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Evaluation of Science Projects in TÜBİTAK 4006 Science Fairs : The Case of Kayseri Province

TÜBİTAK 4006 Bilim Fuarlarındaki Fen Bilimleri Projelerinin Değerlendirilmesi: Kayseri İli Örneği[*]

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Abstract

In the research, it is aimed to evaluate the 4006 Science fairs of the Scientific and Technological Research Council of Turkey (TÜBİTAK) in the light of the opinions of observers, and provincial representatives. The phenomenology designof the qualitative research method was used. The research was conducted with twoobservers, and a provincial representative. Data were collected with semi-structured interview forms prepared by the researcher. Content analysis was used in the analysis of the data. Direct quotations from the participants were included in the findings. While it was determined that the participants were satisfied with the

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science fairs, it was concluded that the science fairs contributed to the problem-solving skills of the students, increased their self-confidence, attitudes, and academic success, the project subjects were determined according to the students' wishes and interests, and the exhibited projects were quality projects. In addition, suggestions were made to carry out studies to increase the number of visitors and to add a "project training" course to the curriculum.

Keywords: Science fair, science education, TÜBİTAK 4006

Öz

Araştırmada, izleyicilerin ve il temsilcisinin görüşleri ışığında Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) 4006 Bilim fuarlarının değerlendirilmesi amaçlanmıştır. Nitel araştırma yönteminin fenomenoloji deseni kullanılmıştır. Araştırma iki izleyici ve bir il temsilcisi ile yürütülmüştür. Veriler araştırmacı tarafından hazırlanan yarı yapılandırılmış görüşme formlarıyla toplanmıştır. Verilerin analizinde içerik analizi kullanılmıştır. Bulgularda katılımcıların doğrudan alıntılarına yer verilmiştir. Katılımcıların bilim fuarlarından memnun kaldıkları tespit edilirken bilim fuarlarının öğrencilerin problem çözme becerilerine katkı sağladığı, özgüvenlerini, tutumlarını ve akademik başarılarını artırdığı, proje konularının öğrenci istek ve ilgilerine göre belirlendiği, sergilenen projelerin kaliteli projeler olduğu sonuçlarına ulaşılmıştır. Ayrıca ziyaretçi sayısının artmasına yönelik çalışmaların yapılması, müfredata "proje eğitimi" dersi eklenmesi hususunda önerilere yer verilmiştir.

Anahtar Kelimeler: *Bilim fuarı, fen bilimleri eğitimi, TÜBİTAK 4006*

Introduction

A constructivist approach is student-centered. In this approach, the student needs to be active in the classroom environment, to learn the content by doing, to discover information, to realize learning based on discussion and research. The teacher, on the other hand, is in the position of a guide for the student to reach the information in this process. In this context, the Ministry of National Education (MoNE) made changes in primary education programs since 2004 (Balcı, 2007). One of the courses affected by this change is the science course.

Several adjustments and additions were made in the science program, which was updated in 2018, to support the constructivist approach, to involve students in the process, and to produce a product. Some of these additions are science process skills (SPS), engineering, and design applications. For students, they need to research and therefore they need to comprehend scientific process skills (SPS) and learn how science develops to understanding the world. In addition to science, the development of students in the field of technology and producing innovative ideas are among the aims of the program. To develop scientifically and technologically, enables countries to increase their socioeconomic levels, develop and gain strength in the global competitive environment (MoNE, 2018). For this reason, the basics of science and technology are taught in science courses. A versatile perspective towards science and technology can be created with good science education (İşman et al., 2002). Science enables individuals to obtain regular information about both themselves and their natural environment, and to constantly develop and renew this information (Morgil, 1990).

In recent years, many projects have been supported by both national and international institutions for education in Turkey. Educational institutions also apply to these support programs and, if accepted, they implement their projects by providing the necessary budgetary support. Institutions such as MoNE, European Union Education, and Youth Programs Center Presidency, Non-Governmental Organizations, embassies, and the Scientific and Technological Research Council of Turkey [TÜBİTAK] provide support to projects in the field of education (Akay, 2013). TÜBİTAK, one of the institutions supporting projects in the field of education, carries out many activities to raise awareness in terms of scientific, technological, and innovations and to increase the rate of scientific literacy. In addition to all these, it has been publishing magazines and books, organizing competitions, festivals, and fairs since its establishment (Akay, 2013). Considering the national and international developments, one of the TÜBİTAK events that will meet many expectations such as the student's access to information, gaining new information based on the information obtained, and presenting this information is science fairs (Karadeniz and Ata, 2013; Oğuz Ünver, Arabacıoğlu and Okulu, 2015). Science fairs are very important among scientific events and organizations (TÜBİTAK, 2015a). TÜBİTAK 4006 Science Fairs Support Program was carried out for the first time in the period of 2015-2016, following the agreement signed on 08/09/2015 in cooperation with the Ministry of National Education and TÜBİTAK to develop the science culture in students at various levels of the schools affiliated to the Ministry of National Education. TÜBİTAK Science Fairs are project activities in which students prepare the project topic chosen by their interests in line with scientific research processes. Students will develop skills related to critical thinking, good use of time, problem-solving, and presentation during the planning, preparation, and realization stages of the projects they will present, and they will not only learn to be patient and self-confident but also gain leadership skills (TÜBİTAK, 2015b). With TÜBİTAK Science Fairs, students can learn more about the subjects that they have determined and that fall within their fields of interest. Students develop scientific thinking and problem-solving skills while researching their projects. In an experimental project, he/she can interpret the findings and results obtained and express them with presentations. In addition, both himself and his friends gain a critical perspective while interpreting the experimental results in the project. Understands the importance of using mathematics by making use of tables and graphs while analyzing the data obtained in the research. In the presentation phase of the project, by gaining communication skills, the skills of understanding and explaining a scientific subject are also developed (TÜBİTAK, 2015b).

