A study on the evaluation of science projects of primary school students based on scientific criteria

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Received 18 May, 2013
Revised 20 Dec., 2013

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Abstract

This study re-evaluated 454 science projects that were prepared by primary school students between 2007 and 2011 within the scope of Science Projects Event for Primary School Students. Also, submitted to TUBITAK BIDEB Bursa regional science board by MNE regional work groups in accordance with scientific research methods and techniques, including also the related studies in the literature. In this evaluation, criteria that are particular but not limited to the determination of the problem was included. Originality and creativity, scientific method, consistency and contribution, usefulness, implementability, literature review and result, were taken as a basis. Within the scope of this study, theoretical and technical methods employed for evaluating the projects were focused on, and the fitness of the steps taken for evaluation was discussed. Furthermore, recommendations were put forward concerning the solution of the basic problems facing teachers and students during the design and implementation of these projects as well as the administration of methods.

Keywords: Sciences, scientific criteria, primary education, project

Introduction

Science and Technology included in curricula as a basic course that provides individuals with cognitive development, self-confidence, creativity, and a capability to act independently. In this course, students examine their environment through scientific methods, and get accustomed to thinking objectively and making correct decisions in the face of different phenomena and events. In other words, students learn real life, thus adapt to natural life more easily thanks to this course. Beyond the key role of preparing individuals for the upper educational level in the traditional sense, primary science education has vital importance for preparing individuals for the future and the life, which is a highly significant function (Zinicola, 2003).

The fact that science course contains information overload and is considered by students difficult and inadequately linked to daily life directs students and teachers to easy project works (Millar and Abrahams, 2009; Duggan and Gott, 2002). The difficulties encountered in project design are mentioned as follows: the wearisomeness of process, heavy work load, the problems encountered in problem determination, lack of interest in field work, non-equal task distribution, impossibility of getting in contact with authorities, lack of knowledge, lack of guidance, lack of resources and time, and financial troubles. It should be noted that project works provide participants with acquisitions including improvement in self-confidence, socialization, effective learning, and cooperative working during exhibition (Küfrevioğlu et al., 2011). Project preparation is quite important in terms of solving the problems encountered in the daily life. Project works, which enable students to exhibit different skills in a particular time, have become more and more widespread in public and private educational institutions in recent years. Project works have both curricular and extracurricular subjects.

These kinds of designs involve activities such as thinking, problem-solving, creativity, reaching the information, processing the information, reorganizing the information, questioning, compromising, writing, and presentation. However, it should be kept in mind that project subjects should be chosen among from those which are related to daily life and enable individuals to solve problems, make decisions, and use instruments.

According to Korkmaz and Kaptan (2001), project preparation should aim to solve problems through individual or small groups by means of an approach that is similar to life under natural conditions. For Çepni (2005), it is a method which can be used by students for solving problems by putting their knowledge and skills into practice in their daily lives. Project design process includes all actions from the emergence of the idea through writing out, developing, implementing, and evaluating it as well as generating new ideas based on it (İçelli et al., 2007). Within this process, students plan their learning processes in line with particular goals individually or in the group, do research, work in cooperation, take responsibility, collect information, and organize the collected information (Yurtluk, 2005). It is mostly under the responsibility of students to reach and properly use the information (Demirhan and Demirel, 2003).

Projects are also used as part of methodology in project-based learning patterns. The main idea of project-based learning is to deal with real life problems and the fields of interest of students, and to encourage students for meaningful thinking when resorting to new information during the problem-solving process (David, 2008). In this way, students reach a position where they search, investigate, reach the information, and attempt to solve a problem by utilizing the obtained information. In addition, it is a form of learning that aims at improving decision-making skills and self-confidence levels of students whereby they are expected to obtain a product (Coşkun, 2004; Özdener and Özçoban, 2004; Demirel, 2004). Project-based learning consists of three basic concepts that have been meticulously selected to show the shape required to be taken by education systems in our day. One of these concepts is learning, which is highly important for drawing attention to learners, but not teachers. Another concept is project. Project means design or design development, imagining, and planning. This concept refers to the design, that is, the orientation of learning. It emphasizes relational learning for a particular purpose rather than singular learning. Taking project as an infrastructure element rather than a goal, project-based learning highlights process, but not product, in learning, and provides learning with a structure that is unique to learner (Erdem and Akkoyunlu, 2002).

Projects should require an inter-disciplinary work, provide students with an opportunity to express their personal opinions, be a product of endeavor and creativity, and reflect information and opinions of students about both the main topic and the other fields with which the main topic is associated. We are of the opinion that it is not correct behavior for students and teachers to expect an absolute invention or discovery in every project. Projects should not include any project or study evaluated before, not contain extracts or sections with unspecified references, not negatively affect education, training and social life of students (though it is difficult and takes a long time to prepare them), and not have subjects that may be summarized through exacts taken from references including books, encyclopedias, etc. (Baki and Bütüner, 2008).

