

## Science Teachers' Views about the Science Fair at Primary Education Level

Hasan Said Tortop

Bülent Ecevit University, Turkey

[hasansaid@yahoo.com](mailto:hasansaid@yahoo.com)

### Abstract

Science fair is an environment where students present their scientific research projects. Opinions of science teachers who participated as a mentor in science fair are important for determining of the science fair quality and its contribution of science education. The aim of study was to determine science teachers' views about the science fair at primary education level in Turkey. In this qualitative study, seven science teachers who worked in A city in Turkey were interviewed regarding a national science fair called "This is My Work Science and Mathematics Project Study for Elementary School Students". According to the interviews, the science teachers reported that students and their parents were indifferent to science fair; that they had difficulties developing a project idea; that students do not prepare the projects themselves but their parents or teachers do; and that science fair was important for developing certain skills of students. In developing countries, certain arrangements should be made in science programs as well as in science fair organizations to avoid transforming science fairs into a harmful tool.

**Keywords:** *Science education; science fair; dishonesty; constructivist curriculum*

### Introduction

Science fairs, claimed by a number of studies to be effective in developing different skills of students, have become traditional in many countries (Grote, 1995; Bunderson & Anderson, 1996; Abernathy & Vineyard, 2001). Attempts to organize the national science fair – which has been conducted for a long time at secondary education level (high school level) in Turkey – were also started at elementary school level in 2005. These attempts were especially initiated by the science education curriculum appropriate to the constructivist approach changed in 2005. In Turkey, the new science curriculum for primary schools aimed to bring up individuals who can inquire, search, investigate and establish relationships with their daily lives and science. Besides, they can use scientific methods in all fields of life to solve problems, and they can see the world from scientists' perspectives (Republic of Turkey Ministry of National Education, Board of Education, 2005). For this reason, science fair is a very important tool for education. However, besides its positive contributions, there are also negative sides of a science fair in terms of education (Grote, 1995; Bunderson & Anderson, 1996; Czerniak, 1996; Bellipanni & Lilly, 1999; Abernathy & Vineyard 2001; Balas, 2003; Wang & Yang, 2003; Kankelborg, 2005; Gomez, 2007; Robertson, 2007; Yayla & Uzun, 2008).

The national science fair, in which elementary school 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade students participate with their projects in the fields of science and mathematics in Turkey, is known as "This is My Work Science and Mathematics Project Study for Elementary School Students" This is My Work (TMW) Science Fair has been conducted in 7 regions since 2006. In this competition, science and mathematics teachers act as mentors for students. The projects successful in the exhibitions in the

region participate in the final exhibition in Ankara (the capital city of Turkey). Different awards are given to the students participating in the final exhibition (Republic of Turkey Ministry of National Education, Educational *Research and Development* Directorate, 2012).

### **Statement of the Problem**

Science fair organizations and scientific committee recommend that project idea must be just student self-work (Ministry of Education, The Bureau of Research and Development of Education, 2011, The Scientific and Technological Research Council of Turkey, 2011). Some researchers stated that students' projects reflect their parents' work. Parental pressure affects this situation (Grobman, 1993; Shore et.al., 2007). For this reason, science teachers have a critical role. Teacher's attitudes towards science fair allow students to give importance to science fairs and to scientific research projects (Blenis, 2000; Van Eck, 2006). Fisanick (2010) stated that teacher' attitudes towards and views about science fairs are shaped by some factors; teacher motivation regarding their participation in science fair; conducted projects in the curriculum, expectations of administrators for teacher or students in participating science fair and so on. For this reason, ideas of science teachers about national science fairs are important. So, more research should be carried to deal with the difficulties in science fairs and to increase effective participation in science fairs.

### **Purpose of the Study**

This study aimed at investigating science teachers' views about national science fairs at primary school level in Turkey. For this purpose, the following research questions were directed in the study:

1. Which stage is the most difficult for teachers in guiding the project competition process?
2. In what ways do students determine the project idea?
3. What ways do teachers follow in the development of the project ideas?
4. What are parents' perspectives regarding the science fair?
5. What do teachers think about dishonesty at science fairs?

## **Methods**

### **Research Model**

Case study design was selected as the research design. Case study, which is one of the qualitative research methods (Miles & Huberman, 1994; Yıldırım & Şimşek, 2003). The single case was "This is My Work Science and Mathematics Project Study for Elementary School Students" science fair. The single case, which was studied in this research, covered the views about the science teachers at the national science fair, which was called "This is My Work" (Bu Benim Eserim) in Turkey.

