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The Views of Primary School Mathematics Teachers about Mathematics Project Studies in Schools

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ABSTRACT

The purpose of this study is to search the knowledge of primary school mathematics teachers about projects and their opinions about projects and project competitions. The projects which were started to use together with the renewed education programs are methods which allow students to access new information by searching a subject that they want. In the research, first a survey which was prepared by the researchers was conducted together with 72 primary school mathematics teachers who are working in the city of Istanbul. Semi-structured interviews were carried out with 6 teachers which were selected among them. After the data had been analyzed quantitatively and qualitatively, the findings of the study were interpreted. At the end of the study, it was concluded that most of the teachers were using projects in mathematics lessons and students of those teachers also participated in project competitions; however the knowledge of teachers about projects was insufficient and in addition to that projects and project competitions were not supported by parents and schools.

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Keywords:
Project, mathematical project competitions, teachers' opinions

Introduction

In this era where the change and development is inevitable, the information is constantly increasing and continuously renews itself. Learning which is enriched with methods and techniques where students can access information on their own and where students are in the center is highlighted. It is ensued with various researches that these method and techniques are more effective in students' learning. Projects are one of these highlighted methods and techniques.

Projects are studies which are carried out in groups or individually with the guidance of the teacher to make inferences, to produce original ideas, to access new information, to produce an idea and to analyze, search and interpret a subject that the student wants to study on (Ministry of Education, 2008). According to Erdem and Akkoyunlu projects are defined as developing a design, dreaming and planning (Çıbık and Emrahoğlu, 2008). Project –based learning is an approach that puts students in the center of teaching and learning process and includes real life situations and applications (Demirel, 2006). While a teacher is a guide and counselor in project-based learning, students are the ones who are implementing projects by themselves, who access information and who present exploratory and unifying information. Project is a product and project-based learning is the process of acquiring this product. According to Korkmaz and Kaptan (2002) up till now in the studies which have been carried out in our country about Project based learning, it is seen that teachers do not have much information about project studies and they cannot guide students much on this subject.

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According to the Demirel (2005) project-based teaching approach consists of such steps; organizing groups within themselves by determining the topic and sub-topics, making project plans of the groups, carrying out the project, planning the presentation, presentation and evaluation.

As in every teaching method, project based learning have advantages and disadvantages. According to Hamurcu (2000) project work has important advantages in terms of life skills such as planning, preparing a budget, using technology skills such as using computer and internet, cognitive skills such as making a decision, critical thinking and problem solving, self-regulatory skills such as creating a target, organizing processes and time management, attitudes such as being curious about learning and education for future, tendencies such as self-regulation and the feeling of success and having an effect on gaining self-sufficiency beliefs (cited in Önen at all, 2009). Besides, students can study more easily in project works and in individual and cooperative learning environments (Shearer and Quinn, 1996). In addition to its advantages, project based learning also has disadvantages such as; increasing the work load and responsibility of the teacher, extension of time and an extreme deviation and dispersion from the topic when the borders of the topic are not clear (Korkmaz & Kaptan, 2001).

Today as a result of various researches it was appeared that project works increased the students' achievement, attitude and some thinking styles (Thomas, 2000; Korkmaz, 2002). From the studies conducted in the field of Mathematics and Science, from observations and experiences it was seen that students could learn subjects in an enjoyable environment and more effectively with the help of supporting Mathematics and Science lessons with projects (Smith, 2001). Thomas (2000) as a result of researches and reviews related with the project based learning concluded that teachers and students viewed project approach as an effective and useful method. Besides, it was demonstrated that project works affected the attitudes of students towards lessons positively and provided opportunities for teachers to display their professional properties.

