Do Tubitak-4006 Science Fairs Achieve Its Objectives? The Viewpoints of School Administrators And Teachers

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Abstract

The aim of this study is to review the opinions of principals and teachers on TUBITAK-4006 (Scientific and Technological Research Council of Turkey) science fairs which are organized in about 10.000 schools every year in Turkey. This study is a qualitative research and it is formed with phenomenological design. The study group is determined with criterion sampling method, and it comprises 10 teachers and 10 school administrators who have participated in TUBITAK-4006 science project fairs. The data are collected with a semi-structured interview form, and the interviews are carried out face to face. The data collected have been evaluated using content analysis method. As a result of the analysis, the viewpoints of the school administrators and teachers are presented in two themes and seven categories. For the both participant groups, the themes are analysed by categorizing them as the effects on teachers, the effects on students and parents. Besides, the suggestions category is indicated under one single title. According to the findings, all the participants stated that TUBITAK-4006 science project fairs are useful if carried out considering their purposes while they cause more harm when their objectives are disregarded.

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INTRODUCTION

Scientific knowledge can only be reached by scientific research methods. When scientific research methods are taught students in education, it provides significant contribution to their academic development. Projects in schools are particularly important in students' acquiring scientific research skills in educational institutions. Students focus on an outcome thanks to these projects and they practice the stages of a project as a scientific process. According to Ozden (2002), projects in schools play a complementary role in providing a better insight into curriculum. For this reason, it is apparent that project studies are crucial component of modern education in order for students to discover new information. Karadeniz and Ata (2013) have stated that project studies take students' individual differences into account, they contribute to students' developments and activate them.

When the literature is reviewed, it can be found that project studies are examined within the scope of project-based learning. Project-based learning is an effective teaching method in today's modern educational concepts (Lam, Cheng, and Choy, 2010), and helps students to figure out complicated problems that they encounter (Şahin, Güven, and Yurdatapan, 2011; Korkmaz and Kaptan, 2001). In these kinds of teaching approaches which show students the ways to do self-assessment and develop different skills in learning (Çıbık and Emrahoğlu, 2008), students' thinking, imagination, perception, creativeness, and decision-making skills are highlighted (Erdem, 2002).

While the students who are getting project-based learning make more progress in their behavioural, cognitive, and affective development (Johnson and Delawsky, 2013), their motivation is increased and they excel in cooperation in learning (Thomas, 2000; Green, 1998). Thanks to this approach, students can increase their inquiry-based learning ability (Wong, Quek, Divaharan, Liu, Peer, and Williams, 2006), they discover new information during the project developing process (Gallagher, Stepien, Sher and Workman, 1995), they develop their thinking skills and lifelong learning abilities (Hung and Wong, 2000), and they have the chance to collaborate with the parents to support the school program (Katz and Chard, 1992). The projects obtained as a result of the project developing process have many positive sides, and they are exhibited in different science fairs to advance science and to increase students' motivation.

Science fairs are carried out in many countries so as to provide scientific literacy, to further students' self-recognition, and for the development of science (Yasar and Baker, 2003; Ekici and Yılmaz, 2013). Science fairs have become an indispensable practice in educational institutions due to the opportunities they have created (Hampton and Licona, 2013). Students make use of their prior knowledge with their experience obtained from the science fairs (Balas, 1998), they learn new information about how a scientist work and the steps they follow (Wilson, Cordry, and Unline, 2004). Students do brainstorming, get exciting and new information, use their own imagination and skills while they are reviewing the projects (Kanematsu and Barry 2006).

Science fairs are non-formal learning medium including interactive activities with students (Keçeci, Zengin and Alan, 2017), bringing mobility into schools (Çolakoğlu, 2018), providing opportunities to students to share their research results with peers, teachers, parents, scientists, and other people in the society (Okuyucu, 2019). Science fairs in which teachers and parents participate enthusiastically (DeClue, Johnson, Hendrickson and Keck, 2000) have an important place in school programs (Grote, 1995). Science fairs are the activities celebrating and evaluating the projects which are managed by students, and they contribute to students individual and social developments (Bencze ve Bowen, 2009). In this regard, science fairs enable students to develop their sharing of experimental findings, their inquiry skills, offering research proposals, collaboration with peers, verifying the results skills (Sumrall ve Schillinger, 2004). The schools that ensure the active participation of the students to the science fairs show successful performance and this affects the advancement of the school positively (Harris, 2010; Akıllı, 2017).

