Education Quarterly Reviews

Birinci Konur, K., & Yazici, A. (2022). Evaluation of 4006 TUBITAK Science Fairs in Terms of Science Teachers. *Education Quarterly Reviews*, 5(3), 180-194.

ISSN 2621-5799

DOI: 10.31014/aior.1993.05.03.537

The online version of this article can be found at:
https://www.asianinstituteofresearch.org/

Published by:
The Asian Institute of Research

The *Education Quarterly Reviews* is an Open Access publication. It may be read, copied, and distributed free of charge according to the conditions of the Creative Commons Attribution 4.0 International license.

The Asian Institute of Research *Education Quarterly Reviews* is a peer-reviewed International Journal. The journal covers scholarly articles in the fields of education, linguistics, literature, educational theory, research, and methodologies, curriculum, elementary and secondary education, higher education, foreign language education, teaching and learning, teacher education, education of special groups, and other fields of study related to education. As the journal is Open Access, it ensures high visibility and the increase of citations for all research articles published. The *Education Quarterly Reviews* aims to facilitate scholarly work on recent theoretical and practical aspects of education.

ASIAN INSTITUTE OF RESEARCH
Connecting Scholars Worldwide

The Asian Institute of Research
Education Quarterly Reviews
Vol.5, No.3, 2022: 180-194
ISSN 2621-5799
Copyright © The Author(s). All Rights Reserved
DOI: 10.31014/aior.1993.05.03.537

Evaluation of 4006 TUBITAK Science Fairs in Terms of Science Teachers

Kader Birinci Konur[1], Ayşegül Yazici[2]

[1] Recep Tayyip Erdogan University, Faculty of Education, Department of Mathematics and Science Education, RİZE. Email: kader.konur@erdogan.edu.tr / ORCID ID: 0000-0003-0766-5585
[2] Science Teacher, Levent College, RİZE. Email: ayshe07.34@hotmail.com / ORCID ID: 0000-0003-0123-6077

Correspondence: Kader Birinci Konur. Email: kader.konur@erdogan.edu.tr

Abstract
In recent years, the organizations of the science fairs at schools have been emphasized on. Science fairs are important since students' perceptions, attitudes, and achievements towards sciences are affected positively by the science fairs. It is important to carry out studies for science fairs and follow up this process in this context. This study aims to evaluate the effectiveness of the 4006 coded TUBITAK science fairs and the problems experienced by sciences teachers during the preparation and implementation stages of the fair. For this purpose, the study was carried out within the framework of the Phenomonographic approach, which is one of the qualitative research methods. The study group consists of 20 sciences teachers who participated in the support program of TUBITAK science fairs coded 4006 in the 2018-2019 academic year in Istanbul. In the study, a semi-structured interview form was used as a data collection tool. When the interview form was examined; It was determined that the majority of the teachers participating in the study demonstrated positive thoughts towards 4006 TUBITAK science fairs. Teachers stated that students who participated in science fairs developed skills such as imagination, active participation, self-confidence, socialization, work awareness, and responsibility.

Keywords: 4006 TUBITAK Science Fairs, Science Education, Teacher Opinions

1. Introduction

In the information society we live in, one of the most basic needs of learners is to learn how to access information rather than getting ready-made information. Because developing technology has made it easier for learners to access information, it has gained the feature of being reached by learners in a very short period, expressed in seconds (Durdukoca, Yardimciel, Beşeren, & Özbek, 2017). Science, which is the process of thinking about the nature of knowledge, understanding existing knowledge, and producing new knowledge, includes two elements: scientific knowledge and ways of acquiring knowledge. Scientific knowledge is the applied and sound knowledge contained in science and includes factual propositions, generalizations, hypotheses, theories, principles, and laws. Ways of acquiring knowledge are ways of getting scientific knowledge. Scientific knowledge can be divided into two groups as attitude and process skills. Scientific attitudes are the characteristics that should be found in people who are interested in science, that is, scientists. These attitudes; are qualities such as curiosity, modesty, not giving up, truthfulness, and skepticism (Oğuzkan, 1984, 95, cited in Tan and Temiz, 2003).

Science allows children to reveal their imagination and creativity. Students with the science education at the secondary school level begin to understand the basic definitions, principles, laws, and theories that support the emergence of science knowledge. They get the chance to know and apply the reasons that involve practice and scientific analysis. They understand the structure of scientific research, the history of its development, and the relationship between science and technology. They get the opportunity to know the social, cultural, and historical context in which these relations occur (Trowbridge, Bybee, & Powel, 2004, cited in Anagün, 2008).

It is known that innovations and inventions in science both make great contributions to the development of countries and are the basis of scientific and technological developments. This situation causes the importance of science and science education to increase day by day, and all nations give importance to the development of science. For this purpose, countries are trying to develop science education programs, increase teachers' quality, and equip educational institutions with tools (Ayas, Çepni, & Akdeniz, 1993). In recent years, project-based learning (PBL) practices have entered the school environment with the program changes made in our country. Project design is among the initiative and entrepreneurial competencies of the curriculum. Initiative and entrepreneurship refer to the ability of an individual to transform his thoughts into action. It includes creativity, innovation, risk-taking, and the ability to plan and manage projects to achieve goals. In the science curriculum, it is foreseen to conduct courses in learning environments (project, problem, argumentation, cooperative learning, etc.) based on the student. It is recommended that the performances of project design, model and product creation, product presentation, etc., which are expected from students, to be carried out in the classroom and under the guidance of the teacher as much as possible. It is expected that the activities will be held together with their peers in the school atmosphere (MNE, 2018). In this context, within the scope of each unit, project design gains are given to students. Thus, students reveal their inventions with the products they created by applying the PBL steps. Projects make students feel like scientists since they own their products. Since science is a course that is intertwined with daily life, it can attract the attention of students as a course suitable for projects.

In summary, studies have shown that when science courses are taught based on projects, learning is more permanent for students, and academic success is increased. Çiftçi (2006) found a significant difference in the experimental group due to the test he applied to measure the students' permanence levels. Dilşeker (2008) observed that academic achievement increased in experimental groups using the PBL method. He emphasized that PBL would provide permanent learning. Karaçallı (2011) stated that PBL provides permanent learning for students in his study made with 4th graders in science lessons. When the literature on academic achievement and permanent learning is examined, there are studies on the positive effects of PBL (Aladağ, 2005; Çil, 2005; Gültekin, 2007; İmer, 2008; Keser, 2008; Korkmaz & Kaptan, 2002; Özcan, 2007; Seloni, 2005; Soil, 2007; Wolk, 1994). In recent years, it has been seen that science fairs with the code 4006 supported by TUBITAK have been held in secondary schools to make students like these project studies as festivals. In this process, teachers and students go through a time and exhibit their projects towards the end of the semester. However, it is thought that teachers' ideas are important for future project studies in revealing whether teachers' process with students is effective. In this context, the opinions of teachers participating in 4006 TUBITAK science fairs as coordinators on this issue gain importance. For this reason, this study, it is aimed to get more detailed information about the preparation and implementation process of 4006 TUBITAK science fairs and to determine the thoughts of the teachers who act as a guide. In this direction, the study tried to answer the problems experienced by science teachers participating in TUBITAK science fairs with code 4006 during the preparation and implementation phases.

1.1. Sub Problems

- What are the problems experienced by science teachers during the preparation phase of TUBITAK science fairs with code 4006?
- What are the problems experienced by science teachers during the implementation phase of TUBITAK science fairs with code 4006?