### **Participants**

The purposeful sampling method was used to determine the selection of the participants (Miles & Huberman, 1994; Yıldırım & Şimşek, 2003). The objective of purposeful sampling is to select information-rich cases, because it will clarify the research questions. Besides, criterion sampling and snowballing sampling technique was implemented, whereby all cases have to meet some predetermined criterion of importance (Patton, 2002). The criteria for the selection of the seven participants (teachers) were as follows: They had a science fair mentorship experience before, and they previously joined a science fair as mentor in the current academic term in their district. In this respect, seven volunteering science teachers, who took part in the National Science Fair in A city as a mentor in the academic year of 2011-2012, were determined as the participants in this study. The demographic data regarding the participants in the study is presented in Table 1.

Table 1. The Demographic Background of the Science Teachers

	Gender	Age	Faculty or school graduated from	The type of the school they work at
Science Teacher 1	Male	36-40 years	Faculty of Education	Public school
Science Teacher 2	Female	31-35 years	Faculty of Education	Public school
Science Teacher 3	Male	36-40 years	Faculty of Education	Public school
Science Teacher 4	Female	41-45 years	Faculty of Education	Public school
Science Teacher 5	Male	41-45 years	Faculty of Education	Public school
Science Teacher 6	Female	36-40 years	Faculty of Education	Private school
Science Teacher 7	Female	31-35 years	Faculty of Education	Public school

Table 1 demonstrates the profile of the study group. Four of the science teachers were male, and three of them were female. All of them were medium-aged, and all graduated from an education faculty. Six of the science teachers worked at a public school, and one of them worked at a private school.

### Data Collection Instrument

The data in this study were collected via a semi-structured interview. The related literature was reviewed to prepare the interview form (Grote, 1995; Bunderson & Anderson, 1996; Czerniak, 1996; Blenis, 2000; Syer & Shore, 2001; Yayla & Uzun, 2008; Fisanick, 2010). The interviews with the seven participants constituted the main source of the data collected in this study. The in-depth interviews, conducted with participants, reflect on their experiences in the science fair mentorship. Thanks to the semi-structured interview, it became flexible and conversational. This situation allowed the participants to express their views by expanding the subject without being bored (Payne, 1999). This form was also reviewed by three experts in the field of science education. According to this review, the form was revised, and eight open-ended questions were determined. The interview guide used in the study. Period of one interview ranging in length from 20 to 30 minutes was conducted with each of the science teachers.

### Data Analysis

Inductive analysis was used as the strategy for analyzing and interpreting the data in this study. This approach involved examining the data in detail. And the categories or themes constituted while considering relationships among the categories (Glaser & Strauss, 1967; Yıldırım & Şimşek 2003). The one of process of content analysis stage is coding. In coding, the obtained data were examined in detail to identify similar categories and themes. Unifying the data coded and identifying them allowed us to look at the data from different perspectives (Huberman & Miles, 1994; McMillan, 2000). This construction helped us better analyze the data. Obtained themes or categories were searched for any consistency between two or more themes within the data. Afterwards, some generalizations were found at explained consistencies in the data. These generalizations about the participants' science fair mentorship experiences were discussed with literature on teachers' views about science fair.

### Validity of Study

Some precautions were taken to ensure the validity and reliability of the study. While preparing the interview form, the related literature was examined to create a contextual framework in order to increase the internal validity of the research. Member checking was also done. Moreover, the participants were able to express their opinions freely and sincerely. The research process was explained clearly to increase external validity. The design of the research, study group, data collection instrument and process as well as analysis and interpretation of the data were explained in detail. All of the data were written without any interpretation to ensure internal reliability (Miles & Huberman, 1994; Yıldırım & Şimşek, 2003). In addition, another researcher who had experience in qualitative research and science education coded the information obtained from the interviews. This code was compared with that of the researcher, and the consistency was calculated (92%).

### Results and Discussion

The findings of the research obtained from the interviews are as follows; the science teachers' quotations are presented below in the table, which includes content analysis of the interviews.