Importance and Purpose of the Research

As a result of the literature review on scientific project activities, it is possible to come across studies conducted abroad in this field (Bencze and Bowen, 2009; Bunderson and Anderson, 1996; Dionne et al., 2012; Durant, 2013; Fisanick, 2010; Gomez, 2007). Bencze and Bowen, in their study in 2009, concluded that students participate in science fairs because they provide convenience in finding a job and

university entrance, that students see this process as a long and challenging process, and that there are negative aspects such as participating in these programs to win awards. Bunderson and Anderson (1996) stated that teachers generally find science festivals beneficial for students, develop students' creativity, provide students with the opportunity to conduct independent research, and increase their interest in science. Dionne et al. (2012) examined the motivation of students to participate in science fairs in their research and as a result, they reached the server that there are five different motivation sources. These are : Interest, sense of self-efficacy, assurance of success with awards or congratulations, socialization, and gaining scientific knowledge and methods. Durant, in his study in 2013, stated that science has developed and spread rapidly, and it has become easier for the public to be aware of these developments. She emphasized that science fairs, fairs, and festivals have an important place in this regard. He stated that this would contribute greatly to the development of the country. Fisanick, in his study in 2010, investigated the attitudes of secondary school science teachers, whether different methods were preferred at science fairs and the demographic information of these teachers. As a result of the research, it was concluded that the teachers wanted the students to develop scientific projects, but they did not want them to participate in the project competitions. Gomez (2007) researched the use of scientific words during science fair presentations of sixth-grade students. In his research, he concluded that students' conversations about science in daily life can be used as a useful tool in teaching basic scientific concepts.

As a result of the literature review on scientific project activities in Turkey, studies have been found and it is seen that these studies have a close past (Akay, 2013; Keçeci, Kırbağ Zengin, and Alan, 2017; Şahin, 2012; Tezcan and Gülperçin, 2008; Yavuz, Büyükekşi and Işık Büyükekşi, 2014; Yıldırım, 2018; Yıldırım and Şensoy, 2016). When the literature is examined, it can be said that the limited number of scientific research projects in Turkey has increased over time. TÜBİTAK 4006 Science Fair can be counted among the important scientific research projects realized at the national level, in which students exhibit their projects under the guidance of teachers. In the literature review, studies on the TÜBİTAK 4006 Science Fair were found (Balcı, 2019; Kahraman, 2019; Soyuçok, 2018). Balcı (2019) evaluated TÜBİTAK 4006 science fairs within the scope of Polatlı in his study. In this study, he took the opinions of teachers and students participating in TÜBİTAK 4006 science fairs about science fairs. Kahraman (2019) examined the effect of TÜBİTAK 4006 Science Fairs on the image of scientists as students. In his research, Soyuçok (2018) took the opinions of students, science teachers, and school principals about the science projects in TÜBİTAK 4006 Science Fairs. It is also known from research that students have problems with making projects, teachers having projects and presentations (Aydın and Çepni, 2011; Aydın, Bacanak and Çepni, 2013; Tortop, 2013; Özel and Akyol, 2016). According to Fisanick, the main factor in ensuring students' participation in science festivals is teachers (Fisanick, 2010).

Participation in TÜBİTAK 4006 Science Fair projects is very important in terms of examining the quantity and quality of students' scientific research culture in Turkey. As a result of the literature review, no studies were found for the provincial representative andobserver. Considering the importance of science fairs, it is thought that it is important to get the opinions of the observers and provincial representatives to investigate the fair process in all aspects and to examine the achievement of the science fairs' goals.

The current research, it was also necessary to take the opinions of the observer who examine and report whether the science fairs are carried out in line with the determined goals and objectives and whether the expenditures and invoicing are done correctly. In this way, it is aimed to reveal whether the TÜBİTAK 4006 Science Fairs have achieved their purpose within the scope of the call, with the views of theobserver. Opinions of the TÜBİTAK provincial representative were also taken in the research. The purpose of taking the opinions of the provincial representative is to guide the students and teachers who will make the project by determining what attention is paid to the projects and which issues are emphasized.

This research, it is aimed to examine the approaches to the process, the expected gains from the students, the problems encountered, the causes of these problems, and the solutions to the problems in the light of the views of observers, and the provincial representative in the TÜBİTAK 4006 Science Fair. In addition, since there is no study on the observerand provincial representatives in the literature, it is aimed to contribute to the literature in this respect. For this purpose, the problem sentence of the research is "What are the opinionsof the observers and the provincial representative about the Science projects in TÜBİTAK 4006 science fairs ?" is in the form.