2. Method

To evaluate 4006 TUBITAK science fairs in terms of teachers, it was found appropriate to use the phenomenography qualitative research method. Phenomonographic research describes the different ways people experience, interpret, understand or conceptualize a particular aspect of a phenomenon (Çepni, 2007). The phenomenography method aims to reveal the perceptions of the participants towards a concept and events (Yıldırım & Şimşek, 2012). Interviews are frequently used to collect data in phenomenographic research (Richardson, 1999; Çepni, 2012; Khan, 2014).

2.1. Study Group

The study group consists of 20 science teachers working in secondary schools in Istanbul, Turkey. Purposive sampling was used in the selection of the sample in accordance with the purpose of this study since it focuses on the opinions of science teachers rather than all teachers in different branches who carry out 4006 project studies. Teachers were coded as T1, T2, T3, …..T20.

2.2. Data Collection Tool

In order to collect data in the research, a semi-structured interview form was prepared to evaluate TÜBİTAK science fairs with the code 4006 for teachers. The questions in the interview form were prepared by taking the opinions of 5 experts in the field of science education from the related literature. Initially, the first version of the interview was one-stage, with a literature review. The previous version of the questions was aimed at getting simpler and shorter answers. Since some questions are directive, they were made more open-ended and arranged to receive more explanatory answers from the teachers. Then, the questions were examined one by one and staged in the form of preparation and application. Experts made the necessary combinations and arrangements in these questions and brought the interview form to a question format for getting more data. This prepared form consists of two parts. The first part includes demographic information, and in the second part, questions about evaluating the project process. In addition, the second part consists of the preparation and implementation phases. The semi-structured interview form was applied face to face, and the application process took 45 minutes. The data were collected in the form of audio recordings by taking the teachers' views along with the interview questions. All interviews were conducted in an empty room at schools by getting appointments. Later, the audio recordings were converted into Word documents.

2.3. Analysis of Data

NVivo 11 program was used to analyze the data, and content analysis was carried out in the evaluation of the interviews with the teachers. An attempt was made to establish a relationship between content analysis and concepts. The reason for this is to reveal the underlying events in the analysis of the data obtained. Then, the researcher interprets and organizes his analyses so that everyone can understand (Çepni, 2012). The data were described according to the codes and themes obtained and tabulated by making the necessary calculations. The questions written in the first stage are divided into two parts: preparation and application stages due to expert opinions. The questions in the preparation and implementation phases were dimensioned. The 1st-4th. questions or the preparatory stage of the study are dimensioned as “project task-information” dimension, 5th-6th. questions are dimensioned as “website use” dimension, 7th-8th. questions are dimensioned as "teacher competence" dimension, 9th-11th. and 14th. questions are dimensioned as "general problems" dimension, 12th-13th. questions are dimensioned as “project topics” dimension. 15th.-18th. questions for the implementation phase are dimensioned as “general problems” dimension 19th-20th. questions are dimensioned as the “student-teacher contribution” dimension. Then, the data were analyzed in this order by the researcher and presented as findings.

A preliminary study was carried out to increase the validity and usefulness of the developed semi-structured interview form. The questions in this interview form were determined considering the purpose of the research. To ensure content validity in the development process of the form, the literature was used, and the program was reviewed. The final form of the interview form was given by taking the opinions of 5 science education experts

about the prepared questions. The questions were written in a very short and simple way when they were first prepared, these questions were corrected these questions, and different questions were suggested to be added to the form. These corrections were taken into account by the researcher. Thus, the data were collected in different ways and evaluated by comparing them with each other. Audio recordings were taken while the interview questions were answered.

Regarding the reliability of the study, the consistency of the codes given among the coders was examined in the study. In this regard, the codes given by two coders were evaluated by three science experts. Miles and Huberman's (1984) principles were used for the reliability of coding. The following ways were followed for the reliability of the study: The analyzes on the probability of error were reviewed repeatedly. It was checked whether there was a deviation in the creation process of the codes and whether the meanings of the codes changed. The communication between the coders and the sharing of analyzes by getting the coders together at regular intervals and conducting studies was coordinated. The thesis advisor re-evaluated the codes and themes to cross-check the codes developed by different researchers and independently derived results and to ensure compatibility between coders. Then, with the acceptance of the coders, the codes whose reliability was evaluated were finalized. The consistency of the codes created separately was checked. Then, they were grouped as "Agreement" and "Disagreement" based on the evaluations of the researcher and two experts by taking the answers given to the teachers' questions into account. The reliability of the study was calculated by using the percentage of agreement calculation formula. In the calculations made, the percentage of agreement between the researcher and the experts in the field of science was found to be 87.5%. It can be said that the research conducted is reliable by looking at these values.

3. Results

3.1. Findings Concerning the Preparation Phase of TUBITAK Science Fairs with Code 4006

With the developed interview form, 14 questions were asked to evaluate the preparation phase of the 4006 coded TUBITAK science fairs. These questions are addressed in 5 dimensions. These dimensions are; project task information, website use, teacher competence, general problems, and project subject.

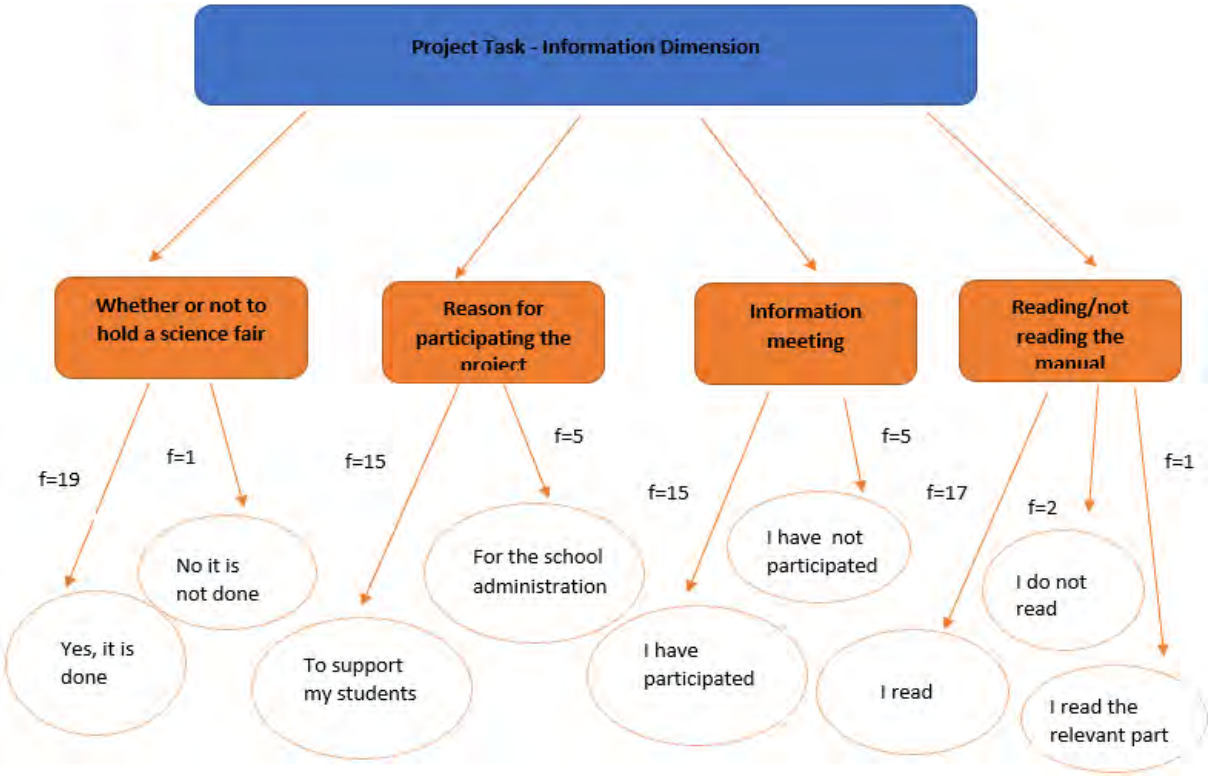

Figure 1: Model for the project task-information dimension

As can be seen in Figure 1, the "Project Task-Informing" dimension is grouped under four themes as; whether or not held the 4006 TUBITAK science fairs, their participation in the project and the reason for it, their participation in/not participating in the information meeting, and reading/not reading the guide. When we look at the codes regarding the theme of the 4006 TÜBİTAK science fair should be held or not, the teachers emphasized the most "Yes, It is done." T6 expressed his views as *"...Yes, it was done. It was held in different fairs...."*. The statement of the teacher, who was the project manager, was as "*I worked as an executive for four years in a row. It has never been done before in our school. At first, I had no knowledge or idea about the 4006s. I told my principal that I wanted to write a project for "this is my work" competitions, then he introduced me to the R&D unit project manager and the 4006 processes started at our school. I aimed to develop skills in my students and arouse interest in science through projects."* reveals the teacher's voluntary participation.