Science fairs in Turkey are organized by the schools affiliated to the Ministry of National Education (MEB) with the support of the Scientific and Technological Research Council of Turkey

(TUBITAK) (Gülgün, Yılmaz, Avan, Akyol and Doğanay, 2019). The subject of this study, 4006-TUBITAK science fairs support program, have emerged from "Cooperation Protocol in Education" which is signed by MEB and TUBITAK, and implemented by TUBITAK, in order to enhance scientific culture in Turkey. The first fairs were supported in 2012-2013 academic year by 1000 pilot schools. Then, 881 schools in 2014, 3201 schools in 2015, 5986 schools in 2016, 5334 schools in 2017, and 9876 schools in 2018 have been supported (Okuyucu, 2019:203). 4006 Science Fairs Support Program aims to promote "Science Fairs" that offer a non-formal learning environment for 5th – 12th grade students who can do researches about the topics of their interests, exhibit their results of the, and learn with fun (Peten, Yaman, Vekli and Çavuş, 2019:80).

There are few numbers of studies on TUBITAK 4006 science fairs in literature. Çolakoğlu (2018) has studied the contribution of TUBITAK 4006 science fair supports to the education; Atalmış, Selçuk, Ataç (2018) have studied the viewpoints of administrators, project coordinators and students on TUBITAK 4006 projects; Okuyucu (2019) has studied the viewpoints of teachers and students on TUBITAK 4006 science fairs; Sontay, Anar, Karamustafaoğlu (2019) have studied the viewpoints of secondary school students who participated in TUBITAK 4006 science fairs. When these studies are examined, it is found out that there are positive and negative views about TUBITAK 4006 science fairs. Considering 10.000 schools that have participated in TUBITAK 4006 science fairs in Turkey, the researches on this subject are not adequate enough.

New information and technologies that are based on scientific researches and projects are crucial in a country's development. For this reason, in order to meet this need, TUBITAK 4006 science fairs help students to gain scientific research skills and they are necessary investments on the future of the country. Therefore, this study is vital for the development of students, schools, the society, and the country. New studies are expected to contribute more to the improvement of TUBITAK 4006. Due to this expectation and necessity, TUBITAK 4006 science fairs are determined as the subject of this study. Unlike the other studies, the viewpoints of administrators and teachers are analysed together in this paper. The aim of the study is to examine TUBITAK 4006 science fairs according to the views of administrators and teachers who take part in projects.

METHOD

This section includes the research design, study group, data collection tool and some information about the analysis of the data.

Research Model

This study is a qualitative research and it is made with phenomenological design. Phenomenology approach focuses on the sense humans make with their experiences. The same phenomenological experiences could mean different senses and experiences of people, and people's past experiences are important as well as their current experiences (Saban and Ersoy, 2016:55). In phenomenological studies, the aim is to anatomize the phenomena which are observed in our environment but not examined in detail and not having a clear sense, and is to discover the effects of them on people (Yıldırım and Şimşek, 2011). In view of these explanation, it is clear that TUBITAK 4006 project studies in school are phenomena affecting all the stakeholders in schools. TUBITAK 4006 project studies are among the educational practises in schools and they are repeated every year, however, their purposes and advantages haven't been made clear yet. With the intent of identifying the significance of the TUBITAK 4006 project phenomenon for stakeholders in schools, phenomenological design is used in this study.

Study Group

In order to determine the study group, criterion sampling method which is one of the purposive sampling methods is applied. According to Yıldırım and Şimşek (2011), the individuals of

the sampling must have previous experience on the subject of the study. The participants of the study group must essentially be selected in accordance with their previous experience and these participants must be meet the certain criteria. Creswell (2013) has stated that it is important to explain why some certain criteria are employed in determining the sampling of a study. Therefore, the study group of this study includes ten school administrators and ten teachers who have experience on TUBITAK 4006 project phenomenon. In determining the study group, the schools which have been holding TUBITAK 4006 project exhibitions for the last three years, and which are situated in Sivas city centre from various socio-economic backgrounds are opted for as the key criteria. Another criterion is to interview one teacher and one administrator from each school.

Data Collection Tool

It is necessary to ask some questions during an interview describing under which conditions and environment, what kind of experiences the participants have had to ascribe the expected senses on the phenomena relating to the data collection process (Saban and Ersoy, 2016:100-101). For this reason, the data of this study are collected with a semi-structured interview form which is occasionally used in phenomenological researches according to Yıldırım and Şimşek (2011).