Sub Problems :

- What are the opinions of the observers about Science projects in TÜBİTAK 4006 science fairs ?
- What is the opinion of the provincial representative about Science projects in TÜBİTAK 4006 science fairs ?

Method

Research Design

In this study, in which the qualitative research method was used, the phenomenology design was used. Phenomenology is a design in which how an individual makes sense of a certain phenomenon and his perceptions and experiences about the phenomenon are investigated (Fraenkel and Wallen, 2009). The reason for choosing this design is to try to understand how the observer and the provincial representative in the study group interpret the science fair from their perspectives. The pattern that will meet this stated situation is the phenomenology design. Because the

participants should consist of individuals who have experiences with the determined phenomenon (Creswell, 2016).

Study Group

The research group consists of two TÜBİTAKobservers and a TÜBİTAK provincial representative who took part in science fairs in the province of Kayseri in, 2019-2020 academic year. A purposive sampling design was used to determine the research group. Purposive sampling is a non-random sampling design that enables in-depth research in terms of information (Büyüköztürk et al., 2016). In this study, criterion sampling, one of the purposive sampling types, was used. Criterion sampling is the desire to research certain people, events, objects, and situations (Büyüköztürk et al., 2016). The reason for choosing the criterion sampling type within the scope of this research is that the research will be conducted with people who participated in the science fair.

Data Collection Tools

In this study, the interview was used as a data collection tool. An interview is a verbal communication process conducted by at least two people. Interviews are conducted to determine the experiences and meanings of individuals towards the phenomena (Büyüköztürk et al., 2016). In this research, it was tried to reveal the experiences of the observer and provincial representatives about the science fair by interviewing. A semi-structured interview, one of the interview types, was used in the research.

Semi-structured interview forms consisting of separate questions for observers and the provincial representative were prepared by the researcher by scanning the necessary literature (Karadeniz and Ata, 2013 ; Küfrevioğlu, Baydaş and Göktaş, 2011 ; Oğuz Ünver et al., 2015 ; Özel and Akyol, 2016 ; Soyuçok, 2018 ; Tortop, 2013). For the interview forms prepared as a draft, the interview forms were finalized by taking the face-to-face opinions of an expert science educator and a Turkish teacher.

Data Collection

To determine the time of the interviews, interviews were held with the participants who agreed to participate in the research by making an appointment in advance. Before asking the questions in the interview, the participants were informed about the research and interviews. In this regard, the participants were informed about the purpose of the research, the interview process, and the estimated duration of the interview, and that the names and identity of the participants would be kept strictly confidential, and permission was obtained for audio recording to use the time better and to keep a more detailed record of the answers given during the interviews. The questions in the interview form were asked only by stretching or changing their places when necessary, depending on the answers given by the participants and whether they

understood the question. The recordings were backed up on the computer using a voice recorder for the interviews.

Analysis of Data

The interviews, which were semi-structured and recorded on the tape recorder, were transcribed without delay. Content analysis, one of the qualitative data analyses, was used in the analysis of the texts obtained from the interviews. Content analysis is a systematic technique based on certain coding rules, in which certain words in a text are summarized as smaller categories (Büyüköztürk et al., 2016). The content analysis defines the data and aims to extract in-depth information that may be hidden in the data. In this context, with content analysis, similar data are collected under certain themes and categories, so that they are arranged in a way that the reader can understand (Yıldırım and Şimşek, 2016). In the present study, it is aimed to analyze the answers given by the participants to the interview questions in depth. To achieve this aim, the data obtained were analyzed in three stages.

Coding the data : The coding of the data, which constitutes the first step of content analysis, is defined as the division of the data obtained into sections and the conceptual naming of these sections (Yıldırım and Şimşek, 2016). In the current study, the texts obtained from the interviews were examined and codes were created by the researcher. In addition, the data obtained from the observer, and provincial representatives participating in the research were coded by the researcher and two field experts. Then, based on the codes, categories and themes were determined. Compatibility percentages of the codes were calculated using Miles and Huberman's compatibility test (Reliability= [Agreement/ (Agreement + Disagreement)] x 100) (Miles and Huberman, 2015). The rate of agreement between coders was 91% for the observers and 89% for the provincial representative.

Finding themes : After coding the data, it is necessary to determine the themes by categorizing these codes into titles that can explain them in general. To determine the themes, the codes are brought together and the codes that are related to each other are categorized by determining their common points or differences. The themes obtained in this way express more general phenomena (Yıldırım and Şimşek, 2016). After the codes were created, categories were determined. Categories are grouped under a certain theme.

Arrangement of codes and themes : The codes and themes determined at this stage are explained in a way that the reader can understand. The data under the same code and theme are explained and the relationship of these data with each other is presented to the reader.