There were two different issues that teachers focused on the most about participating in the project and the reason, which is another theme related to the Project Task-Knowledge dimension. The majority expressed their opinions regarding participation in the project as "Yes, I participated" and expressed the reasons for participation as "I participated voluntarily." T8 expressed their opinions as *"...I acted as an executive. I follow it constantly. I love to involve my students. I joined voluntarily." T7 comments as "I joined. We attended because the school administration requested it. So the demand came from the school. Actually, I also wanted to participate in the events. So, we joined with my students."*.

The majority of them attend the meeting, under the theme of attending/not attending in the information meeting. T10 expressed his opinions as *"...Yes, I participated, but not enough information was given. I mostly reach information by researching myself or get information from our provincial representative ..."*. T2 said, *"I participated, meetings and seminars are held in the provinces regarding such projects. Prior notices are given. I often go to these meetings with my colleagues. Information on innovations and things to do is given. I think it is useful too."*

"Yes I read" was the most emphasized by the teachers regarding reading/not reading the Guide, another theme related to the project task-information dimension. T2 stated as *"...I read the manuals. I take notes, I sort it..."*. T6 comments expressed as *"I read the guides every year because there are changes every year, and if you do not follow these changes, it is not possible to get the fair approval."*

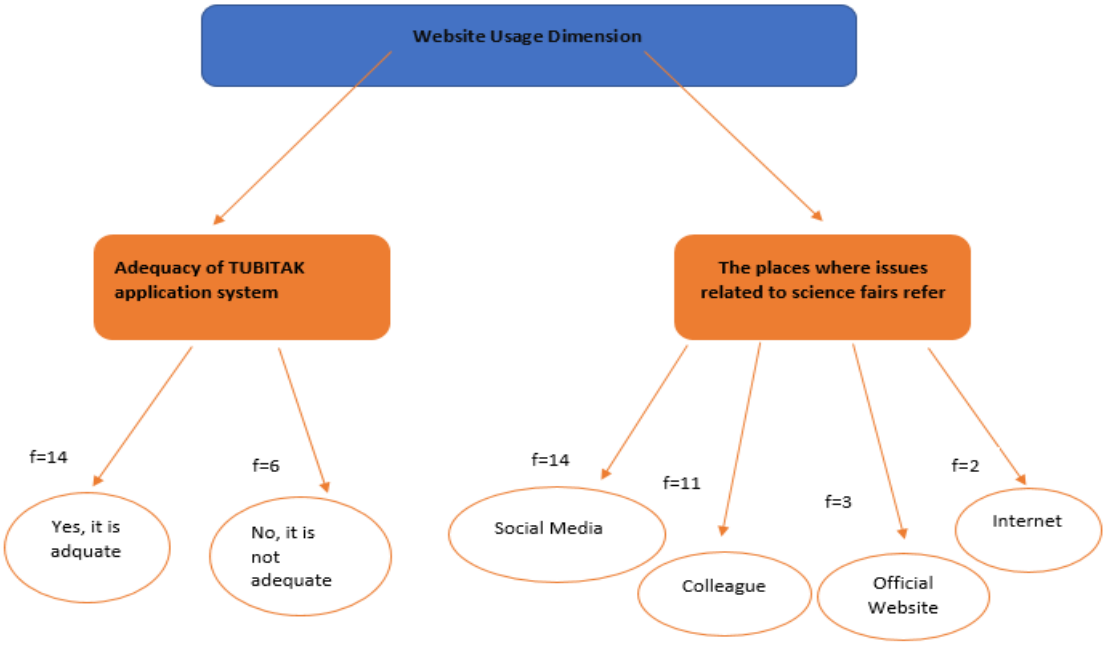

Figure 2: Model for the dimension of website usage

As seen in Figure 2, the majority of teachers find the TUBITAK application system sufficient. T5 expressed his views on this subject as "*…Yes, it is enough. I can find answers to any question I want."* T9 stated as *"I don't find*

it sufficient. Because there are serious problems in the application system. Notifications are not made on time and in the right way. For example, the guideline was not created when the e-signature process started. It is a very challenging process for people who will use e-signature for the first time. Instinctively, we try to use the system by trial and error."

Teachers generally stated that they found out what they were curious about or problems about TÜBİTAK by using social media groups, colleagues, the internet, and official sites. T8, replied *"R&D units in the provinces are trying to help in this regard, but unfortunately, they cannot help because their project tracking screen systems are different from ours. It is very useful to consult experienced friends from social media groups or to follow the posts of the members. I even try to help my friends who do not have experience in these groups because I also benefit from it myself. When I even meet my friends from university in social media groups, good exchanges can occur"* regarding finding out what they are curious about. T17 stated as *"I ask the provincial R&D officer what I am curious about TUBITAK. I rarely consult my colleagues. There are now a lot of sharing groups on this subject. There are groups on Facebook, and these groups are very useful. They are not bad at generating ideas as well."*

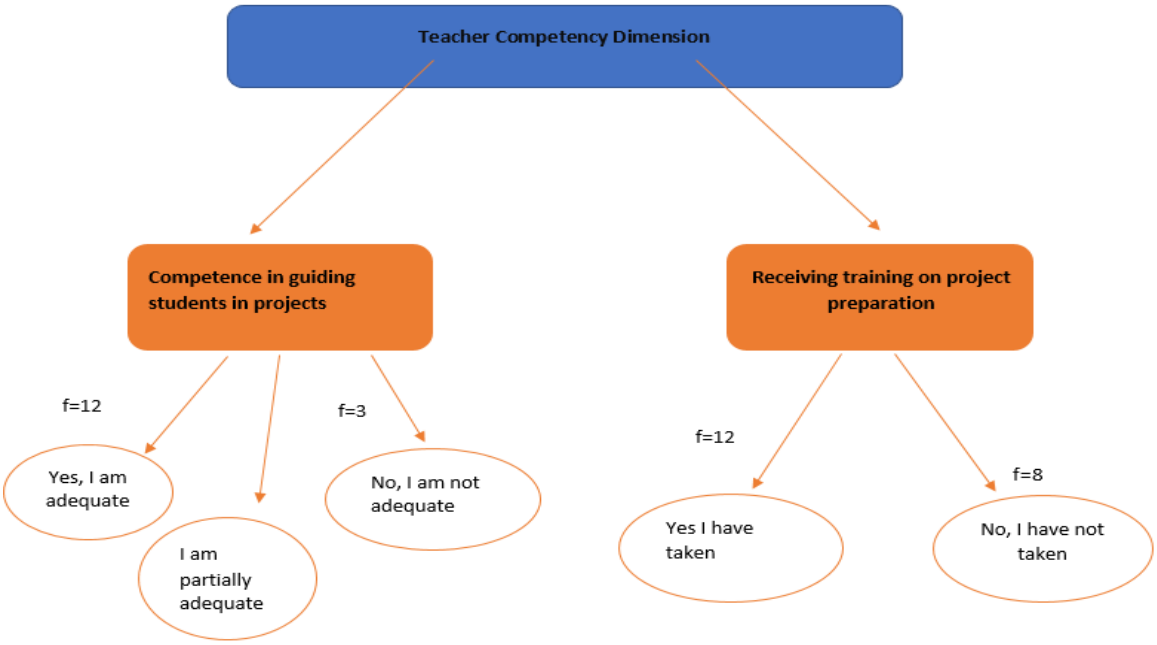

Figure 3: Model for teacher competency dimension

Twelve of the teachers find the project proposal stage sufficient in terms of guiding their students. T2 expressed his views on this subject as *"...I think I am enough. I take a very active role and give direction...."* T11 said, *"It is not possible to direct students during the project proposal phase. TUBITAK raises the bar every year, and students prefer to copy and paste from the internet at the point of the project proposal. Teachers at school (including me) have not received training on project production or project management. In the stages of proposal and project execution, the advisor teachers should first understand so that the student can understand the situation. I do not know how to direct students during the project proposal stage, and I do not think that other teachers (at least in science) know either."* Therefore, he stated that he was insufficient in the process of guiding the students.

Twelve of the teachers received courses or training on project preparation. T17's views on this subject were as follows: *"... Yes, I got it. I went to the courses and got a certificate. It helped..."* T18 expressed their opinions as *"I attended project preparation seminars a few times and I think it is useful. At the university, we had classes on preparing materials and projects. I think they also contributed".* T6 expressed his views as *"I did not receive any training, but there were courses for this when I was studying at university. We were preparing projects and making presentations. It is good to be given in such classes."*

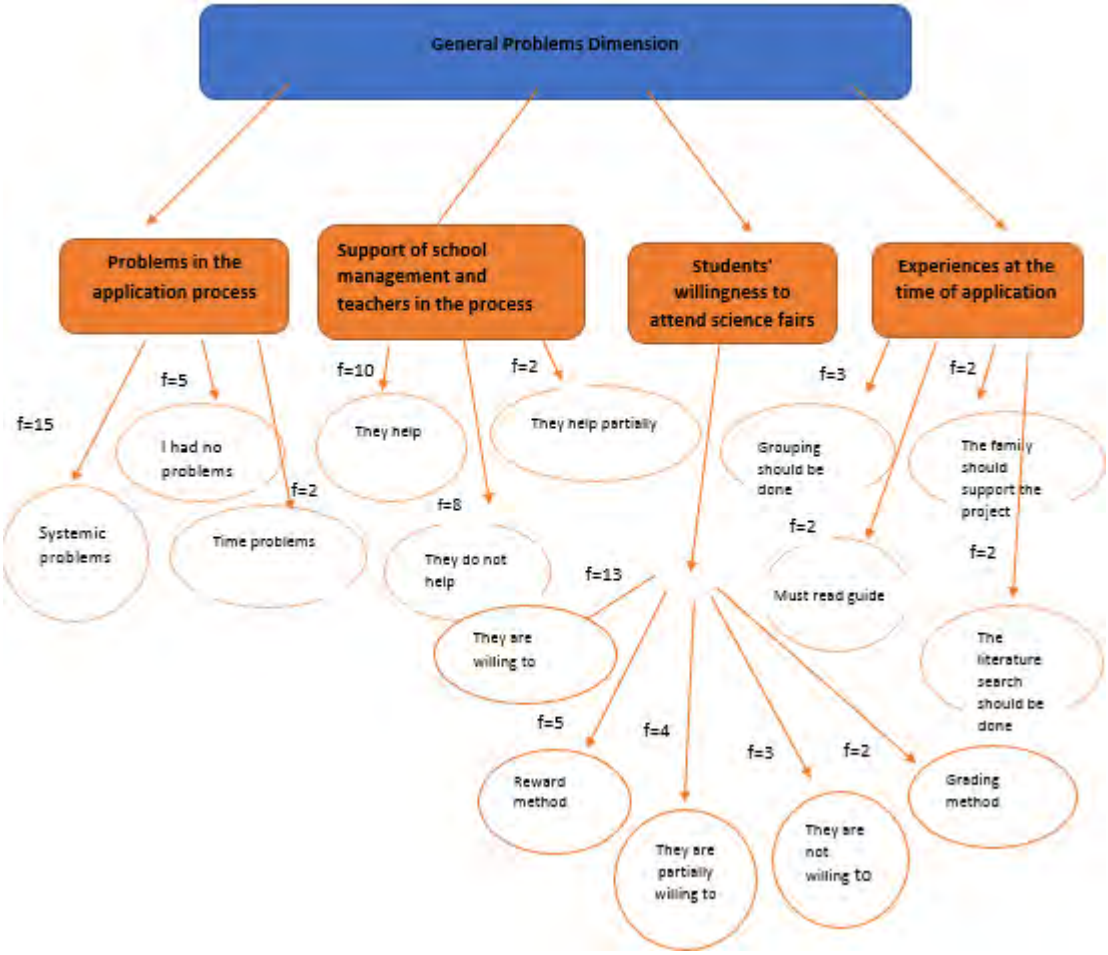

Figure 4: Model for the dimension of the general problems

General problems, another dimension of the research, were gathered under four themes as; problems in the application process, teachers and school administration's help in the project preparation process, students' willingness to participate in the science fair, and determining the project topics. When the teachers' opinions regarding the problems in the application process were examined, the *teachers drew attention to the problems related to the System. T2 expressed his views as follows: "The e-signature process is difficult, we have problems in signing in to the site, and there are a lot of system errors."* T5 expressed the problems he experienced as follows; "*Some sentences in the guide are not understandable during the application process. The system is very busy. The different rules that come in every year create problems. However, I learned a lot about solving the logic of preparing projects, and I also guided my friends."*

In the theme of the assistance of teachers and school management in the project preparation process, some of the teachers mentioned that they were helpful. T3 draws attention to the help of the school administration and teachers with his statement as *"... They help. When we can't find materials, we ask for them to be brought, or we share ideas..."*. T12 expressed his views on this subject as *"Other teachers are reluctant to prepare projects. I think that such activities are necessary to get teachers and students out of their molds, and I get very serious support from my principal."*

The majority of teachers find students willing to participate in science fairs. T18's views on this matter were as follows: *"...They are enthusiastic. They like to do projects by themselves... I worked with a group of 23 people, all of them were very enthusiastic. They like to do things, work, and spend time with their friends."* T7, one of the teachers of the students who participated willingly, said that: "*Students are very willing to participate. They can experience many emotions such as being in the fairground, making a presentation, feeling belonging to a group, feeling valued, etc. Since I am an executive, some students started to circle me a month before the fair. Even if they do not present a project, I try to assign tasks in the fair area according to their qualifications. In other words,*

I evaluate such fields not only as scientific work and project creation, but also to help my students gain behaviors that I cannot gain in classes".

The teachers' conclusions from their experiences at the time of application are grouping, literature review, reading the guide thoroughly, and families supporting the project.