In general, a project includes such stages as determining the purpose and references to be employed, noting down the important ideas and concepts intended to be searched, determining the project duration, presenting the project, and evaluating the project (Saban, 2002). Since there are high expectations from competition projects, it is obviously necessary to be more meticulous and careful at these stages in order to create a difference.

Teachers need to have a high knowledge level, methodology knowledge, and guidance skill and experience in order to serve as an important source for their students in the process of designing competition projects. Tendency for self-development and creativity considerably varies among teachers working at public schools and private schools (Sönmezer and Eryaman, 2008). Naturally, this situation positively affects the active participation of private school students in educational processes. As a matter of fact, the study conducted by Kutlu and Kumandaş (2009) found that students attending private schools were more successful in fulfilling certain tasks in comparison to public school students.

In this study, 454 science projects prepared by primary school students between 2007 and 2011 and submitted by MNE regional work groups to TUBITAK (The Scientific and Technological Research Council of Turkey) BIDEB (Department for

Supporting Scientists) Bursa regional science board were re-evaluated based on scientific research methods and techniques. The study aimed for developing a new chart (ANNEX-1) which would help students and teachers manage and finalize their future projects better, eliminate certain deficiencies, and serve as a basis for evaluating the future competition projects.

Project design and management requires certain characteristics including being curious, making an observation, independent working, imagination, generating original ideas, creating solutions, following complex processes, and having problem-solving skills. Furthermore, it is necessary to take the same care to the evaluation stage, and to ensure that evaluation criteria and outputs are interpreted in terms of individual, social, and scientific processes. However, it is observed that these points are not taken into account in project evaluation. This situation gives rise to many problems especially in the projects prepared for competition. Students need to be protected against adverse effects and pressures. The expectation for students voluntarily participating in project designs to advance in science-related fields in the future is not much different from the expectations from gifted students (Cutts and Moseley, 2001; Kargı and Akman, 2003).

Method

The research universe consists of the science projects participating in the Science Projects Event for Primary School Students that was jointly conducted by MNE (The MNE) and TUBITAK (The Scientific and Technological Research Council of Turkey). The research sample is composed of 454 science projects applying to the above-mentioned event from Bursa region between 2007 and 2011.

The Evaluation Chart for Science Projects Event for Primary School Students was used for evaluating the project reports prepared by students. However, expert opinions were taken and some changes were made in the chart used for evaluation within the scope of the event (competition) while preparing the new chart. Used as an evaluation instrument, this chart consists of 8 main items and 23 sub-items. 8 main items are as follows: The Determination of Problem (DP), Originality and Creativity (OC), Scientific Method (SM), Consistency and Contribution (CC), Usefulness (U), Implementability (I), Literature Review (LR), and Result (R). The items in the chart were answered with the following responses: “Yes” (2), “Partly” (1), “No” (0) (Table 10).

The data obtained through the evaluation of 454 science projects were analyzed by means of SPSS 18.00. In addition, f and % values were calculated in regard to qualitative data.

The expert opinions and recommendations were taken concerning the Evaluation Chart for Science Projects Event for Primary School Students in order to ensure scope validity of the scale.

Kolmogorov-Smirnov test demonstrated that data did not display a normal distribution. In the event that two researchers come up with different scores concerning the evaluation of a formation, Kendall's tau-c is used for determining the correspondence of evaluation scores. Kendall's tau-c coefficient is a statistical element that tests the correspondence between asymmetrical peers in ordinal scale, near scale, or interval scale data (Özdamar, 2011). Thus, Kendall's tau-c coefficient was used for interpreting the research data.

The meanings of Kendall's tau-c coefficients are as follows:

>0.50	: High-level correlation,
0.36-0.49	: A Significant correlation,
0.20-0.35	: Intermediate level correlation,
0.10-0.19	: Low-level correlation,
< 0.10	: No correlation.

Fit values and percentages of the scores given by two researchers in re-evaluations were determined. Fit index (FI) was calculated as follows:

FI= ((Total number of correspondences) / (Total number of evaluations)) x 100

Total number of evaluations= the number of corresponding evaluations + the number of non-corresponding evaluations

FI needs to be over 75% for inter-experts evaluation results that are to be considered reliable. A lower ratio means that observers think differently to a considerable extent. In the table 1, correspondence values of two experts are given, and correspondence percentages and averages are separately calculated for each project. Accordingly, correspondence percentages vary between 62.3% and 94.7%. According to the table 1, correspondence ratio is over 75% in all criteria except for The Determination of Problem. In other words, there is a high-level correspondence between observers in 7 criteria.

Table 1. The percentages of correspondence between expert evaluators

Criteria	N	The number of correspondence	Correspondence %
a) The determination of problem	454	283	62.3
b) Originality and creativity	454	364	80.2
c) Scientific method	454	347	76.4
d) Consistency and contribution	454	389	85.7
e) Usefulness	454	403	88.8
f) Implementability	454	430	94.7
g) