morrison, 2007; Çepni, 2012).

The sample of the research consisted of 531 (268 female, 263 male) secondary school students of four different schools in different provinces of Turkey that are participated in science fairs supported by the 4006-TUBITAK Science Fairs Call program. Data were collected with the secondary school students (grade 5-8), of two schools in Elazığ, a school in Malatya and a school in Diyarbakır, using science festival attitude scale. Schools that the first time science fair was conducted were selected. Four schools are the state schools where socio economics levels of parents are similar. The students of sampling were not the ones had projects in science fairs. All of the students participated in science fairs as observers in their schools.

The 22-item scale, was developed on three sub-dimensions by Keçeci, Kırbağ Zengin & Alan, 2017, was used as data coolection tool. The sub-dimensions of the scale are the belief that science festivals will contribute to personal development, the belief that science festivals are intriguing and the impact of science festivals to social life. The Cronbach's alpha reliability coefficient of the scale is .816. The highest score to be taken from the 5 likert type scale is 110 and the lowest score is 22. Data were analyzed by using the one-way analysis of variance (ANOVA) and a post hoc test using the Dunnet C with the Statistical Package (version 22.0; SPSS).

3. Findings

In this research, it is tested whether there is a meaningful difference between the mean scores of science festival attitude scale of secondary school students of four different secondary schools. Distribution of scores significantly were a normal distribution. After the means and the standard deviations were presented descriptively, the data were analyzed using one-way ANOVA. Dunnet C was used as a post-hoc test because the problem assumption of equality of group variances. Descriptive statistics are given in Table 1 according to students' science festivals attitude scale scores.

Table 1. Descriptive statistics of students' science festival attitude scale scores

School	N	Mean	SD
School A-Elazığ	108	3.43	.34
School B-Elazığ	112	3.07	.20
School C-Diyarbakır	150	3.21	.37
School D-Malatya	161	3.12	.35
Total	531	3.20	.35

Table 1 examines the attitudes of students in different schools towards science festivals. One of the two schools in Elazığ has the highest average (School A) while the other school has the lowest average (School B). The attitude scores from the highest to the lowest are like that; School A, School C, School D and School B. Anova results are shown in Table 2 according to science fair attitude scale scores of students of schools in different cities.

Table 2. Anova results according to science festival attitude scale scores of students of schools in different cities

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.604	3	2.868	26.791	.0001
Within Groups	56.419	527	.107		
Total	65.023	530			

The results of the ANOVA analysis show that there is a significant difference between the schools in different cities among the average of the scores of the science festival attitude of the students, $F(3, 527)=26.791$, $p<.01$. Dunnet C test was used as a post-hoc test in order to find out the difference between the components. Dunnet C test results are shown in Table 3.

Table 3. Dunnet C test results

(I) School	(J) School	Mean Difference (I-J)
School A-Elazığ	School B-Elazığ	.35941*
	School C-Diyarbakır	.21325*
	School D-Malatya	.30776*
School B-Elazığ	School A-Elazığ	-.35941*
	School C-Diyarbakır	-.14616*
	School D-Malatya	-.05165
School C-Diyarbakır	School A-Elazığ	-.21325*
	School B-Elazığ	.14616*
	School D-Malatya	.09452
School D-Malatya	School A-Elazığ	-.30776*
	School B-Elazığ	.05165
	School C-Diyarbakır	-.09452

When the Dunnet' C results are examined, science festival attitude scores of School A students significantly different from the attitudes of all other school students. B school students' attitude mean scores differ significantly from the attitude scores of students of School A and School C. Science festival attitude mean scores of C School's students differ significantly from the attitude scores of students of School A and School B. D School' s students science festival attitude mean scores are similar with the attitude mean scores of School B students and School C students.

Descriptive statistics and ANOVA results of factor 1 (the belief that science festivals will contribute to personal development), factor 2 (the belief that science festivals are intriguing) and factor 3 (the impact of science festivals to social life) are shown below.

Table 4. Descriptive statistics of sub-dimensions scores

	School	N	Mean	SD
Factor 1	School A-Elazığ	108	3.33	.34
	School B-Elazığ	112	3.03	.33
	School C-Diyarbakır	150	3.27	.43
	School D-Malatya	161	3.14	.45
	Total	531	3.19	.42
Factor 2	School A-Elazığ	108	3.65	.67
	School B-Elazığ	112	2.99	.31
	School C-Diyarbakır	150	3.43	.59
	School D-Malatya	161	3.39	.63
	Total	531	3.37	.61

Factor 3	School A-Elazığ	108	3.31	.54
	School B-Elazığ	112	3.18	.39
	School C-Diyarbakır	150	2.93	.61
	School D-Malatya	161	2,83	,69
	Total	531	3,03	,61

Table 4 examines factor 1, factor 2 and factor 3 mean scores of students in different schools. The attitude scores from the highest to the lowest according to factor 1 are like that; School A, School C, School D and School B. The attitude scores from the highest to the lowest according to factor 2 are like that; School A, School D, School C and School B. The attitude scores from the highest to the lowest according to factor 3 are like that; School A, School B, School C and School D.