Table 2. Content Analysis of the Data Obtained from the Interviews

Categories	ST1	ST2	ST3	ST4	ST5	ST6	ST7
<i>Category 1. The most difficult stage of mentorship</i>							
Getting the project idea	+	+	+	+	+	+	
Writing the project report							+
<i>Category 2. Students' ways of getting the project idea</i>							
From the Internet	+				+		
Getting help from parents		+					
Reading science fair guide	+						+
Examining the previous project		+	+	+		+	
<i>Category 3. Teachers' approaches to getting the project idea</i>							
Showing the daily-life problems	+		+				
Examining the previous projects		+		+		+	+
Making students free					+		
<i>Category 4. Development of students skills</i>							
Science literacy skills			+				
Creative thinking skills	+						+
Scientific research skills				+		+	
Scientific process skills	+	+					
Problem solving skills	+						
Drawing picture skills					+		
<i>Category 5. Teachers' self-efficacy in mentorship</i>							
Feeling oneself efficient		+		+		+	
Feeling oneself inefficient	+		+		+		+
<i>Category 6. Parents' perspectives of science fairs</i>							
Positive							
Neutral					+	+	
Negative	+	+	+	+			+
<i>Category 7. Collaboration with related associations</i>							
Yes, I did					+	+	
No, I did not collaborate	+	+	+	+			+
<i>Category 8. Dishonesty at science fairs</i>							
Admitting dishonesty	+		+	+	+	+	+
Rejecting dishonesty		+					

ST: Science Teacher

#### Category 1: The Most Difficult Stage in Mentorship

Six science teachers stated that the stage of getting the project idea at science fair was the most difficult stage of mentorship. One of them reported that the most difficulty stage in mentorship was the writing of project report. Some quotations of the science teachers are as follows:

"Especially, when getting projects idea, trouble gives rise to" [Science Teacher 1]

*"Because of getting intensively exams and courses, students don't ignore scientific project process especially getting project idea stage" [Science Teacher 2]*

*We get trouble in determining project topic, teachers undertake all of issue for preparing project report because of inadequacy of students these skills" [Science Teacher 3]*

*"Students were educated exam based educational system. When they have learned letters, they started solving multiple-choice test, and then we expect to students that getting projects. However, inquisitive students ask question. Because, project starts with question. This related with curiosity. Scientific projects must not get compulsively to unconcern students. We live big problem at getting project ideas stage. If students like getting projects and searching, they spare the time and get project with pleasure" [Science Teacher 4]*

Most of the teachers reported that they experienced difficulty in determining the subject of the project at the science fair. In this respect, the reasons for this difficulty could be exam-based education system and students' inefficiency in these fields.

### **Category 2: Students' Ways of Getting the Project Idea**

Science teachers reported their views about students' ways of getting the project idea as follows: examination of the previous projects (four Science Teachers), reading the project guide (two Science Teachers), searching from the internet (two Science Teachers), and help from parents (one Science Teacher). Some quotations of the science teachers are as follows:

*"They are getting help from parents"[Science Teacher 2]*

*"Students mostly do things which they saw. So, projects are not authentic" [Science Teacher 3]*

*"Students examine other projects"[Science Teacher 6]*

*"Students examine science fair guide"[Science Teacher 7]*

The ways that teachers follow in determining the subject of the project in TMW are presented in this category. Teachers generally agree that students "examine other projects".

### **Category 3: Teachers' Approaches to Getting the Project Idea**

One sub-category regarding the ways the teachers followed in determining the subject of the project was 'I make them free'. Guidance via making them face the daily life problems was reported by two teachers. The teachers had also reported previously that the most difficult stage for them was determining the subject of the project. The findings in this sub-category could, to some extent, explain the reasons for such difficulty.

Some quotations of the science teachers are as follows:

*"I try to find the subject of the project considering the problems experienced in daily life." [Science Teacher 1]*

*"First of all, we make effort to make them love science. I ask them about the problems in their lives. Then I struggle to make them think how to solve these problems" [Science Teacher 3]*

*"... and how to make our lives better. I make students free in determining their projects" [Science Teacher 5]*

#### **Category 4: Development of Students' Skills**

The science teachers' views about the development of students' skills in science fair were as follows: two teachers stated it develops scientific research skills, one teacher state that it develops science literacy level, two teachers stated that it develops creative thinking skills, two teachers stated that it develops scientific process skills, one teacher stated that it develops problem solving skills and one teachers stated that it develops drawing picture skills. Some quotations of the science teachers are as follows:

*"The drawing picture skills of students develop as well. When they draw while presenting the project"*[Science Teacher 5]

*"they develop these skills"*[Science Teacher 7]

All the teachers believed that science fairs developed certain skills of the students.

#### **Category 5: Teachers' Self-Efficacy in Mentorship**

The science teachers reported their views about efficacy in mentorship as follows: feeling oneself efficient (three science teachers), feeling oneself inefficient (four science teachers). Some quotations of the science teachers are as follows:

*"There is not enough time, and we have to take training on project mentorship, and then we can do mentorship"*[Science Teacher 3]

*"I feel myself efficient, and I am experienced in this project mentorship"* [Science Teacher 6]

The fact that the teachers considered themselves to be efficient in project mentorship are an important finding in terms of the quality of this science fair.