While developing the semi-structured interview form, the literature is reviewed, and three teachers who have previous experience on the subject of this study have been interviewed, then the open-ended questions are prepared in reference to the data gathered from these interviews. Afterwards, two domain experts have examined the form and their opinions are taken into consideration. Two Turkish language teachers have gone over the form to check its legibility and clarity. Thereafter, the final semi-structured interview form is implemented on two teachers who are not included in the study group, and as a result of the feedbacks, it is determined that the interview form is suitable as data collection tool of this study. The questions posed to the participants are; a) How do TUBITAK 4006 project studies affect the school environment? b) How do TUBITAK 4006 project studies affect teachers? c) How do TUBITAK 4006 project studies affect students? d) How do TUBITAK 4006 project studies affect parents? e) What are your suggestions to make TUBITAK 4006 project studies more efficient and productive?

To employ the data collection tool, particular schools have been visited and the interviews are conducted with the school administrators and the teachers. Due to the unwillingness of the participants for voice recordings, their answers are noted down. So as not to skip any data, the participants are asked to fill in the interview form. As a result, it is seen that there is consistency with the interviewer's notes and the participants' interview forms.

Data Analysis

Data analysis in qualitative searches includes organization of data for the analysis, coding and gathering the observed data, thematizing them, and finally presenting the data in figures, tables or as a discussion (Creswell, 2013). The research data is evaluated with content analysis. As Yıldırım and Şimşek (2011) stated before, the coding process is completed after data during content analysis are examined in significant distinct fragments. The processed data obtained after coding are categorized and thematized, and data are made ready for representation. In presenting the data, the "representation through discussion" method which is stated by Creswell (2013) is adopted.

While representing data through discussion, the participants' similar opinions were presented in a paragraph under pseudonyms. In the paragraphs, data were represented complementarily and fluently. The data represented under the themes were given in different paragraphs showing positive and negative views separately. Mainly, the findings were remarked for the readers in the first paragraph. Direct quotations were occasionally given in italics or in quotation marks in the paragraphs. After the coding of the data was finalized, an academician, who is a domain expert, were consulted

and it was found out that there was %85 (Miles and Huberman, 1994) similarity between the codes. Of the participants, the administrators were indicated as (A1, A2, A3), and the teachers as (T1, T2, T3).

Validity and Reliability of the Study

In this study, instead of using the terms validity and reliability, the concepts of credibility, transferability, consistency, and confirmability are preferred as Mills (2003) suggested. For this reason, in order to provide credibility, the interviews were conducted face to face, and besides the participants were asked to give their answers in written forms. With an objective stance during the interview, the participants were prevented to exhibit a particular bias. Collected data were examined under a word file. As for the transferability, each step of the study was clarified in the method section. By sharing the research questions, they are made public to be used in other studies. In order to provide consistency, interview memos and participants' written forms were compared and checked. In addition, the feedbacks of two domain experts were also contrasted to reinforce the rate of consistency. Data collection process was clearly indicated in the study as regards to confirmability.

FINDINGS

As a result of the analysis, the opinions of the teachers and administrators are presented under two themes and seven categories. The themes are classified into the effects on teachers, the effects on students and the effects on parents for the both participant groups. And, the suggestions category is presented under a particular chapter.

Teachers' Opinions on 4006 TUBITAK Project Studies

All the participants expressed their positive and negative opinions on TUBITAK 4006 project studies as well as their suggestions. This shows that the participant can consider the issue with various aspects. Much as 4006 TUBITAK project studies make the stakeholders in schools feel content, the problems that arise during the process shouldn't be disregarded. The teachers' opinions as a result of the analysis on the findings are examined under three categories which are the effects on students, the effects on teachers, and the effects on parent.

The Effects on Students

All of the participants have stated that 4006 TUBITAK project studies have beneficial outcomes for students when the processes of the projects are well organized. Especially, their advantages are defined such as its support in students' gaining self-confidence, developing their critical and creative thinking abilities, boosting their problem solving skills, learning with fun, encouraging scientific research, improving their sense of wonder, improving the cooperation between students and teachers, motivating students.

Considering these, the participant S3 stated that *"it contributes to the interests of the students by making them think about and working through the project, solve problems, concentrate on a specific topic."*, and the participant S7 expressed that *"it creates an entertaining, didactic, and educational environment where students can share their scientific information after with their friends, teachers, and anyone who is interested."* The participants S8 and S6 pointed out that during the preparation of the projects, the method of learning through experience is highly functional, and it promotes learning of the scientific methods. The participants S10 and S2 emphasized that these projects provoke students' curiosity and increase the cooperation between students and teachers. S9 described the benefits of the project studies saying *"They both give students self-confidence and contributes to their desire to do researches. A students can get experience in doing researches on a topic, how to write a hypothesis, and their finding solutions etc. and they feel the happiness of creating a product."*

All of the participants think that unless 4006 TUBITAK project studies are carried out in accordance with its purposes, they bring disadvantages. It is pointed out that some students do not take responsibility, they consider them as an obligation, the ideas of the projects do not belong to students, unauthentic projects do not improve students' creativeness, they fall behind in their classes, and students do not have enough knowledge.

The participant S2 stated that students do not take any responsibility, and added on *"What is good about a study on which students do not think, produce nothing, and make no effort for. They are just a show off, and a cut and paste activities."* S6 told that he project studies are obligated to students and *"It is not possible get an outcome by just saying let's do a project. It would be better to fully support students, and to provide opportunities them if there happens to a study that emerges naturally."* S1 pointed out that especially 8th grade students are unwilling to participate in project students due to their high school entrance exam, and these projects are *"just a waste of time, and causes them to fall behind in their classes"*. Another participant, S9, stating that the project studies must be carried out in accordance with their purposes, argued that *"when a goal-oriented way is followed, there can be a good educational result, but when they deviate from the aim, they just become a burden on teachers and students."* S6, S8, and S7 emphasized that it is important to find ways to motivate students who are reluctant and irresponsible.

The effects on Teachers

All the participants stated that the project studies contribute a lot to teachers who actively participate in projects. Especially, there are some notable opinions which are; they provide teachers self-confidence and job satisfaction in their profession, they consolidate the cooperation between teachers and students, they give teachers the opportunity to get to know and discover their students, they improve teachers' counselling skills, they make teachers realize their inadequacies, and they lead teachers to motivate themselves to make projects.

The participant T1 expressed that *"the process of developing a project is tiresome, but it helps teachers to gain self-confidence towards doing projects."* And T5 stated that project studies enhance teachers' job satisfaction and their productivity. Besides, T1 highlighted that projects contribute to students' individual development and stated that *"I think each student is an undiscovered treasure, and teachers have the chance to discover these treasures. What else could make a teacher happier than this?"* The participants T2 and T6 stated that the process of project developing helps them realize their occupational inadequacies, and leading them to compensate them, in addition to this, T10 expressed that *"project studies are good opportunities for teachers to improve their skills."* T8 and T4 explained that teachers do not have extra time for managing these projects during their class hours, so thanks to these projects, they get the opportunity to organize the activities that they are not able to do during class hours. Similarly, T3 stated that with the help of 4006 projects, teachers and students collaborate with each other and this has a positive outcome for the sake of the both parties' development.

All the participants expressed that 4006 TUBITAK project studies are not functional in teachers' aspect when they are not in accordance with its aims. Some of the highlighted drawbacks are; projects take up too much time of teachers, teachers' doing the projects instead of students, teachers' inadequate knowledge in designing projects, unauthentic projects having no benefit, teachers are forced to do the projects, teachers' being reluctant to participate in projects.

In addition to these disadvantages, T7 stated that *"Unfortunately, teachers carry all the burden on their shoulders. The teachers does the research, but the students present the project. This generation is used to gain everything effortlessly and they aren't making any effort for the projects, so they can't produce anything."* Similar to this, T5, T3, and T1 remarked that during the project developing process, while teachers are actively striving, students just do the presentation. The participants T8 and T6 criticised that these projects must be done voluntarily, however, teachers are forced to participate in these studies by school administrations. T9 noted the reaction against this

enforcement saying *"We are such frustrated by the enforcement that some of colleagues intentionally offer poorly designed projects so that their projects can be rejected. They don't want to be bothered with this burden."* T10 expressed that developing a projects necessitates special expertise and skills, and added on *"As teachers we have too many inadequacies in designing an educational projects and counselling students for them."* As the participant T2 clearly defined, teachers who are project coordinators lack the experience and knowledge needed in projects, and this causes them to be demotivated and to lose their interest in the projects.

The Effects on Parents

All the participants stated that 4006 TBUITAK project studies are beneficial with regard to parents. In parents' aspect, there appeared no negative view. Some notable views are; parents take part in education, they are proud of their children's work, they are pleased with their children's taking responsibility, and with the awards granted by TUBITAK for the projects, parents' more frequent visits to schools.