However, when the literature was analyzed, it was seen that there are a few studies about identifying the opinions and qualifications of teachers about projects and project based learning. The success of the project works that provides significant improvements for students depends on how well the teachers who have the guidance role for conducting the project know this process and in what ways they can transfer their knowledge to their students. Therefore, teachers' qualifications about this topic and problems they faced during project works should be identified. By this way some shortcomings can be eliminated and the process of preparing a project can reach targeted results in a shorter time in terms of both for teachers and students by taking certain precautions when necessary. From this perspective 'What are the Knowledge Levels of Primary School Mathematics Teachers about Projects and Their Opinions about Projects and Project Competitions?' was determined as the research question of the study. With this purpose in mind, the answers of the following sub-problems were searched:

- What are the knowledge levels of primary school mathematics teachers about the projects?
- What are the opinions of primary school mathematics teachers about the projects and project competitions?
- What are the difficulties that primary school mathematics teachers faced while conducting projects?
- How do primary school mathematics teachers manage Project Works? (Topic selection, evaluation and guidance)
- What do primary school mathematics teachers think about the advantages and disadvantages of project works?

Method

Design of the Study

Both qualitative and quantitative research methods were used in the study. In the first part of the study, scanning method was used among quantitative research methods. Scanning model is an approach which is trying to define a situation from past or present as it exists today (Arlı & Nazik, 2001). Coding system was

used during the qualitative analysis of the open ended questions. According to Bogdan and Bikle (1992) coding system consists of several steps. The researcher analyzes the similarities, patterns and samples, and then writes them as words, concepts or sayings that will represent them. These concepts or sayings are the coding categories (Cit: Ekiz, 2009). In the study attitudes which owned by people who were investigated in the research were coded. According to Bogdan and Bikle (1992) general considerations, common rules and norms shared by people who were investigated stated in the coding category of attitudes which owned by people. Certain sentences and words used by individuals were also used in coding (cited in Ekiz, 2009). In the second part of the research, semi-structured interviews were used among qualitative research methods. Qualitative research; is a research in which a qualitative process is followed for presenting perceptions and events in a holistic manner in natural environments and in which qualitative data collection tools are used (Yıldırım & Şimşek, 2006).

Universe, Sample and Study Group

All the primary school mathematics teachers who were working at public schools in Üsküdar, Kadıköy and Bakırköy districts of the city of Istanbul were the universe of the study and 72 of the primary school mathematics teachers who were working in the same district were the sample of the study. 6 teachers who were selected for the sample consisted of the study group of the research.

Data Collection

In the research firstly, a survey was conducted with the teachers who were in the sample group of the study; later on six teachers selected among them were interviewed by using semi-structured interview forms. After conducting surveys, 6 teachers who has different experience about project studies, were interviewed by using semi-structured interview forms.

Analyzing of the Data

The quantitative data of the study was analyzed by using SPSS 15.0 statistical packet program. During the analysis of quantitative data, in order to determine the distribution of teachers' opinions about the projects, frequency (f) and percentage (%) values of each sub-problem were given in tables and necessary evaluations were made. The open-ended questions used in the survey and semi-structured interviews which were carried out with teachers were analyzed qualitatively. Content analysis was used in analyzing the qualitative data. Audio recorded interviews were written for the analysis. The collected data was interpreted according to the answers provided by teachers.

Findings

Demographic characteristics of the teachers obtained from the first part of the survey are given in Table 1 and Table 2.

Table 1: The Frequency and Percentage Distributions of Teachers' Genders according to their teaching experience

	Teaching Experience											
	0-5		6-10		11-20		21-30		31 and more		Total	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Female	34	69,39	8	16,33	6	12,24	1	2,04	-	-	49	100
Male	5	21,74	9	39,13	5	21,74	2	8,7	2	8,7	23	100
Total	39	54,16	17	23,61	11	15,28	3	4,17	2	2,78	72	100

As it is seen from Table 1, the majority of the teachers who participated in the study were consisted of female teachers (68%). When the total working time of the teachers were analyzed, it was seen that teachers who had 0-5 years teaching experience that can be considered as novice teachers were the majority of the teachers (54%). This situation is thought to be important in terms of identifying the degree of compliance of the current teacher training system with the constructive teaching practice of the education system. The information about the faculties from which the teachers graduated is stated according to their gender in Table 2.

Table 2: According to the Gender s of Teachers, the Frequency and Percentage Distribution Values of the Faculties from which the Teachers Graduated

	Graduated Department							
	Mathematics (Faculty of Science and Literature.)		Primary School Mathematics		Secondary School Mathematics		Total	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Female	13	26,53	33	67,35	3	6,12	49	100
Male	7	30,43	10	43,48	6	26,09	23	100
Total	20	27,78	43	59,72	9	12,5	72	100

As it is seen from Table 2, the majority of the teachers (72%) were graduated from faculty of education. In Table 3 the distribution about where the teachers got the information about projects is given according to their gender.

Table 3: According to Teachers' Gender, The Distribution of Where the Teachers Got the Information about Projects.

	Undergraduate		Graduate		In-service Training		Workshop		With My Own Effort		Other	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Female	24	14,29	10	35,72	3	10,71	1	3,57	9	32,14	2	3,57
Male	4	55,81	4	9,3	3	6,98	3	6,98	9	20,93	-	-
Total	28	39,44	14	19,72	6	8,45	4	5,64	18	25,35	2	1,4

As it is seen from Table 3, only 39% of the teachers stated that they got the information about projects from their undergraduate education. More than half of the teachers (61%) expressed that they received the information about projects other than their undergraduate education. This situation points out that there is a shortcoming about this subject in undergraduate education. Table 4 shows us the distribution of the teachers' answers which were given for the questions stated in the second part of the survey.

Table 4: The Distribution of Teachers' Answers to the Short- Answer Questions in the Second Part

	Yes		No		Empty	
	(f)	(%)	(f)	(%)	(f)	(%)
Have you ever used projects?	64	88,89	8	11.11	-	-
Are you taking your students to project fairs?	44	61,11	27	37,5	1	1,39
Are you encouraging your students to go project fairs?	58	80,55	13	18,06	1	1,39
Are you getting help from branch teachers?	41	64,06	23	35,94	8	11,11
Have you ever participated in project competitions?	50	78,13	14	21,87	8	11,11
Have you ever succeeded in project competitions?	7	10,94	51	79,69	6	9,37
Are you getting your students to prepare project diaries?	37	57,81	27	42,19	0	-
Are you getting your students to use time schedule?	53	82,81	11	17,19	0	-
Do you agree with opinion that 'You cannot do projects in Mathematics'?	2	2,78	64	88,89	6	8,33

As it is seen from Table 4, 64 of the participant teachers have used before but 8 of them have not used projects before. Although 11% is a small proportion of teachers when it is compared with the general situation, having teachers who have not used projects before is an important issue which is needed to be focused on.

In the survey teachers were asked about whether they were taking their students to the project fairs or not. It is obvious that project fairs have an important role for students both to get motivated to develop projects and to get an idea about how to do a project by analyzing the projects. With the answers of this question it was concluded that 37% of the teachers have never taken their students to the project fairs and a portion of 18% did not even encourage them.

In the survey teachers were asked about whether they got help from branch teachers or not. It is necessary to display an inter-disciplinary approach both in teaching the subject and in doing projects. So, concepts related with subjects can be constructed effectively by establishing relationships between concepts related with different lessons. However, it is seen that an outstanding proportion (36%) seem to ignore this situation.

50 of the teachers who used projects declared that they attended project competitions, 14 of them said that they did not attend competitions. 8 teachers did not respond this question. When the teachers were asked why they did not want to attend project competitions, they declared the reasons as there were not any competitions in the district where they were working and even when there were competitions they could not hear about competitions. When the teachers who attended competitions were asked whether they succeeded or not, 7 of the teachers said they were and 51 of them said they were not. 6 of the teachers did not respond this question.

In the survey, there were questions about the process of doing projects for the teachers who use projects. When it is thought that activities such as project diaries and time schedule enable to carry out the project work systematically, it is obvious that not using these activities in project work is an important deficiency. As it is seen above 78% of the teachers stated that they could not be successful in project competitions. It is thought that one of the reasons of this finding may be the lack of information and application such as not getting students to use project diaries and not getting students to prepare time schedule in the process of doing projects.

When teachers were asked whether they agreed on the idea that 'Projects cannot be done in Mathematics' or not, 64 of the teachers stated that they did not agree with the idea and 2 of them stated that they agreed with the idea. 6 teachers did not respond this question. Teachers stated that projects could be

done in Mathematics lessons and they generally compared with mathematics lesson with science and technology lesson. They expressed that there were more creative projects in Science and Technology lessons. They declared that there could be more creative projects in mathematics but they were more difficult and more time consuming. The opinions of two teachers are given below.

'I do not agree with this idea. As in Science and Technology lessons, very creative ideas can also be found in Mathematics'.

'Projects can be done but it is difficult to find projects since it is not as visual as the Science and Technology lesson'.

In Table 5, the distribution of the answers of the questions related with how the project costs are met, how the project is carried out individually or group work and who decided the project topic is given.

Table 5: the Distribution of the Answers of the Questions Related with How the Project Costs are Covered, How the Project is carried out individually or Group Work and Who Decided on the Project Topic

	Student		Teacher		Both		Empty	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Who is deciding on the project topic?	31	43,06	14	19,44	23	31,94	4	5,56
	Individually		Group		Both		Empty	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
How you are doing projects?	7	9,72	34	47,22	23	31,95	8	11,11

As it is seen from Table 5, In the survey when the teachers using projects were asked about who decided on the project topic, 31 teachers stated that students decided and 14 teachers stated that they decided on the project topic. 23 teachers stated that they decided on the project topics together with students. 4 teachers did not respond this question.

When teachers were asked whether they got students to do projects individually or in group work, 7 teachers answered as individually, 34 teachers answered as in group work and 23 teachers answered as in both. Eight teachers of the participants did not respond this question.The distribution of the answers of the teachers to the question of how the project costs are covered is given in Table 6.

Table 6: The Distribution of the Answers of the Teachers to the Question of How the Project Costs are Covered?

	Parent/Student		School		Teacher		Other		Empty	
How the Project costs are covered?	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
	29	45,31	18	28,13	8	12,5	7	10,94	2	3,12

As it is seen from Table 6, nearly half of the teachers (45%) stated that the project costs were covered by students/parents. It is thought that this result may cause negative attitudes on students with poor families may develop towards project works. Thus, it is concluded that school administrations should have policies about financial support and developing projects.

The distribution of at what stages teachers help students while doing projects is given in Table 7. As it is seen from Table 7, more than half of the teachers (60%) stated that they helped their students at each stage of the project work. When the necessity that teachers should take the role of guidance at each stage of the project work was taken into consideration, it was seen that more than half of the teachers stated that they were doing this. However, 40% of the teachers have deficiencies on this issue and this result indicates the fact that effective training about project works should be provided to teachers.

Table 7: The Distribution of at What Stages Teachers Help Students While Doing Projects

	Deciding on the Topic		Presentation		Preparation of the Material		Supplying Required Material		Scanning the Literature		Accessing the Information		Each Stage		Empty	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Project Stage	10	15,63	3	4,69	4	6,25	1	1,56	3	4,69	2	3,13	39	60,93	2	3,12

At the third part of the survey six thoughts about projects were given to teachers and they were asked to express their opinions about these thoughts. The data about teachers' responses related with these six thoughts is given in Table 8.

Table 8: The Distribution of the Teachers' Opinions about the Thoughts related with Projects

	Agree		Undecided		Disagree	
	(f)	(%)	(f)	(%)	(f)	(%)
A Consultant help should be taken while doing projects	66	91,67	1	1,39	5	6,94
Project works increase the interest of students to the lessons	56	77,78	12	16,67	4	5,55
Project works plays a role in increasing the success in SBS examination.	28	38,89	23	31,94	21	29,17
Project works have positive effects on the retention of the information.	56	77,78	10	13,89	6	8,33
Parents support the project works.	29	40,28	23	31,94	20	27,78
When students fail at project works, teachers should provide feedback.	57	79,17	9	12,5	6	8,33

As it is seen from Table 8, a great majority like 77% of the teachers stated that project works increased the interest of students to the lessons but when the role of project works to increase success in SBS examination this proportion decreases to 38%. The proportional decrease in the answers of the teachers suggests that they think there is not a positive correlation between school work and SBS success. However it is expected that with the help of project works students can achieve more high level learning on certain topics. As a result of this it should contribute positively to SBS examination. Therefore this finding is important and should be emphasized. As it can be seen, the proportion of teachers who responded positively and negatively about parents support to projects is close to each other. It is thought that the answers of this question can differ according to the district of school, socio-economic status and education level of the parents. While 57 teachers agreed with the last item of this part of the survey which is about giving feedback when students fail at project works, 6 teachers disagreed. 9 teachers were undecided. A great majority like 79% of teachers is expecting to receive feedbacks to their project works. It is clear that feedbacks will create opportunities to the teachers for guiding to produce more beneficial and high-quality projects in the next process. Besides, when teachers and students understand that their projects are disapproved on valid grounds, the risk of losing motivation will be eliminated. Therefore the fact that this expectation of teachers and students has greater importance should not be ignored.

Most the teachers (75%) could not completely answer the question of 'Do you know project stages?' Since they accessed the information about project works mostly by themselves and they only knew the stages stated in the Ministry of Education's guide books at schools where doing projects was an obligation, satisfactory answers could not be given to this question. Most of the teachers (55%) answered this question as specifying the topic, data collection about the topic, preparing a work schedule and evaluation. Some of

the teachers (26%) preferred to answer as 'I do not have complete information about the subject' and some (19%) did not respond to this question. Also there were teachers who stated their complaints that the subject was not taught satisfactory enough at the in-service teacher training courses so they did not have satisfactory information about the subject.

To the question of 'Which criteria do you use to evaluate project works?' generally answers like 'the originality of the projects, projects carried out by students, the compliance with goals and objectives' were given. Some teachers (36%) stated that they evaluated according to some criteria as 'Ministry of Education's criteria, composition and layout, being practical, that can be used in daily life and being an affordable project. In the answers of this question teachers gave the priority to the criteria of the originality of the project and being logical, and then they searched for the visual features and economy.

Most of the teachers (69%) expressed their ideas by mentioning that there were many advantages in terms of teachers and students to the question of 'What are the advantages and disadvantages of project works according to you?' The advantages that most of the teachers agreed on are as follows: projects make students to be able to think all sides, projects can connect mathematics to the daily life by putting theoretical knowledge into practice, projects can positively contribute to the sense of responsibility of the students, projects can improve self-confidence on students, projects can provide permanent information for students, Projects can help teachers to identify the talented students, projects can give the sense of discovery to the students.

Teachers who talked about disadvantages (31%) criticized the points as lack of equipments, SBS examination factor and negative attitudes of the school administration to the subject. Teachers generally stated the disadvantages as in the following: Doing and evaluating projects produce spending much time outside the classroom for teachers and students, students' reluctance because of their concern about SBS examination and in the same way parents and school administration do not open to time consuming activities like project works since they focus on the success in SBS examination, the difficulty to find original project in mathematics lesson. A few teachers indicated that there were not any disadvantages in doing projects.

Conclusion, Discussion and Suggestions

According to the findings of this study, primary school mathematics teachers do not posses sufficient information about using projects. Experienced teachers received their information about projects from in-service teacher training courses and novice teachers received information during their postgraduate educations. This situation has similarities with the study of Korkmaz and Kaptan (2002).

Teachers mostly have difficulties in specifying the topic among project stages. This situation is similar with the study of Baki and Bütüner (2009).

This also shows itself in issues such as the costs and the lack of interest of the parents. According to the findings obtained from the survey, project topics were specified by students in 43%, 06 by both teachers and students in 31, 94% and by teachers in 19, 44%. This situation has similarities with the study of Kurak (2009). On the contrary, it does not coincide with the study of Şahin (2009).

Another finding obtained from the survey was while teachers generally (47, 22) preferred to carry out project works in groups, 31, 95 of teachers preferred both individual and group work. Few teachers (9, 72%) indicated that they carried out projects individually. Although teachers generally complained about the lack of interest of the parents, the cost of the projects generally (45, 31%) were covered by students/parents. This showed us that parents only supported projects economically. After parents, the cost of the projects were covered by schools (28, 13%), by teachers (12, 5 %) and by other people and institutions (10, 94 %). Şahin (2009) also indicated that project costs though not often produced economic difficulties for schools and students.

When teachers were asked at what stage of the project they provided help to students, most of the teachers (60, 93 %) answered as at every stage. This situation has similarities with the study of Kurak (2009).

The percentage of teachers who thought that project works increased the interest of students to the lessons was 77, 78%. It was seen that while 38, 89 % of teachers thought that projects played an important role in increasing success in SBS examination, 31, 94% of teachers were undecided on this issue and 29, 17% of teachers disagreed with this idea. This situation has similarities with the studies of Şahin (2009) and Başbay (2009).

The percentage of teachers who thought that project works had a positive impact on the retention of information was 77, 78%. This situation has similarities with the studies of Başbay (2006) and Çakan (2005).

While the percentage of teachers who thought that parents were supporting project works was 40, 28 %, the percentage of teachers who though that parents were not supporting project works was 27, 78% and the percentage of undecided teachers was 31, 94%. This situation has similarities with the studies of Kurak (2009) and Şahin (2009).

To the question of 'Which criteria do you use to evaluate project works?' generally answers such as originality, whether it was made by students or not, the compliance with goals and objectives' were given. Şahin (2009) concluded in his study that teachers did not possess sufficient information to evaluate projects.

To the question of 'What are the advantages and disadvantages of project works according to you? most of the teachers indicated the advantages as projects make students to be able to think all sides, projects can connect mathematics to the daily life by putting theoretical knowledge into practice, projects can positively contribute to the sense of responsibility of the students, projects can improve self-confidence on students, projects can provide permanent information for students, Projects can help teachers to identify the talented students, projects can give the sense of discovery to the students. Most of the teachers thought that projects had many advantages with regards to its disadvantages.

The findings stated in the study of Kurak (2009) have also similarities with the results of this study. 51, 4% of the teachers agreed with the statement of 'I think that project works can develop sense of responsibility in students'. When the findings related with the thoughts about the subjects were learnt on the application level not by memorization were analyzed, it appeared that 54, 5 % of teachers agreed on this issue. This situation has similarities with the studies of Başbay (2009) and Çakan (2005).

Among the answers about the disadvantages of the projects, there were answers like the difficulty of doing projects due to lack of equipments and physical conditions, carrying out and doing projects produce spending much time outside the classroom for teachers and students and students, parents and school administrations do not open to project works because of their concern about SBS examination. This situation has similarities with the studies of Kurak (2009), Başbay (2006) and Çakan (2005).

In this study, in addition to information obtained through qualitative data collection method, information obtained through quantitative data collection method was also used. For this purpose, 6 teachers were interviewed. The teachers were: 1) who didn't manage any project, 2) who managed a project but couldn't award a prize and 3) who managed a project and awarded a prize. According to the information obtained from these interviews, the teachers believe that they have enough information about the project. However, they complain indifference of students and parents. They expressed that they don't have enough time to manage a project because of reasons such as work intensity and KPSS exam. They said, it is difficult to find an original project in the field of mathematics for students. They reported that there must be motivational applications about project studies for students, teachers and parents. Otherwise project studies will be perceived as a waste of time for them. So, it will be difficult to increase project studies.

The following suggestions were given below in accordance with the results obtained from this study:

- The study should be carried out with more teachers and by adding the study groups of other cities.
- The results should be searched by conducting the survey with other teachers other than primary school mathematics teachers.

- Experimental studies should be carried out about project based learning at different education stages and at different classrooms.
- Student teachers should take an applied education about project based learning in universities.
- Teachers should be encouraged to use projects and with this purpose school administrations should provide support when necessary.
- In-service teacher training courses should be given to teachers by experts of the subject.
- School administrations and parents should be informed about the advantages of the projects.
- Students should be encouraged to do projects.
- Teachers should have opportunities to analyze the project evaluation criteria of the Ministry extensively.
- The Ministry of Education should include elective lessons about projects in primary education syllabus.
- Teachers and students who participated in project studies should be awarded as a factor for increasing motivation.
- Teachers should be informed via an in-service teacher training program which will be prepared by faculty members about the stages of projects and as a result of these studies teacher should be asked to prepare projects.
- In addition to that, in-service teacher training programs should be carried out nation-wide instead of limiting them to one city and teachers should be informed about how to use projects with facilities available.
- Since not only using projects but also evaluating projects is also important, teachers should be informed about evaluating projects, and the topic of in-service teacher training program should be specified as a result of the data obtained by including study groups from other cities.

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