#### **Category 6: Parents' Perspectives of Science Fairs**

The science teachers reported their views about the parents' perspectives of science fair as follows: negative perspective (five science teachers), neutral perspective (two science teachers), there is no positive perspective surprisingly. Some quotations of the science teachers are as follows:

*"Parents are indifferent to science fair"*[Science Teacher 2]

*"They (parents of students) have negative views; rather, they want their children to be successful in exams"*[Science Teacher 4]

*"They don't want them to join the competition"*[Science Teacher 4]

All the teachers agreed on the parents' indifference to science fairs. It was also surprising that no teacher reported that the parents were interested in such science fairs.

#### **Category 7: Collaboration with Related Associations/Institutes**

Most of the science teachers (five) stated that there was no collaboration with associations, but two science teachers reported that there was collaboration with associations regarding the project process. Some quotations of the science teachers are as follows:

*"I have not made collaboration, but it have to, and it have been taken a support"* [Science Teacher 3]

*"Of course, project is far-reaching process, if the school is capable, the collaboration is necessity"*[Science Teacher 5]

The fact that most of the teachers reported there was no collaboration with the related institutions and associations could be regarded as a deficiency in the acquisition of scientific research skills.

### **Category 8: Dishonesty at Science Fairs**

Most of the science teachers (six) reported their views in a way to admit dishonesty, but only one teacher stated a counterview. Some quotations of the science teachers are as follows:

*"I absolutely witness the injustice and dishonesty"*[Science Teacher 1]

*"In my opinion, in this science fair, teachers' projects compete rather than those of the students. These projects do not reflect the students' level. Teachers should just do mentorship"*[Science Teacher 4]

*"Parents prepare their children's projects as if they are the parents who compete. If you let students free, you will see how beautiful projects they will prepare. There is competition. This is quite bad. Yes, we witness this. Parents prepare the project, and students just present it. This project work should be redesigned or changed. The competition should not go on in that way."*

All the teachers agree on existence of dishonesty in science fairs. They stated that the bad effects of this situation will be observable on students.

### **Conclusion**

This study investigated science teachers' views about national science fairs in Turkey at primary school level. The science teachers' views about dishonesty in preparing projects (projects made by their parents or teachers) are very important. Similar findings were also obtained by some other researchers (Grobman, 1993; Shore & Delcourt, 1995; Blenis, 2000; Abernathy & Vineyard 2001; Syer & Shore, 2001; Shore et al. 2007). Tortop (2010) stated that whether the Project Based Learning Model was assimilated by students and they present scientific ethical behavior at science fair or not should be investigated.

This study revealed that science teachers' views about their efficacy in mentorship were not enough. But, science teachers or mentors, needed to serve as role models, coaches and vocal supporters of science fair competitions, which are necessary and important (Blenis, 2000; LaBanca, 2008; Van Eck, 2006).

Science teachers mostly stated that parents' views about science fairs were negative. This situation was very important. Science teachers stated about contributions of science fair to students that it allows applying science to daily life, motivates to investigate and increases their knowledge about science. The same findings were also obtained by Czerniak & Lumpe (1996), McDonough, (1996), Abernathy & Vineyard, (2001).

In this study, most of science teachers (6 persons) did not collaborate with institutions or organizations. Tortop (2010), if students were in collaboration with related associations, PBL could be successful. Besides, the field trips should be done with related organizations, institutes or research centers at this process.

Misapplications in science fairs, despite their benefits as an important educational tool, could make these science fairs harmful for students. Considering the findings obtained the necessary arrangements in curricula and in the organization committee of science fairs should be made at once.