T3, T7, and T9 expressed that parents feel proud of their children's projects, and they feel great joy while they are visiting project exhibition. T5 described that the responsibility students take makes parents pleased, and added on *"the parents become content when they see their children taking responsibility and achieving an objective."* According to the participants, the most welcomed side of the projects is the awards granted. T1, T4, and T10 uttered that financially disadvantaged students abstain from these kind of projects, but thanks to the awards granted, parents can also support their children. Through the projects, T2 stated that the parents are involved in education, they improve cooperation in teacher-student-parent triangle, and added on *"The parents visit schools more frequently during the process of project preparation. They ask questions about projects, they offer their support, with the projects, schools have become a more attractive place for parents.*

School Administrators' Opinions on 4006 TUBITAK Project Studies

All the administrators expressed negative opinions on 4006 TUBITAK project studies while eight participants expressed positive opinions. As a result of the analysis on the findings obtained, the opinions of the administrators, the effects on students, the effects on teachers, and the effects on parents are examined in three categories.

The Effects on Students

The participants stated that if 4006 TUBITAK project studies are conducted in accordance with its objectives, they can contribute a lot to the development of students. The participants having a positive attitude claimed that project studies improve cooperation between students and also develop their socialization, raise their awareness, increase their performance, lead them to study, help them feel a sense of accomplishment, improve their sense of responsibility, help them to discover their hidden talents, reinforce their entrepreneurialism, improve their research and interpretation skills.

The participant A2 argued that *"students have the opportunity to improve themselves by taking part in projects",* and A5 stated that *"students' interest in science as extracurricular activities contributes to science"* Furthermore, the participants A1 and A6 claimed students feel the satisfaction of obtaining a result and finalizing a task so that their self-confidence is improved. A3 emphasized that school is not just about courses, and noted that *"with the project studies, student have the chance to express themselves outside their classrooms and this changes their attitudes towards school.* Y7 and Y5 pointed out that thanks to the project studies, students could improve their entrepreneurialism, and this encourages them to be open to new experiences. A8 underlined the improvement of the relationship between teachers and students, and stated that *"as far as I can see, students'*

sense of responsibility is improved and it contributes to their skills of doing researches, thinking, and interpretation as well as discovering their talents."

All the participants claimed that when 4006 TUBITAK project studies are not carried out in accordance with their aims, they do not make any sense for the benefit of students. Some significant opinions are, unauthentic projects, less efforts by the students, students' skipping the classes, waste of time, problems in schools' discipline and order, students' only doing the presentation, their being obligators is a waste of sources, they implicitly engage students in deception.

A2, A5, and A9 claimed that teachers manage the projects alone and students just do the presentation of them and this doesn't bring any benefit to students. A10 stated that students do not take part in developing a project actively, and added on *"these projects are perfunctory, students do not make any effort, and this is just a waste"* A6 drew the attention to the problems occur in discipline and order of school during project period, and students have to skip their classes, moreover, A3 uttered that *"there are some successful students who skip their classes and they are affected negatively"* The participant A7 had a different standpoint, and claimed these studies are just deception; they misguide students as they imitate previous projects, and they misleading students to cheating and forgery, and added on *"this is because the students are expected to do a scientific study although their curriculum doesn't include a scientific, critical thinking approach. They cannot devise a project; however, teachers have to design projects due to the demand by directorate of national education, and students present these projects like theirs."*

The Effects on Teachers

The participants believe that 4006 TUBITAK project studies increase teachers' motivation, contributes to teachers' educationally, teachers feel proud of their work during project presentations, they raise teachers' sense of belonging to school, teachers gain self-confidence while doing the projects, and teachers develop their vocational skills.

The participants A3 and A5 pointed out that with the project studies, teachers can break their routines and try new things, and this positively affect their motivation. A7 emphasized teachers' organizational commitment uttering *"I notice that teachers who have done successful projects come to school willingly and cheerfully."* Similar to this, A10 stated that teachers feel proud of themselves at the end of the project period, uttering *"It is worth to see the pride and happiness in teachers during the presentation of the projects."* A1 and A6 expressed that teachers gain self-confidence thanks to these studies, and A8 mentioned their contribution to teachers' vocational competence, remarking *"teachers have difficulty in improving their vocational competence. They don't have the chance to do that in schools. With the project studies, they get the opportunity to improve themselves."*

Some of the significant opinions of the participants about the negative sides of 4006 TUBITAK project studies are, teachers carry all the burden in developing the project, teachers are obliged to do projects though they are voluntary studies, teachers' reluctance in staying in schools after their classes are over, their spending less time in classes, dealing with the paperwork.