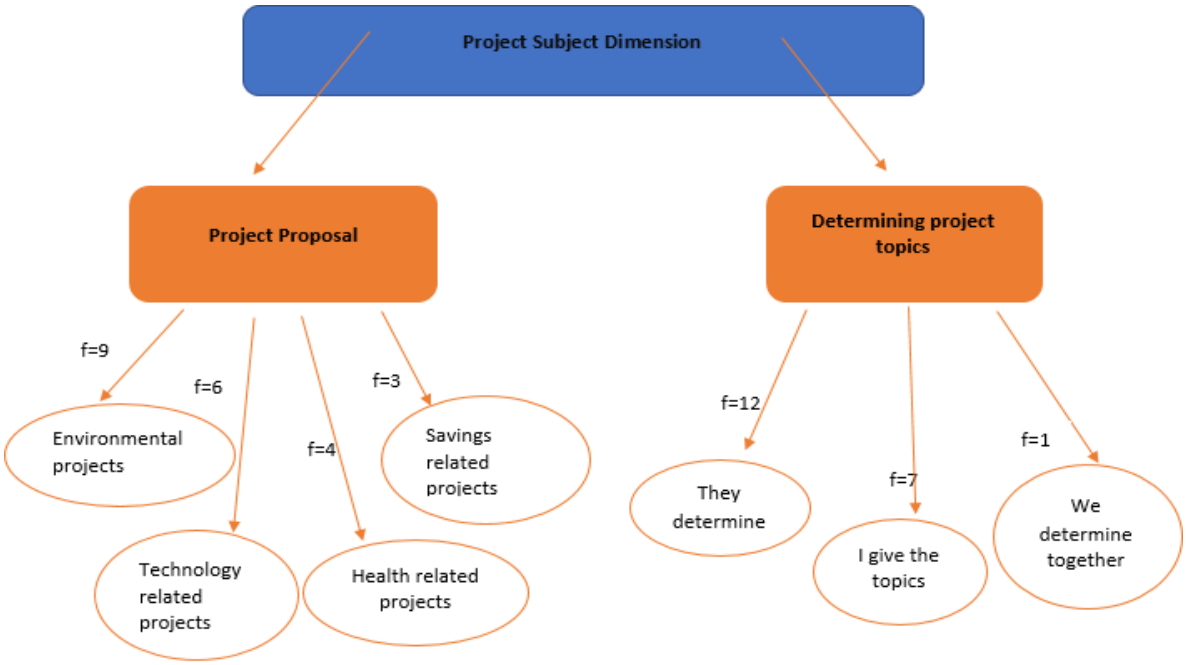

Figure 5: Model for the project subject dimension

As seen in Figure 5, it was stated that most of the work done by the teachers was related to the environment. They also stated that they are doing projects for savings, technology, and disabled people. T1 expressed his views on this subject as *"... Projects related to the environment, nature and life ..."*. T3 expressed his views on this subject: *"We applied the projects such as the most durable building with the least cement (mathematics-engineering-bioimitation) hexagon bricks, the effect of expired vitamins on plant growth (chemistry-biology-environment), game design with science subjects and learning with games, which is Einstein?"* T13 expressed his views as *"We have done projects related to fields such as physics, chemistry, biology, and health sciences. We have designed projects on issues related to mirror images, dental health, healthy nutrition, and periodic systems and applied."*

The majority of the teachers (12) leave it to the student while determining the project subject. T2 expressed his opinions as *"... I want students to determine their views on this subject, I give sample topics and try to create a project based on them. Sometimes I show examples of projects that have been made. Of course, I have students who have something in their minds, and sometimes I have to help them generate ideas even though I give the subject. Not every student is at the same level of success. Some are very creative, while others I have to hold their hands with."*. Regarding the students' realization of the projects by themselves, T11 stated that, *"In the projects that I carried out, they were able to carry out and follow the experimental processes themselves. In many other projects, since the teachers were the first consultants, I directed the teacher first, and then the teacher guided the students. The job of the executor is quite difficult"*. More burdens and responsibilities fall on executive teachers. They help both their colleagues and student groups and play an active role in most of the process.

3.2. Findings Concerning the Implementation Phase of TUBITAK Science Fairs with Code 4006

With the developed interview form, six questions were asked to evaluate the implementation phase of the 4006 coded TUBITAK science fairs. These questions are addressed in two dimensions. These dimensions are; general problems and student-teacher contribution.

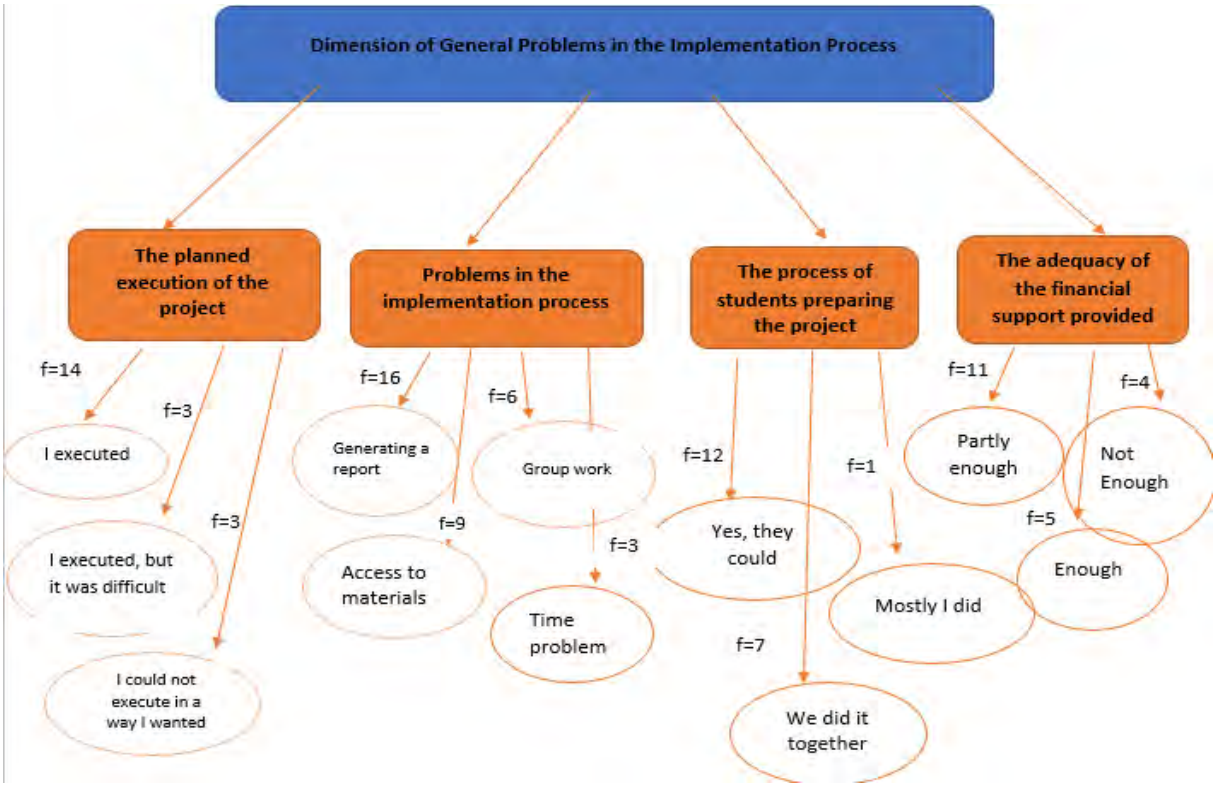

Figure 6: Model regarding the dimension of the general problems in the implementation process

As shown in Figure 6, most teachers think that they carry out their projects as they wish. T10 expressed his views on this subject as *"... Yes, we were able to carry it out. At first there were problems with planning. Over time, we got used to it, we don't have any setbacks anymore..."* and T5 expressed his opinions as *"Some of them yes and some no. Some students were very willing in the projects but did not want to realize it. Later on, we had to change students in the middle of the project."*

The most common problem faced by teachers during the implementation of the project is report creation. T12 expressed his views on this subject as *"... Since some of the students are bussed students, group work got stuck in the lunch breaks, and there were times when it was not productive. It was very difficult to guide advisor teachers during the reporting process. Because each project was in a different field and in a different genre."*

The majority of the teachers participating in the research think that the students realize their projects. T13 expressed his views on this subject as *"... Of course, they asked for help. However, they followed a good process. I was just a guide...."*

In addition, most teachers do not find the financial support provided by TUBITAK to be fully sufficient. T1 expressed his views on this subject in the form of "… It is not very sufficient …".

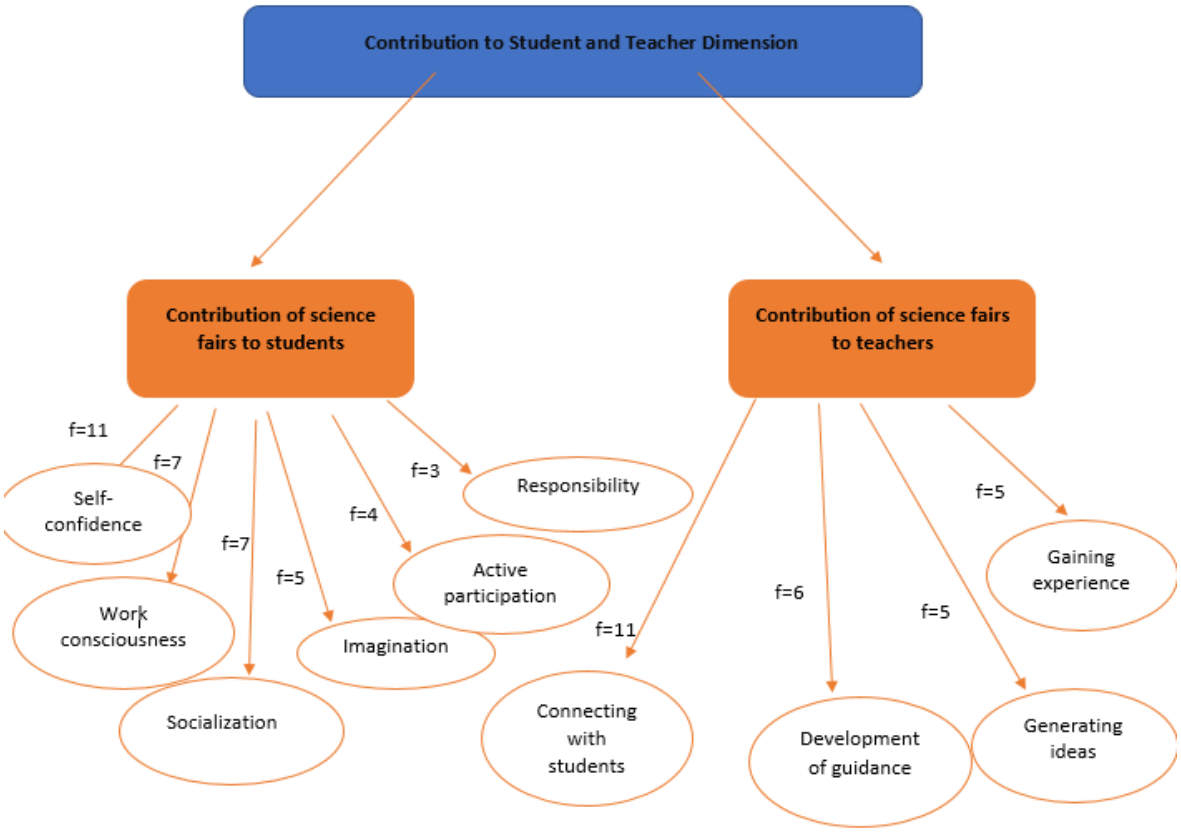

Figure 7: Model for the dimension of student and teacher contributions

Teachers participating in the research see the effect of science fairs on students' self-confidence the most. T2 expressed his views on this subject as *"... Their self-confidence has increased. It makes them proud to present the results they have achieved...."* At the same time, T5 stated that the science fairs made students gain as follows; *"The ability to express oneself, the ability to speak in the face of protocol and self-confidence, the sense of belonging, the motivation to succeed, the feeling of being valued, the learning to dress according to the environment." When the effect of science fairs on students is evaluated, it is seen that most of the teachers answer "self-confidence."* In addition, they stated that TUBITAK science fairs strengthen communication and thus socialize students.

The majority of teachers participating in the research think that science fairs increase the bond and interaction between students. T4's views on this subject were as follows: *"... In this process, I saw how I understood the student better. I learned to motivate the student better..."* T6 expressed his views on this subject as *"... The revisions made by TUBITAK every year have taught me a lot. Every year, I learned how to write a project step by step, and I did consultancy. With these activities, I learned that I could give my students many different skills by doing. I learned to see the light, excitement, and sense of discovery in the eyes of my students."*

4. Discussion and Conclusions

In this part of the study, the data given in the findings section were associated with each other and compared with other studies on the subject. The discussion for each sub-problem is presented under headings.

4.1. Discussion of findings obtained for the first sub-problem

In this part of the study, the discussion of the findings obtained for the sub-problem of "What are the problems faced by science teachers during the preparation phase of 4006 coded TUBITAK science fairs?" is included.

In this context, when the 4006 coded TUBITAK science fairs preparation phase was evaluated, it was seen that all the teachers participated and were willing when the teachers were asked about their participation or not

participating in the projects. In line with the answers given, their willingness is to see that they are successful even if it aims to support the students. It was stated that TUBITAK science fairs were held in the schools of many participants. Although teachers stated that they participated in science fairs voluntarily, some teachers stated that they participated in science fairs under pressure from the school administration. It has also been observed that teachers who work on their own will participate in meetings and activities related to the science fair and read the guides. When the working experiences of the teachers who read the manual are examined, it is seen that there are more teachers with fewer years of experience. Some teachers read only the parts of the guide that are related to their field. In addition, teachers' willingness to participate in TUBITAK science fair projects with the code 4006 confirms with the study by Atalmış, Selçuk, and Ataç (2018). As a result of the findings they obtained in this article, they stated that teachers willingly participated in science fairs.

Considering the dimension of website use, it is seen that teachers (f=14) think that the TUBITAK system is sufficient, but some (f=6) teachers find it insufficient. It is thought that the reason for this may be the changes and innovations made. Teachers often use social media groups and peers for answers to questions about science fairs. The situation of using the internet and the official site is less preferred than other situations. Teachers consider themselves sufficient in guiding students at the project proposal stage. On the other hand, it is striking that the teachers who deem themselves inadequate are less involved in these studies or those who state that they have participated for the first time. In terms of training or taking courses for the project, it was stated that most of the teachers took courses for this situation, and some of them did not receive any training. Considering this situation, it is quite meaningful that the result is like this.

Another dimension of the first sub-problem is general problems. It is seen that teachers generally experience systemic and time problems during the application process. Teachers often state that they have problems in the application system for TUBITAK science fairs with the code 4006. Since the teachers are not informed about the innovations and changes made, it is seen that problems arise and make the process difficult. It has been determined that some teachers can get help from the school administration during the project preparation process, and this help is related to the project proposal, place, and process.

It is seen that most of the students are willing to participate in the TUBITAK projects (Table 9). Students' willingness to participate in science fairs is generally more positive when associated with grades and rewards. Grade and reward can be used as a solution, especially for students who are reluctant. Thus, the student can experience the project, and if he is successful in the next process, he can go into the study without the need for grades and rewards. In this way, students also develop a sense of responsibility, self-confidence, interest in lessons, feelings of courage, and socialization skills. It has been demonstrated by other studies that TUBITAK science fairs with the code 4006 provide students with life skills that are also included in the science curriculum (Karadeniz and Ata, 2013; Meydan, 2017; Yıldırım and Şensoy, 2016).