## References

- Abernathy, T.V., & Vineyard, R.N. (2001). Academic competitions in science. *Clearing House*, 74(5), 269-277.
- Balas, A.,K., (1998). Science fairs in elementary school, ERIC clearinghouse for science mathematics and environmental education columbos OH., 1-5, (ERIC document reproduction service No. ED 432444)
- Bellipanni, L.J., & Lilly, J.E. (1999). What have researchers been saying about science fairs? *Science and children*, May 99, 46-50.
- Blenis, D.,S., (2000). The effects of mandatory, competitive science fairs on fifth grade students' attitudes toward science and interest in science. *Reports- Research* (143), 26 sf. Retrieved from <http://www.eric.ed.gov/PDFS/ED443718.pdf>
- Bunderson, E.D., & Anderson, T. (1996). Preservice elementary teachers' attitudes toward their past experiences with science fairs. *School science & mathematics*, 96(7), 371-378.
- Czerniak, C.M. (1996). Predictors of success in a district science fair competition: An exploratory study. *School science & mathematics*, 96(1), 21-28.
- Czerniak, C.M., & Lumpe A.T. (1996). Predictors of science fair participation using the theory of planned behavior. *School Science & Mathematics*, 97(7), 335-362.
- Fisanick, L. M. (2010). *A descriptive study of the middle school science teacher behavior for required student participation in science fair competitions*. Doctoral Thesis. Pennsylvania University. Indiana. Umi Number: 3403187
- Grobman, A. (1993). A fair proposition?, *The Science Teacher*, 60, 40-41.
- Grote, M., (1995). Teacher opinions concerning science projects and science fairs. *Ohio journal of science*, 95(4), 274-277.
- Grote, M. (1996). The nature of student science projects in comparison to educational goals for science. *Ohio journal of science*, 96(4/5), 81-88.
- Gomez, K. (2007). Negotiating discourses: sixth-grade students' use of multiple science discourses during a science fair presentation. *Linguistics and education*, 18, 41-64.
- Kankelborg, A., (2005). *Rural science fair competition: levelling the playing field*. Master thesis. Montana University, Montana. UMI: EP31005
- LaBanca, F., (2008). *Impact of problem finding on the quality of authentic open inquiry science research projects*. Doctoral Thesis. Western Connecticut State University. UMI Number: 3411366.
- McDonough, S. G. (1995). How parental support affect students' attitudes towards the science fair. *Reports-research*, 143, 46 pp. ERIC Document Reproduction Service No. ED 390707.
- McMillan, J. H. (2000). *Educational research: Fundamentals for the consumer*, (3rd Ed.). Newyork: Addison Wesley Longman.
- Miles, M.B., & Huberman, A.M. (1994). *Qualitative data analysis*. London: Sage Publication.
- Payne, S. (1999). Interview in qualitative research. In Memon, A. & Bull, R. (Eds.), *Handbook of the psychology of interviewing* (pp. 89-100). Chichester :Wiley.
- Republic of Turkey Ministry of National Education, Board of Education, (2005). TTKB (Talim Terbiye Kurulu Başkanlığı) Fen ve Teknoloji Dersi Programı. Retrieved from, <http://ttkb.meb.gov.tr/program.aspx?tur=ilkogretim>
- Republic of Turkey Ministry of National Education, Educational Research and Development Directorate, (2012). Retrieved from, <http://tegm.meb.gov.tr/bubenimeserim/>

- Shore, B.M., & Delcourt, M.A.B. (1995). Understanding inquiry: Lessons in scientific thinking and fraud from students' participation in science fairs. *Annual Meeting of the National Association for Gifted Children*, Salt Lake City, UT.
- Shore, B. M., Delcourt, M. A. B., Syre, C. A., & Shapiro, M. (2007). The phantom of the science fair. In B. M. Shore, M. W. Aulls, & M. A. B. Delcourt (Eds.), *Inquiry in education, volume II: overcoming barriers to successful implementation*. Mahwah, NJ: Erlbaum.
- Syer, C.A., & Shore, B.M. (2001). Science fairs: What are the sources of help for students and how prevalent is cheating ?, *School Science & Mathematics*, 101(4), 206-221.
- Tortop, H. S. (2010). *The application of project based learning model supported by prepared according to constructivist approach the field trip to the solar energy and its usage areas*. Doctoral Thesis. Suleyman Demirel University. Isparta. Turkey.
- Van Eck, R. (2006). The effect of contextual pedagogical advisement and competition on middle-school students' attitude toward mathematics and mathematics instruction using a computer-based simulation game. *Journal of Computers in Mathematics and Science Teaching*, 25(2), 165-195.
- Wang, X.H., & Yang, B. Z. (2003). Why competition may discourage students from learning? A behavioral economic analysis. *Education Economics*, 11(2), 117-128.
- Yayla, Z., & Uzun, B., (2008). Fen ve teknoloji eğitiminde proje çalışmaları ve bilim şenlikleri. *XVII. Ulusal Eğitim Bilimleri Kongresi*. 1-3 Eylül 2008. Sakarya.
- Yıldırım, A., & Şimşek, H., (2003). *Sosyal bilimlerde nitel araştırma yöntemleri*. Seçkin Yayıncılık. 3. Baskı. Ankara.