A3, A4, and A9 argued that teachers find the project idea, and they seek to put these projects with students, so this indicates that teachers do the projects rather than students. A5 stated that teachers are pressed by directorate of national education into participating these projects, uttering *"normally, projects require volunteering. The teachers who are willing to take part in the projects already do what they have to do. However, when these teachers are obliged to participate in the project, it makes the process tedious and senseless."* The participants A6 and A7 stated that teachers already have a heavy workload at schools, and together with the projects, teachers main responsibility which is lecturing is interrupted. A2 underlined teachers' unwillingness to spend extra time in schools, likewise, A1 and A8 claimed that teachers consider the project studies as paperwork and they are not attentive enough to the projects.

The Effects on Parents

Most of the participants stated that 4006 TUBITAK project studies don't have a significant effect on parents. A3 and A8 thought that some parents are mainly interested in their children's achievements, but others are in the opinion that due to the project studies, students skip their classes.

A9 noted that *"TUBITAK 4006 studies are advantages especially for rural school as they don't have many chances in rural areas considering their distance. Project exhibitions in rural schools positively affect both students and parents"* and also pointed out the parents in rural schools are more enthusiastic about the projects. A2 remarked that they cause financial burden on parents and they are deception, moreover, parents do not show their support with the projects. However, A4 and A10 put forward that project studies arouse parents' sympathy to schools, and they enjoy seeing the project exhibitions.

Teachers and Administrators' Suggestions on 4006 TUBITAK Project Studies

Regarding to 4006 TUBITAK project studies, teachers recommended that projects should be authentic, students should be active in the project period, projects should be conducted voluntarily, not compulsorily, teachers should receive special training about projects, parents should be informed about projects, TUBITAK should give priority to promising projects, and all the teachers should take the responsibility in project studies.

T2 emphasized that *"whatever we do, however simple it is, it must include authenticity, it must reflect students' ideas, it must be taken seriously tough very simple. They don't have to be perfect, they mustn't pretended to be better than what they are."* Similarly, T5 argued that *"they must be picky about patents of the projects, and it is important avoid wasting time with unauthentic projects."* About one of the biggest problem which is compelling to do the projects, T3 pointed out that *"directorate of national education should not force schools to do the projects, the schools should volunteer themselves."* And T7 explained *"only with voluntary teachers and students, prolific indiciduals can come out."* T10 stated that project period has some certain steps, teachers and students should be trained about them, and added on *"I think coordinator teachers and student who are supposed to participate in science fairs should be given seminars or in-service training. Teachers' awareness in project consultation and scientific research studies should be raised.* T6 drew the attention to the parents' support saying *"parent should be informed about it. It can be more effective to consider the projects as an opportunity to improve students' creativeness, not as ordinary homework."* T9 argued that TUBITAK do not give priority to promising projects and added on *"When TUBITAK do not give particular importance to promising students causes us think "Why would I do a project" First of all, TUBITAK should attach importance to projects. The authorities there should be qualified with their scientific knowledge."* T8 criticised that simply one teacher is assigned as project coordinator, all the teachers in schools must share the responsibility in project studies.

School administrators mainly suggested that 4006 TUBITAK project studies should be authentic, they shouldn't have financial stress, a student-centred approach should be adopted, students should be guided city-wide, the number of class hours should be reduced and there should be spared more time for the projects, project should be conducted on a volunteer basis, setting up R&D units at schools, and training of the project stakeholders.

About the authenticity, A8 stated that *"instead of ordinary projects, the ones which are feasible, authentic, and leading teachers and students to do researches should be picked."* Additionally, A3 added that *"the projects must be authentic, scientific, and they must be carried out after brainstorming."* The participant A4 thought that *"the quantity of the participation should be low, but the quality must be high."* A8 explained that students must actively take part in project studies and noted that *"even though they are not a hundred percent authentic, the projects reflecting students ideas should be concentrated, supported*

and guided." A10 remarked that the stakeholders of the projects should be trained, *"teachers should be trained, convinced, supervised, given punishments and rewards, and school administrator should also be trained."* Furthermore, A1 stated students should be given professional assistance in city-wide. A7 noted that there are too many class hours to concentrate on project studies, so the class hours should be reduced. A2 referred the importance of R&D researches in the project period, and suggested to set up R&D units at schools. Having a different perspective, A5 thought that project studies should be carried out considering schools' fields of study, so science high schools should take the leading role, besides, projects studies are fruitless in secondary school levels, and mainly high schools should be engaged in science projects.