The subject of the project, which is another dimension of the first sub-problem, is very important. Because the main purpose of these fairs is to create projects. It was determined that the teachers gave the most importance to this point in the interview questions. Two themes were included in the project subject dimension; project examples and determining the project topic. Project examples include projects that students generally create to solve problems in current life. Generally speaking, students prefer environmental issues. These issues can be related to savings, recycling, technology, or health. It is thought that students prefer current situations more because they identify a problem by observing the events happening around them. Because an important step in project-based learning steps is to identify the problem. While determining this, it is important that it is useful and economical, which will solve the event that occurs more. In this, students need to use their observation skills to see a problem. The project's main feature is that the student can independently decide how and in which order to solve the problem to find the solution to the problem (Kubinova, Novotna, & Littler, 1998, cited in Saracaloğlu et al., 2006).

Teachers generally stated that it is important to read the guide on their experiences during the application process. It is not enough for the students to be supported only by the teachers or the administration in the projects. Students' families should also support and assist them throughout the project process. A literature review is important in terms of the originality of the studies, and it is thought that making groupings makes the studies easier. It is thought

that there will be no time problems in planned and regular studies. When the preparation stage of the study is considered as a whole, it is stated that five dimensions are important separately. In general, it has been emphasized that the biggest problems for teachers in the preparation phase are systemic. In this regard, teachers should pay attention to participation in information meetings for this problem. In this way, they can be informed about innovations and changes.

4.2. Discussion of findings obtained for the second sub-problem

In this part of the study, the discussion of the findings obtained for the sub-problem of "What are the problems experienced by science teachers during the implementation phase of TUBITAK science fairs with code 4006?" is included.

When the implementation phase of TÜBİTAK science fairs with the code 4006 is evaluated, most of the teachers carried out the project in a planned manner. It is seen that teachers who have participated for many years are more experienced in the creation of the work schedule and in the production of the solutions against possible problems. Teachers who participate for the first time have more problems in terms of time and planning. The problems they experienced during the implementation phase were generally grouped under the following headings; accessing the materials, creating reports, transportation problems, time problems, and problems due to group work. In the study conducted by Czerniak and Lumpe (1996), the problems experienced by the students participating in the science fair on the duration overlap with the problems in the implementation phase. When the teachers were asked whether the students realized the projects themselves or not, it was stated that the majority of them carried out the projects under the teacher's guidance. Especially the executive teachers who have a duty have more burdens and responsibilities. They help both their colleagues and student groups and play an active role in most of the process.

Teachers find the support provided by TUBITAK insufficient. It is seen that only half of the teachers gave a partially sufficient response to this support. In this case, in line with the financial support given, the teachers try to realize the projects by limiting the material in their projects. Sometimes they do not do some projects because the budget is not enough. This reveals that teachers have difficulties in putting out an original product. Özel and Akyol determined in their study that (2016), “Problems encountered in this is My Work” project are as follows; financial reasons, writing the project report, finding a project topic, and entering the project into the internet system.

When the effect of science fairs on students is evaluated, it is seen that most of the teachers give the answer of "self-confidence." In addition, they stated that TUBITAK science fairs strengthen students' communication and thus socialize students. In the objectives of the Ministry of National Education's 2018 curriculum, it was emphasized that the individual should interact with his environment and society. When we look at the literature, there are similar studies that have positive effects such as students' academic success, permanent learning, active participation, self-confidence, awareness of taking responsibility, and product design (Bunderson & Anderson, 1996; Ceken 2012; Gültekin, 2007; Korkmaz, 2002; Meyer, 1997; Perry, 1995; Özdener and Özçoban, 2004; Yurtluk, 2003; Zeren, Güngör, & Özkan, 2015). Korkmaz (2002) concluded that project-based learning in science education positively affects students' thinking skills, problem-solving skills, and risk-taking to succeed. When the professional contributions of the 4006 coded TUBITAK science fairs to the teachers were evaluated, the teachers stated that they generally communicated with students and gained experience by establishing a better bond with the students.

When the results are evaluated, it becomes clear how important TÜBİTAK 4006 science fairs are. In particular, the indispensable and most basic result of 4006 TÜBİTAK projects shows that it is beneficial in terms of increasing both emotional and cognitive gains of students, arousing the desire of students to participate in social and civil activities, developing their sense of self-confidence, gaining work discipline, developing their visual and physical skills as well as their creativity (Atalmış, Selcuk and Atac, 2018). In addition to the positive aspects of TÜBİTAK 4006 science fair projects, it is necessary to address the problems in the preparation and implementation phases. There are systemic problems in the preparation and implementation phase, such as determining the subject, time, working environment, writing a project report, working as a group, and insufficient funds. In the study titled "This

Is My Work Project Competition" conducted by Ünver, Arabacıoğlu and Okulu (2015), it was mentioned that the students were not provided with a suitable environment for their studies in their schools, some students did not provide the necessary cooperation in group work, and some students had to work alone. In this context, a suitable working environment should be provided to enable students to learn by doing and experiencing. It is important to ensure the responsibility and duty awareness of each student in group work. For this reason, it is necessary to try to make the students willing and motivate them. As a result of these evaluations, it is seen that thanks to the projects created in TUBITAK 4006 Science Fairs, it strengthens the teacher-student relationship, and the students' self-confidence is formed by teaching project-based learning steps and introducing a new product.

As a result of the evaluation of the findings obtained from the study, the following conclusions were reached:
1. In the study, it was concluded that although some of the teachers participated in science fairs voluntarily, there were teachers who had to attend because the school management and administration wanted.
2. In the interviews, it was concluded that the teachers who performed the executive duty generally had problems uploading the report to the system (systemic) during the preparation phase.
3. It has been concluded that while participating in science fairs, teachers usually leave the choice of subject to students and they help by guiding students in cases where they are inadequate.
4. In the implementation phase of the project; It was determined that teachers had problems such as preparing reports, finding materials, working environment, and problems arising from group work.
5. It was concluded that communication, skills, group work, imagination, active participation, self-confidence, taking responsibility, and duty awareness of students participating in TUBITAK 4006 science fairs improved, contributing to the teachers' development.
6. It has been determined that experienced teachers who have participated in TUBITAK science fairs before are better at managing the process than teachers who have just joined or have little experience.

5. Recommendations

1. It is necessary to compel teachers who do not want to organize activities based on projects, such as science fairs, to carry out these activities. Instead, teachers' attitudes and perceptions towards science fairs can be changed with the studies provided by institutions such as NME and TUBITAK. It may be considered to increase the financial support given to the teacher regarding this situation.
2. Practical project training seminars can be organized to eliminate the problems at the point of application related to the projects carried out by the teachers. In particular, problems such as time management and planning related to teachers who are executives for the first time can be solved by giving in-service training.
3. Opinions can be exchanged between the institutions and organizations that support projects such as TUBITAK on budget support. An increase can be made in the budgets allocated for the project in schools. In addition, the processes that teachers will carry out systematically can be facilitated. Information meetings should be important in schools for teachers who participate in the innovations or will participate for the first time. Motivation and incentive elements can be included to ensure participation.
4. Voluntary participation of students in projects should be encouraged, and students' abilities should be emphasized. For students to demonstrate their abilities, they should be directed and guided to projects related to their areas of interest.
5. Descriptive studies can be done by considering the working hours, ages, experiences, and education fields of the teachers participating in science fairs. In addition, qualitative studies are needed to evaluate these fairs from the perspective of students with the students participating in the science fair.

Acknowledgements

This study was produced from the master thesis of the 2nd author under the supervision of the 1st author.

References

Aladag, S. (2005). *The Effect of Project-Based Learning Approach on Students' Academic Achievement and Attitudes in Primary Education Mathematics Teaching*. [Master Thesis]. Gazi University, Institute of Educational Sciences, Ankara, 167 p.

Anagun, S.S. (2008). *Developing science literacy through constructivist learning in primary school fifth grade students: an action research.* Anadolu University Institute of Educational Sciences, Eskisehir.

Atalmış, E.H., Selçuk, G., & Ataç, A. (2018). Opinions of managers, executives and students on TÜBİTAK 4006 projects. *Ahi Evran University Journal of Kirsehir Education Faculty*, 19(3), 1999-2020.

Ayas, A., Çepni, S., &A kdeniz, A.R. (1993). Development of the Turkish secondary science curriculum. *Science Education*, 77(4), 433-440.

Bunderson, E.D., & Anderson, T. (1996). Preservice elementary teachers' attitudes toward their past experience with science fairs. *School Science and Mathematics*, 96(7), 371-377.

Czerniak, C.M., & Lumpe, A.T. (1996). Predictors of science fair participation using the theory of planned behavior. *School Science and Mathematics*, 96(7), 355- 361.

Çepni, S. (2007). *Introduction to research and project work.* Trabzon: Celepler Printing.

Çepni, S. (2012). *Introduction to research and project work*. Enhanced Edition, Ankara.

Ceken, R. (2012). Content analysis of primary education level student projects in terms of extra-curricular information about biology. *Necatibey Education Faculty Electronic Journal of Science and Mathematics Education*, 6(1), 55-66.

Çiftçi, S. (2006). *The Effect of Project-Based Learning on Students' Academic Risk-Taking Levels, Problem Solving Skills, Achievement, Persistence and Attitudes in Social Studies Teaching.* [Doctoral Thesis], Selcuk University Institute of Social Sciences.

Çil, A. (2005). *Analysis of Project Based Learning in Chemistry Education and Suggestions*. [Doctoral Thesis], Hacettepe University, Ankara, 153 p.

Dilseker, Z. (2008). *The Effect of Using Project-Based Learning Method in Science and Technology Lesson on Primary School 5th Grade Students' Attitudes Towards Science and Technology Lesson, Course Success and Elimination of Misconceptions*. [Doctoral Thesis], DEU Institute of Educational Sciences, 75 p.

Durdukoca, Ş.F., Yardimciel, E., Beşeren, H., & Özbek, S. (2017). Perception scale of pre-service teachers' competencies in choosing teaching techniques. *Electronic Journal of Social Sciences,* 16(61), 397-411.

Gultekin, M. (2007). The effect of project-based learning on learning products in fifth grade science lesson. *Primary Education Online*, 6(1), 93-112.

Imer, N. (2008). *Investigation of the Effect of Project-Based Learning Approach on Students' Academic Achievement and Attitudes in Primary Science and Technology Teaching.* [Master Thesis]. Gazi University, Ankara, 250 p., 142.

Khan, S.H. (2014). Phenomenography: a qualitative research methodology in Bangladesh. *International Journal of New Trends in Education and Their Implications*, 5(2), 34-43.

Karacalli, S. (2011). *The Effect of Project Based Learning Method on Academic Achievement, Attitude and Permanence in Primary School 4th Grade Science and Technology Lesson*. [Doctoral Thesis], Mehmet Akif Ersoy University Institute of Social Sciences, 162 p.

Karadeniz, O., & Ata, B. (2013). Student views on the use of the project fair in the social studies course. *Adıyaman University Journal of Social Sciences Institute,* 14, 375-410.

Keser, K.S. (2008). *The Effect of Project Based Learning Approach on Success, Attitude and Permanent Learning in Science Lesson.* [Unpublished Master Thesis], Eskişehir Osmangazi Institute of Educational Sciences, Eskişehir, 171 p.

Korkmaz, H. (2002). *The Effect of Project-Based Learning on Creative Thinking, Problem Solving and Academic Risk-Taking Levels in Science Education.* [Doctoral Thesis], H.U. Social Sciences Institute, 256 p.,139.

Korkmaz, H., & Kaptan, F. (2002). The effect of project-based learning approach in science education on academic achievement, academic self-concept and study time of primary school students. *Hacettepe University Faculty of Education Journal*, 22(1), 91-97.

Meydan, A. (2017). The contribution of scientific project competitions upon high school students' acquiring a scientific viewpoint (Geography Lesson Case). *Journal of Education and Learning*, *6*(2), 294-394.

Meyer D.K. (1997). Challenge in a mathematics classroom: students' motivation and strategies in project based learning. *The Elemantary School Journal*, 97(5), 501-521.

Ozcan, R. (2007). *The Effect of Project-Based Learning Approach on Students' Academic Achievement, Attitudes, and Views in Algae Biotechnology.* [Master Thesis], Gazi University, Ankara, 98 p.

Özdener, N., & Özçoban, T. (2004). The effect of project-based learning model on student achievement according to multiple intelligence theory in computer education. *Educational Sciences in Theory and Practice*, *4*(1), 147-170.

Özel, M., & Akyol, C. (2016). The problems encountered in preparing the projects in this are my work, their causes, and solutions. *Gazi University Journal of Gazi Education Faculty*, 36(1), 141-173.

Perry, P.J. (1995). Getting started in science fairs: From planning to judging. Blue Ridge Summit, PA: TAB Books.

Richardson, J.T.E. (1999). the concepts and methods of phenomenographic research. *Review of Educational Research,* 69(1), 53-82.

Saracaloğlu, A.S., Akamca, G.O., & Yesildere, S. (2006). The place of project-based learning in primary education. *Turkish Journal of Educational Sciences*, 4(3), 241-260.

Seloni, R.S. (2005). *Elimination of Misconceptions in Science and Technology Teaching with Project Based Learning.* Marmara University Institute of Educational Sciences, [Master Thesis], 159 p.

Tan, M., & Temiz, B.K. (2003). The place and importance of scientific process skills in science teaching. *Pamukkale University Faculty of Education Journal*, 1(13), 89-101.

Toprak, E. (2007). *The Effect of Project-Based Learning Method on the Academic Achievement of Primary 5th Grade Students in Science and Technology Lesson.* [Master Thesis], Marmara University Institute of Educational Sciences, 116 p., 55.

Ünver, A.O., Arabacıoğlu, S., & Okulu, H.Z. (2015). Teachers' thoughts about the guidance process of "this is my work project competition". *Journal of Muğla Sıtkı Koçman University Faculty of Education, 2*(2), 12-35.

Wolk, S. (1994). Project-based learning: Pursuits with a purpose. *Educational Leadership*, 52(3), 42-45.

Yurtluk, M. (2003). *The Effect of Project-Based Learning Approach on Mathematics Lesson Learning Process and Student Attitudes.* [Master Thesis Ankara: Hacettepe University Institute of Social Sciences, 103 p.

Yıldırım, A., & Şimşek, H. (2012). *Qualitative research methods in the social sciences.* Seçkin Publishing House, Ankara.

Yildirim, H.I., & Sensoy, O. (2016). The effect of science festivals on 6th-grade students' attitudes towards science lesson. *Turkish Journal of Educational Sciences*, 14(1), 23-40.

Zeren-Özer, D., Güngör, S.N., & Özkan, M. (2015). A study on evaluation of the biology projects submitted to the TUBITAK secondary education research projects contest from the Bursa region. *Asia-Pacific Forum on Science Learning and Teaching*, 16(1), 1-25.