Validity and Reliability of Data Analysis

Validity

When the studies conducted in qualitative research are examined, it is seen that there are many approaches to validity. As a result of the examinations, it was determined that the approaches and ideas were gathered under headings and turned into methods or strategies. Although there are many strategies for organizing, analyzing, and presenting data, these strategies can be grouped under eight headings. These eight strategies are: They can be listed as long-term participation, data trilogy, peer review, negative situation analysis, disclosure of researcher biases, member control, rich descriptions, and external audits without any order of importance. Long-term participation is spending a long time with the participants in the study environment. Data trilogy is when the researcher creates supporting evidence using different sources. Peer review is the inclusion of a peer-evaluator other than the researcher in the research. Adverse situation analysis is the discussion of data that can create an opposite situation when viewed from different perspectives. Explaining the researcher's biases is the interpretation of how the researcher's past experiences will affect the research. Member control is the final report, special descriptions or the determined themes are given back to the participants for confirmation. Rich descriptions are detailed descriptions of the environment and data in a way that the reader can understand. External audits, on the other hand, are the examination and evaluation of research by individuals independent of the research. Qualitative researchers recommend considering at least two of these eight strategies in any qualitative study (Creswell, 2016). Member control, external audits, and rich description strategies were used in the current research.

Reliability

According to Creswell (2016), if the interviews are recorded with a quality voice recorder and these recordings are written down, the reliability of the research is increased. In addition, Yıldırım and Şimşek (2016) defined the concept of reliability as the fact that cases measured at different times give similar results, and cases measured at the same time by different people reach similar results. The reliability studies conducted in the current research are as follows : Audio recordings, the consensus among encoders, clarity, and clarity.

Findings

In this section, the codes and categories obtained as a result of the interview questions directed to the participant, TÜBİTAK observer and TÜBİTAK provincial representative are presented in detail. Tables related to the findings are listed according to the category titles. While the tables regarding the categories were being prepared, the codes determined for the participant were shown with an “X” sign, while the codes for the participant who had no opinion were left blank.

Findings Regarding Observers Opinions

Findings Regarding the Monitoring Criteria Category

"How do you determine your viewing criteria for the science fair ?" to the observers participating in the TÜBİTAK 4006 Science Fair, the question was asked. According to the statements of P11 and P12, TÜBİTAK 4006 Science Fairs monitoring criteria are determined by TÜBİTAK, and the observer examines the schools where the science fair will be held according to these criteria. The statements of P11 on this subject are "Monitoring criteria are determined by TÜBİTAK, these criteria are then when we go to examine the schools for 4006, we conduct examinations there in line with these criteria and we prepare a report in line with these examinations and send it to TÜBİTAK."

Findings Regarding the Monitoring Process Category

"Which steps do you follow in the project monitoring process at the science fair ?" to the observer participating in the TÜBİTAK 4006 Science Fair. Please explain." question was asked. Table 1 was created in line with the answers given by the observer.

Table 1. *The answers concerning the monitoring process*

Codes	**Participant**	
	P11	P12
Observing the fair environment	X	
Executive interview	X	X
Student interview	X	X
School administrator interview	X	X
Project review	X	X
Getting information about the process	X	X
Determine student contribution	X	

When Table 1 is examined, it is seen that the observer met with people from different segments to get information about the science fair environment and the preparation processes for the science fair. P11's statement on this subject was, " I'm checking to see if there's an air of science at school. …I receive a briefing from the coordinator. Then we tour the science fair together. While visiting these projects, I ask the students questions. After the projects, I get information about the process from our school principal. After that we leave the fair."

Findings Regarding the Difficulties Experienced Category

To the observer participating in the TÜBİTAK 4006 Science Fair, "Did you have any difficulties while conducting the science fair monitoring activities ? If yes, what are they ?" question was asked. Table 2 was created according to the answers given by the observer.

Table 2. *Answers related to difficultie*

Codes		**Participant**	
		P11	P12
Time	Yes		X
	No	X	
Individual	Yes		
	No	X	X
Financially	Yes		
	No	X	X
Students	Yes		
	No	X	X
Teacher	Yes		
	No	X	X
School management	Yes		
	No	X	X

When Table 2 is examined, it is seen that according to the statements of P11, they did not encounter any difficulties in the process of examining the science fairs, and according to the statements of P12, they only had difficulties in terms of requiring extra time to conduct studies in schools located in distant regions. The statement of P12 on this subject is " We did not experience any difficulties. Since we do the planning together, there is no problem because we also meet with the school. …It may be a timing issue, sometimes we need to do both, or we have to do one every day."

Findings Regarding the Category of Increasing Efficiency and Efficiency

To the audience participating in the TÜBİTAK 4006 Science Fair, "What do you think can be done to make science fairs effective and efficient? Please explain." question was asked. In order to make science fairs effective and efficient, the audience suggested that student participation should be increased even more by going student-centered during the project preparation process. In addition, it has been suggested that the application process should be extended in order for schools to apply more easily due to the fact that some procedures are prolonged during the application process to the science fair. P11's statement on this subject is *"…I can say that the participation should increase, but certainly not less, but it should reach more people by making more advertisements. Also, as we see in the projects, there should be more student participation."* is in the form. p12's statement is *"not in the sense of examining science fairs in order to make them effective and efficient, but it would be useful to keep the TÜBİTAK studies a little longer beforehand."* is in the form.