DISCUSSION AND CONCLUSION

All the participant teachers and administrators agreed that 4006 TUBITAK project studies are beneficial when conducted in accordance with their objectives and the project period is well managed. Teachers and administrators noted that science fairs contribute to students' social, affective, and cognitive development. According to the literature, it is understood that 4006-TUBITAK science fairs provide multiple contribution to students. 4006-TUBITAK science fairs; according to Okuyucu (2019) contribute a lot to students and teachers' personal development, and improve their high-level thinking skills, to Çolakoğlu (2018), raise teachers and students' enthusiasm, research and development, eagerness to learn; to Sontay, Anar, and Karamustafaoğlu (2019), help students gain the abilities such as cooperation, creating new ideas, self-expression; to Atalmış, Selçuk and Ataç (2018), arouse students' interest in participating social and cultural activities, improve their self-confidence, affect positively in school cognitive and affective behaviours. Besides, Ozdemir and Babaoglan (2019) identified a positive relationship between scientific process skills of the students who participate in TUBITAK 4006 science fairs and their attitudes towards science fairs and science classes.

Apart from 4006-TUBITAK science fairs, there are other science fairs organized by different institutions under different names, and they also contribute to students' development. The studies show that students taking part in science fairs; according to Grote (1995), Çavuş, Balçın and Yılmaz (2018), Sülün, Ekiz and Sülün (2009), improve their science and problem solving skills; to Esteves and Costa (2011), obtain new terms and gain the ability to do researches; to Ndlovu (2013), have the opportunity to experience real world; to Karadeniz and Ata (2013), develop their sharing, self-expression skills, and also influence their other classes positively; to Keçeçi (2017), develop their skills in using the technology, and transfering their knowledge into real life; to Ocak and Korkmaz (2018), improve such skills as hands-on learning, acquiring permanent and tangible information. Yıldırım and Şensoy (2018) found out that there was a significant increase in their attention scores in scientific subjects with the students in the experimental group who participated science festivals, and it was identified that following the research, this increase continued after twelve weeks. Furthermore, Lattımer and Riordan (2011), Johnson and Delawsky (2013), Tonbuloğlu, Aslan, Altun and Aydın, (2013), Çıbık and Emrahoğlu (2008), Korkmaz and Kaptan (2002) discovered that project-based learning supports the development of students.

All the teachers and administrators agreed that 4006 TUBITAK project studies cause troubles when they are not carried out in accordance with their objectives. The notable opinions are; students do not take responsibility in projects, they don't have enough information, unauthentic outcomes, the problems occur with the discipline and orders of the schools. According to the studies on TUBITAK 4006 Science Fairs, there are similar findings indicating the negative effects of them on students. Atalmış, Selçuk, and Ataç (2018) stated that due to the university entrance exams, students do not pay attention to or concentrate on projects, they do not get the support of their friends; Okuyucu (2019) found out that the shortage of laboratories, the insufficient sensitivity of the school administrations affect project studies negatively. Another study by Sontay, Anar, and Karamustafaoğlu (2019) suggested that the troubles with which students face during the project period are; students cannot

finish their projects in time, they don't have the necessary materials, they worry that they cannot develop the project.

The studies on project and science fairs apart from TUBITAK 4006 Science Fairs show that students, according to Ünver, Arabacıoğlu, and Okulu (2015), are reluctant, consider the projects like ordinary homework, try unauthentic projects; to Syer and Shor (2001), the time pressure that students face while preparing the projects lead them to unauthentic projects, and there isn't given sufficient financial support for the projects. Furthermore, Hampton and Licona (2013) identified that due to the insufficient support given to students, the stress they feel keep them away from science, the problems that face during the project period creates misconception in students, and science is monopolized by some favorite elite students. It can be understood that both TUBITAK 4006 Science Fairs and other projects and fair studies possess negative outcomes affecting students. These findings support the results of this study.

All of the participants agreed that 4006 TUBITAK project studies have important contributions to teachers. Some notable opinions are; they provide self-confidence and job satisfaction to teachers, they increase the organizational commitment of teachers to schools, they create the opportunity for teachers to get to know their students and discover their potentials.

When the researches in the literature on project studies and science fairs are considered, it appears that they mainly focus on students. Their effects on teachers are not much elaborated. In respect to the researches on 4006 TUBITAK science fairs, Okuyucu (2019) claimed that teachers who are mentors in science fairs gain the abilities of managing the different phases of projects and guiding students, and Çolakoğlu (2018) argued that teachers become more eager to learn and to do searches as well as students. With regard to other project and science fairs rather than 4006 TUBITAK science fairs, Akıllı (2017) pointed out that teachers gain experience in project preparation and implementation, Lam, Cheng, and Choy (2010) argued that teachers begin to think innovative and freely when they get enough support. Katz and Chard (1992) found out that teachers academic and intellectual capabilities are improved.