Anova results are shown in Table 5 according to Factor1, Factor 2, Factor 3

Table 5. Anova results according to sub-dimensions scores

		Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Between Groups	6.292	3	2.097	12.906	.0001
	Within Groups	85.646	527	.163		
	Total	91.938	530			
Factor 2	Between Groups	24.983	3	8.328	25.247	.0001
	Within Groups	173.828	527	.330		
	Total	198.811	530			
Factor 3	Between Groups	18.972	3	6.324	18.585	.0001
	Within Groups	179.327	527	.340		
	Total	198.299	530			

The results of the ANOVA analysis show that there is a significant difference between the schools in different cities among the average of the scores of the three factors. The ANOVA results of the factors are that; the belief that science festivals will contribute to personal development, $F(3, 527)=12.906$, $p<.01$, the belief that science festivals are intriguing, $F(3, 527)= 25,247$, $p<.01$, the impact of science festivals to social life, $F(3, 527)= 18,585$, $p<.01$. Dunnet's C test was used as a post-hoc test in order to find out the difference between the components. When the factor 1 Dunnet' C results are examined, there are no significant difference between the mean scores of the A school students and the scores of the C school students, the scores of the B school students and the D school students. When the factor 2 Dunnet' C results are examined, the scores of the school A and school B students are found to be significantly different from the scores of the other school's students. There is no significant difference between the mean scores of the C school's students and the scores of the D school's students. When the factor 3 Dunnet' C results are examined, there are no significant difference between the mean scores of the A school students and the scores of the B school students, the scores of the C school students and the D school students.

3. Conclusion

This research was carried out with students attending science fairs in four different schools. The attitudes of the students towards the science festivals were determined and the attitudes of the students in the different schools were compared. The results of the ANOVA analysis show that there is a significant difference between the average scores of the science festival attitude of the students in different schools. Surprising situation is that one of the two schools in Elazığ has the highest average while the other school has the lowest average. Science fairs held in schools in Turkey are supported by TUBITAK and are usually carried out by one of the school teachers. Teachers' attitudes towards science fair can also affect their students (Bunderson & Anderson, 1996; Şahin & Önder Çelikkanlı,

2014). The significant difference in the attitudes of students amongst the schools may be due to the fact that the projects and practices in different schools are not the same. The students exhibiting their projects at these fairs can share their researches with their peer in the school. There are many studies show that the science fair practices of secondary school students affect the attitude towards science (Bencze & Bowen, 2009; Durmaz, Dinçer & Osmanoğlu, 2017; Finnerty, 2013; Keçeci, 2017; Potvin & Hasni, 2014). In this research, the average of the attitudes of science festivals of all the students in all schools is moderate. This may be because of the first time students have encountered a science fair. Students' attitudes towards science and science festivals can be developed by increasing the number of participation in science fairs.

The results of the ANOVA analysis show that there is a significant difference between the schools in different cities among the average of the scores of the three factors. Descriptive statistics of factor 1, the belief that science festivals will contribute to personal development, show that the factor 1 average scores of students in different schools are moderate. This can be explained by the fact that the workshops in different science fairs are different from each other. The contents of the workshops will also contribute to the personal development of the students. Even if there are different applications of science fairs, it is generally aimed to provide students development in line with their interests and skills, to gain the features of thinking, curiosity and inquiry (Tortop, 2014). The belief that science festivals will contribute to the personal development demonstrate that the objectives of the science fairs are consistent with the aims of the students. The mean scores of factor 2, the belief that science festivals are intriguing, are moderate. Although the schools A and B are in the same city, when the factor 2 mean scores are examined, it is observed that the average score of School A students is the highest and the average score of the School B students is the lowest. According to the studies about science fairs, students can have occasion to interact with other students interested in science (Grote, 1995), can develop communication skills and scientific skills (Fisanick, 2010). Science fairs support interest in science (Vazquez, France & Perkins, 1994) and assist the students to think critically (Tortop, 2014). The increased participation of students in science fairs and the increase in the variety of activities taking place at the fairs will increase the interest of students to science fairs. Descriptive statistics of factor 3, the impact of science festivals to social life, show that the School C and School D' students average scores are lower than the others. The students'scores of two schools in the same city are moderate. For this results, it can be said that participation in science fairs influences social life. The use of the learning attainments of students after their participation in science fairs on other platforms can help to bring "science culture" in society.

The results of this research show that secondary school students participating in the science fairs have moderate attitude to science festivals. The attitudes of the four different school students to science festivals were significantly different. This situation was interpreted as the fact that the workshops taking place at the fairs were varied and different approaches of the teachers and administrators in charge. The attitudes of the students can be raised from moderate to high with the increase of the number of fairs in which students exhibit their projects without competition environment. Given the utilites of science fairs, it is recommended to encourage teachers and administrators to compose science fair.

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Authors

Gonca Keçeci, Fırat University, Elazığ (Turkey). E-mail: kececi.gonca@gmail.com

Fikriye Kırbağ Zengin, Fırat University, Elazığ (Turkey). E-mail: fkzengin@gmail.com

Burcu Alan, Fırat University, Elazığ (Turkey). E-mail: burcualan@outlook.com