Findings Regarding the Objectives Category

To the observer participating in the TÜBİTAK 4006 Science Fair, "Do you think the science fairs achieve their purpose ? If so, how can it be reached ?"question was asked. From the observer participating in the research, P11 stated that the science fairs achieved their purpose, and P12 stated that they achieved their goal if student-centered projects were produced. Information on the purposes of science fairs according to the observer is given in Table 3.

Table 3. *Answers regarding the objectives*

Codes	Participant	
	P11	P12
Ability to express	X	X
Cooperation	X	X
Scientific study skills		X
Creating a new product		X
Different perspective on science	X	X

When Table 3 is examined, it is seen that it is stated that science fairs have goals such as expressing themselves, working in collaboration, scientific work, creating a new product, and gaining different perspectives on science, and that science fairs reach their goals in these respects. P11's statement on this subject said, " I can say that science fairs definitely achieve their purpose because when we go there is a science atmosphere… the students are in such a flurry of excitement. Project teachers at the beginning. Our student has a good command of the subject and then they can explain the project very well, where their communication skills are very good."

Findings Regarding the Satisfaction Category

To the observer participating in the TÜBİTAK 4006 Science Fair, "Are you satisfied with the science fairs ? Why ?" question was asked. It was seen that the observer participating in the research was satisfied with the answers they gave from the science fairs. Table 4 was created in line with the answers given by the observer.

Table 4. *Answer regarding satisfaction*

Codes	Participant	
	P11	P12
Scientific research curiosity	X	
Effort	X	
Not encountering a problem		X
Reaching your goal		X

When Table 4 is examined, it is seen that the observer stated that science fairs increased their interest in scientific research, encouraged them to make an effort, that they did not encounter any problems during the fair process, and that they were satisfied with the reason that science fairs reached their goals. Expressions of P11 on this subject … both the students' interest in this scientific research, their attitude, the teachers' efforts in these projects, and the efforts and support of the school administrator, or rather the administrator and administration, make us very happy in the progress of science. Therefore, I can say that I am satisfied." is in the form.

Findings Regarding Project Quality Category

To the observer participating in the TÜBİTAK 4006 Science Fair, "How do you think the quality of the science projects exhibited in science fairs is ?" question was asked. Table 5 was created in line with the answers given by the observer.

Table 5. *Projects related to the quality of answers*

Codes	**Participant**	
	P11	P12
Curriculum related	X	X
Suitable for student level	X	X
Materials are easy to obtain	X	
The supply of materials is variable		X

When Table 5 is examined, it is seen that the observer generally finds the projects exhibited in science fairs to be of good quality, they are suitable for the level of the student and the curriculum, according to P11, the supply of materials is also of high quality, and according to P12, the difficulty of obtaining materials may vary depending on the originality of the project. P11's statements on this subject said, "First of all, I can say that it is suitable for the level of the student, maybe it is quality, isn't it? It was made in a way that the students can understand or in a way that the guest of the outside participant can understand, so when we say quality, some projects had good material quality, yes, some projects were worn out due to being used and tried, it is necessarily happening in that process, but in general, I can say quality projects. If it is suitable for the curriculum, if the student has experienced those processes, I can say that it is of good quality." is in the form.

Findings Regarding Contribution to Science Education Category

"What are your thoughts on the contributions of science fairs to science education ?" to the observer participating in the TÜBİTAK 4006 Science Fair. The question was asked. Table 6 was created in line with the answers given by the observer.

Table 6. *Responses regarding their contributions to science education*

Codes	**Participant**	
	P11	P12
SPS development	X	
Active participation	X	
Creativity	X	
Academic success	X	
Problem solving skill	X	

Attitude	X	X
Cooperation	X	X
Ability to express	X	X
Entrepreneurship	X	

When Table 6 is examined, it is seen that the observer states that they contribute to improving their SPS, ensuring active participation of the students, gaining creativity, increasing academic success, problem-solving skills, attitude, gaining the ability to work in cooperation, and the ability to express themselves. P12's statements on this subject are : "It has a positive effect on students to have a positive attitude towards science, in terms of doing very good scientific studies, I think they also gain many skills such as collaborative work, self-expression, preparing presentations, in this sense, I think it contributes to science education. ..."

Findings Regarding Provincial Representative Opinions

Findings Regarding the Project Topics Category

To the provincial representative who took part in the TÜBİTAK 4006 Science Fair, "How do you determine the project topics accepted for the science fair?" question was asked. According to the answer given by the provincial representative, it is seen that the project topics are determined according to the thematic areas in the TÜBİTAK 4006 call text, and the sub-topics are determined by the participants. Regarding the themes in the call text, the participants identify the sub-problems and offer solutions and determine the project topics in this direction. The statement of P13 on this subject is "... When the call text of 4006 is published, it is specified in thematic areas. According to the thematic areas specified in the call text, people can propose solutions to the problems they have determined themselves. Call texts and thematic areas are specified. In other words, for this, applications can be made in thematic areas, let's say, a project can be prepared in its sub-field related to clean energy, clean energy, it is determined accordingly, the evaluation of project proposals in this business is read by a few evaluators, and if it conforms to the rules there, it is approved."