About the negative effects on teachers, the participant teachers and administrators agreed that teachers do not have enough information on designing a project, the projects are considered as being compulsory, and they give rise to teachers' workload. There are similar findings in the literature. Accordingly, Chin lu (2013), Özden, Aydın, Erdem and Ekmekçi (2009), Atalmış, Selçuk and Ataç (2018), Bulunuz (2011) and Clark (2006) stated that teachers who are not experienced in projects face difficulties and they are not productive; Ünver, Arabacıoğlu and Okulu (2015) argued teachers have troubles in motivating students to design projects and getting the necessary financial aids, DeClue, Johnson, Hendrickson and Keck (2000), Bulunuz, Tapan-Broutin and Bulunuz (2016) pointed out that teachers have difficulty in finding original themes for the projects, and Okuyucu (2019) found out that teachers can not show their interest in project due to their intensive programs.

While teachers claimed that project studies positively affect parents, and they are proud of their children, and they visit schools more frequently, the administrators thought parents concentrate on their children's academic achievements. In the studies about 4006 TUBITAK, it is found out that parents; according to Sontay, Anar and Karamustafaoğlu (2019), help their children while preparing the projects; to Atakmış, Selçuk and Ataç (2018), are more inclined to contribute to schools thanks to the project studies. In other studies about science fairs and project studies in the literature, it is claimed by Arı (2010) that three quarter of teachers are in the opinion that parents regard projects and performance task as extra costs, heavy burden, and unnecessary activities; by Ünver, Arabacıoğlu and Okulu (2015) that some projects are prepared by parents but they are pretended to be students'; however, it is argued by Katz and Chard (1992) that projects provide the opportunity to work closely together; by DeClue, Johnson, Hendrickson and Keck (2000) that students are more successful with the support they get from their parents; by McDonough (1995) that when there are more support from the parents, students' become to have a more positive attitude to science fairs. On the other hand, Liu and Chien (1998) found out that the parents who have got training for projects support their children,

and build better relationship with them while the parent who do not attend trainings for the projects consider the whole process as extra cost and waste of time.

Teachers and administrators suggested that 4006 TUBITAK project studies should be authentic, teachers and students should be trained, and they should participate in projects voluntarily.

When the studies about projects and science fairs in the literature are examined, it is seen that teacher training is one of the most common aspect of the suggestions. It is suggested by Chin lu (2013) that teachers should be trained through case study method; by Çiğdemoğlu, Tekeli and Köseoğlu, (2019) that teachers should be trained as mentors about project-based learning; by Demirezen and Akhan (2017) that a course on Action Search method is useful; by Ndlovu (2013) that teachers should be trained about projects. Trevethan, Kataoka and Silva Oliveira (2009), Yıldırım and Şensoy (2018) claimed that formal and informal learning environements should be integrated, and McDonough (1995) and Liu and Chien (1998) highlighted that parents should be trained about projects. Moreoever, Lattımer and Riordan (2011) discussed about conferences targeting parents, teachers, and parents; Wilson, Cordry and Unline (2004) referred to the importance of teachers' support; Bencze and Bowen (2009) pointed out sponsorships for the science fairs.

Fleming (2000) determined the 6 steps of designing a project as; authenticity, academic commitment, applied learning, active discovery, adult support, and evaluation practices, and thus put forward a pattern about how to implement project studies. It can be useful to build a training course according to this pattern. Dionne, Reis, Trudel, Guillet, Kleine and Hancianu (2012) determined the source of motivation to students to participate in science fairs as interests in science fairs, self-efficiency, appreciation and accomplishment, willingness to be part of a rich social environment, acquiring new learning experience skills. These findings which are intended to students' motivation can be used to provide students' participation in science fairs.

Based on the Research Findings,

The following ideas can be suggested;

1. The directorate of national educations should organize trainings for teachers, administrators, and students on project-based learning,

2. Granting extra services scores to teachers participating in science fairs,

3. Granting extra services scores to administrators who are qualified to organize science fairs in their schools while appointing school administrators,

4. Granting extra scores to students participating in science fairs after high school entrance exams (LGS),

5. Training parents by schools about the project period to get their support,

6. Allocation extra rewards by TUBITAK to authentic and promising projects,

7. TUBITAK 4006 science fairs should be an indispensable part of the school culture and teams should be organized to enable all the stakeholders to work cooperatively,

8. Students acquired skills and their project deliverables which they achieve during the science fairs should be registered on e-portfolio system within the scope of lifelong learning.

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