Findings Regarding the Evaluation Criteria Category

To the provincial representative who took part in the TÜBİTAK 4006 Science Fair, "What did you pay attention to when evaluating the science fairs? Please explain." question was asked. According to the response of the provincial representative, it is seen that the criteria for the evaluation of the projects are included in the TÜBİTAK 4006 call text and the projects are evaluated according to these criteria. Examples of the evaluation criteria included in the P13 call text are "Security measures to be taken in projects, obtaining necessary permits, originality of the project." stated that such

criteria are included. He stated that the evaluators score the projects based on these criteria.

Findings Regarding the Evaluation Process Category

"Which steps do you follow in the project evaluation process at the science fair? Please explain." question was asked. The statement of P13 on this subject is "There will be a teacher working in that school where one will be registered to ARBIS… like this. They complete the application by fulfilling the necessary conditions there. They make the e-signature, for example, they present the project, they work with the students there in the form of an application to TÜBİTAK in a certain format. The stages of the project processes are experienced and implemented by the students, the projects are presented and TÜBİTAK puts those projects into a pool. It is sent to an ignorant top evaluator who is unaware of each other. …The projects determined by TÜBİTAK are scored separately, that is, how appropriate each project is, for example, a score is formed. TÜBİTAK makes that score in its own internal system, okay, it can be applied, then the process begins, the process of science fairs." is in the form.

Findings Regarding the Challenges Category

To the provincial representative who took part in the TÜBİTAK 4006 Science Fair, "Did you have any difficulties while carrying out the preparation works for the science fair? If yes, what are they?" question was asked. According to the answer given by the provincial representative, he does not encounter any difficulties during the evaluation phase. It was seen that he stated that the evaluation process was efficient and the time was sufficient, that the proposed projects were at the student level, that the projects that were not suitable for the student's level were also taken into consideration, but they did not pose a problem. The statement of P13 on this subject is "There is no difficulty in the evaluation phase. It has a certain process. The time is also sufficient. More than enough time is given by TÜBİTAK. Processes are followed and implemented. In other words, the main purpose here is not now, we do not expect our students to split the atom. In other words, a groundbreaking invention will not come at the secondary school level, and it probably will not come here. For example, on the upper floors that are not applicable, thoughts and projects may emerge. It is appreciated." is in the form.

Findings Regarding the Category of Increasing Efficiency and Efficiency

To the provincial representative who took part in the TÜBİTAK 4006 Science Fair, "What do you think can be done to make science fairs effective and efficient? Please explain" was asked. According to the answer given by the provincial representative, it is seen that to make science fairs more effective and efficient, the project topics should be determined not according to the themes determined by TÜBİTAK, but according to the problems to be determined by TÜBİTAK. In other words, it has been seen that determining the project subjects on a problem-based basis, determining the

problem situations instead of the thematic areas, and determining the projects in a way that will produce solutions to these problems can be more effective. P13's statement on this subject is "It is possible to go on a problem-based basis, that is, the student is given thematic areas, but the students are asked to confirm the problems. We have agricultural and livestock technologies thematic areas. Students choose the subject of these, but for example, the problems encountered in the project are published, there is a problem, so it can be said what to do. In addition to the thematic areas, additional problems are given to be solved. In other words, it can be published in the call text, it can be published on page 4006 of TÜBİTAK, it can be published in any medium, that is, the main problems encountered in the field of agriculture and animal husbandry…".

Findings Regarding the Objectives Category

To the provincial representative who took part in the TÜBİTAK 4006 Science Fair, "Do you think the science fairs achieve their purpose? If so, how can it be reached? the question was asked. According to the response of the provincial representative, science fairs reach their goal. P13's statement on this subject is "I think it reaches a great extent." It is in the form. According to P13, the purpose of science fairs is to provide students with different perspectives, to increase their self-confidence, to enable them to socialize, to increase their scientific process skills, to teach them to work in cooperation, and to gain responsibility. The statements of P13 on this subject are "Students become the center of attention. …It's about participating in the science fair, being responsible there, introducing a certain work to people, making a presentation... In other words, it adds self-confidence, socializes, takes part in the scientific process, experiences the project processes. ".

Findings Regarding the Satisfaction Category

To the provincial representative who took part in the TÜBİTAK 4006 Science Fair, "Do you think the teachers are satisfied with the science fairs? Why?", "Do you think students are satisfied with science fairs? Why?" and "Are you satisfied with science fairs?" P13 stated that the teachers and students were satisfied with the science fairs, and he stated that his level of satisfaction was normal. P13's statement on teacher and student satisfaction: "When we visit many places, the teachers express how happy they are when people come and visit the fair, how much effort the children put in, their satisfaction. It's just that fairs need to be visited, people have to come and listen to the students actively, and enable them to present actively with their students." While the level of satisfaction from his point of view is in the form of "well, sometimes very nice original things come, sometimes not very original things come. But considering the age group that is normal. We do not expect anything groundbreaking…"

Findings Regarding Project Quality Category

To the provincial representative who took part in the TÜBİTAK 4006 Science Fair, "How do you think the quality of the science projects exhibited in science fairs is?" was asked. According to the response of the provincial representative, the projects exhibited in science fairs are suitable for the level of students, related to the curriculum, and are of high quality in terms of material supply, but it is seen that they can be improved in terms of the originality of the projects and the active participation of the students in the process. The statements of P13 on this subject are "Middle school students have difficulty in finding their project idea. …The main problem is the originality of the project. Correct identification of problem areas. Non-original projects are the most important problem, they need to be increased, I do not make such definite judgments. It should be further improved. Work can be done on this subject. Students need to work more on the project processes, that is, more on the processes than the students. In other words, I personally think that the student should be more active. Incoming projects are completely related to the curriculum. In this respect, it is also suitable for the level of the student. A budget is given in terms of materials, of course, materials can be obtained. …So there is no problem with the supply." is in the form.

Findings Regarding Contribution to Science Education Category

"What are your thoughts on the contribution of science fairs to science education?" to the provincial representative who took part in the TÜBİTAK 4006 Science Fair. The question was asked. According to the answer given by the provincial representative, the contribution of science fairs to science education is to put the knowledge into practice and to adapt it to daily life. The statement of P13 on this subject is "Absolutely effective, it contributes. He can also apply the theoretical knowledge he learned there in practice. He can bring his own ideas to life. What he sees in the curriculum, he can see my response in real life."

Conclusion-Discussion and Recommendations

Conclusion and Discussion

In this section, the conclusions reached and their discussion within each other and about the literature is given. Then, based on the current research and suggestions for future studies are presented.

In the research, It was concluded that the observer made their examinations according to the monitoring criteria in the TÜBİTAK call text. It was concluded that the provincial representative evaluated the project issues according to the thematic areas in the TÜBİTAK call text. It is seen that the views of the observer and the provincial representative are also consistent. It is also seen that these results are consistent with similar studies in the literature. In the study conducted by Benzer and Evrensel (2019) on TÜBİTAK 4006, it was concluded that the students usually discussed with their groupmates and teachers while determining the project topics, and they also determined the topics by researching the internet and written sources.

Balcı (2019) also concluded that students benefit from various sources and their prior knowledge of science is also effective in determining the subject. In the study conducted by Ural Keleş and Soyuçok (2020), it was concluded that the teacher guides in determining the project topics, and the students generally get help from their teachers while determining the project topic. In addition, Eymirlioğlu (2019) concluded that teachers' suggestions are prioritized in determining the project topics for science fairs, but the final decision is made as a result of discussions with students, but teacher opinions are the determining factor in the selection of topics. Eymirlioğlu (2019) concluded in his study that teachers pay attention to the fact that they are interesting while determining the project topics. Although this situation was interpreted as the fact that the students could not fully participate actively in the process of determining the project topic, it was stated that the students participated actively at this stage, as they made a literature review to determine the project topic. Bulut and Caner (2018) concluded that the students' determination of the project topics according to their own wishes increases the students' desire to participate in science festivals.

In the research, it was concluded that the observer first observed the fair environment, met with the executive teacher, then visited the fair area, examined the projects and interviewed the students, and received information about the students' project preparation process and determining the students' contribution in this process.

In the research, It was concluded that the provincial representative evaluated the projects according to the criteria in the TÜBİTAK 4006 call text. After the evaluation process, after the teachers registered to ARBIS and submitted the applications to TÜBİTAK, it was concluded that these projects were collected in a pool, evaluated, and scored by independent evaluators, and it was decided whether the projects were applicable or not. When the literature is examined, it is seen that the studies on the project preparation process are limited. Sontay, Anar and Karamustafaoğlu, (2019) concluded that during the project preparation process, they learned science subjects, did a literature review for the project, obtained the materials, and received help from parents and friends in this process.

In the research, according to the questions posed to the observer and the provincial representative in the study; it was concluded that they did not encounter difficulties in terms of individual, financial, time, student, teacher, and school management. When the literature is examined, according to Atalmış et al. (2018), it is seen that there are difficulties in terms of teachers such as the fact that the head teacher and school administrators do not have enough information about the process, the material purchases are delayed as a result of the late payment of the allowance, the delay in informing about whether the support is received, and the inability to account for the expenditures. In terms of students, there are problems such as the school administrators not providing the appropriate place for the students during the project preparation process, the lack of necessary friend support, some students having to do the project alone, and the low participation rate due to the projects being in the exam

period. On the other hand, Benzer and Evrensel (2019) concluded that there were difficulties in determining the subject at the most, as well as in determining and procuring the necessary materials and in the project process. Eymirlioğlu (2019) concluded that there were difficulties in the time and implementation phase. In his research, Okuyucu (2019) concluded that difficulties were experienced due to the lack of equipment, spatial difficulties, the school administration's lack of attention, the student's exam anxiety, the teacher's course intensity, and lack of experience. Sontay et al. concluded that the students experienced difficulties due to the inability of students to complete the project, the lack of materials, and the anxiety of the students not being able to realize the project. Dede (2019), on the other hand, concluded that the financial support provided is insufficient or partially insufficient, therefore, teachers have limited material to realize projects with affordable budgets, and even they cannot realize some projects due to insufficient financial support. He stated that this is an obstacle for teachers to put forward original projects.

In the research, according to the observer, it was concluded that it would be more effective and efficient to carry out studies to increase participation in science fairs and to extend the application process. According to the provincial representative, it was concluded that the students had the most problems in finding the project topic. For this reason, it has been concluded that instead of thematic areas in the TÜBİTAK 4006 call text, it will be more effective and efficient to give problem areas, that is, many problem situations, and to ask students to prepare projects for the solution of these problem situations in determining the project topics. When the literature is examined, it is seen that there are generally suggestions to increase financial support in order to make science fairs more effective and efficient (Avcı and Su Özenir, 2018; Benzer and Evrensel, 2019; Kural and Nakiboğlu, 2020). In addition, it has been observed that there are suggestions for the application process. In this regard, some studies suggest that the application process should be extended (Avcı and Su Özenir, 2018), and some studies suggest that the student should also take an active role in the application process (Kural and Nakiboğlu, 2020).

According to the observer, it was concluded that the students achieved their goals in terms of gaining the ability to express themselves, to gain the ability to work in cooperation, to gain scientific work skills, to gain the ability to create a new product and to gain a different perspective towards science. According to the provincial representative, it has been concluded that it has achieved its purpose in terms of providing students with different perspectives, increasing their self-confidence, ensuring their socialization, increasing their scientific process skills, teaching them to work in cooperation, and gaining responsibility. When the literature is examined, it is seen that there are studies that show that science fairs reach their goals. (Çolakoğlu, 2018; Soyuçok, 2018).

In the study, it was concluded that observers, and provincial representatives were generally satisfied with the science fairs. It has been concluded that the important point here is the realization of student-centered projects according to student interest

and desire. These results are consistent with similar studies in the literature. While Eymirlioğlu (2019) concluded that students generally do group projects and they are satisfied with this situation, Gülgün t al. (2019) concluded that students are generally satisfied with the science festivals in their study.

In the research, it was concluded that the observer was of high quality in terms of compliance with the curriculum, suitability for the level of the student, and the quality of the projects varied in terms of the supply of materials and the originality of the projects. According to the provincial representative, it was concluded that the projects exhibited at the science fair were of good quality in terms of their relationship with the curriculum, their suitability for the level of the student, the supply of materials, their originality, and that they could be improved in terms of active participation of the students in the process.

According to the observer, it has been concluded that it contributes in terms of developing PPS, ensuring the active participation of the student, gaining creativity, increasing academic success, increasing problem-solving skills, increasing attitude, gaining the ability to work in cooperation, gaining the ability to express oneself, and increasing entrepreneurship. According to the provincial representative, it was concluded that the students contributed to putting the knowledge they learned into practice and adapting the knowledge to daily life. It is seen that these results are similar to the literature. In the literature, it is seen that scientific activities increase students' attitudes (Akay, 2013; Babaoğlan Özdemir and Babaoğlan, 2019; Camcı, 2008; Durmaz et al., 2017; Fisanick, 2010; Karadeniz and Ata, 2013; Birinci Konur at al., 2011; Sontay et al., 2019; Şahin, 2012; Yıldırım and Şensoy, 2016), improving scientific process skills (Camcı, 2008), and increasing science achievement (Korur et al., 2014).

Suggestions

Recommendations for Findings

- It is recommended that teachers determine the interests and abilities of the students in determining the project topics and give opportunities to students with different interests and abilities in this direction.
- It is recommended to carry out studies in a way that will increase the motivation of students to participate in science fairs.
- Relevant organizations (MoNE, TÜBİTAK) are recommended to publish sample study plans that can guide teachers and students.

- It is recommended that teachers who will participate in the science fair work to guide students and create a sense of responsibility.
- It is recommended that school administrations give importance to quality rather than quantity in projects.
- It is recommended to associate the projects developed for science fairs with daily life issues and to work in this direction.
- It is recommended that teachers and students who will develop projects for science fairs should do more original work in the projects.
- It is recommended that science teachers give more importance to the development of projects for science fairs and students should be encouraged in this regard.

Recommendations for Future Studies

- In order to benefit from different data collection tools and analyzes, observation and document analysis can be used in addition to interviews in future research.
- Action research can be conducted in order to reveal the existing problems and produce solutions to these problems during the implementation process for science fairs.
- TÜBİTAK 4006 Science Fairs can also include the opinions of the administration and parents.
- Opinions of provincial and district national education directors, national education branch managers, and district governors, who are a part of education and have duties to improve it and have participated in fairs, can be included.
- In order to evaluate how science fairs are interpreted by the participants, the views of other visitors to the fair can be included.
- The academic success, attitude, question and problem-solving abilities of the students participating in the TÜBİTAK 4006 Science Fairs can be tested.

Ethical Statement

Scientific, ethical and citation rules were followed during the writing process of the study titled "Evaluation of Science Projects in TÜBİTAK 4006 Science Fairs: The Case of Kayseri Province"; No falsification has been made on the collected data and this study has not been sent to any other academic media for evaluation.

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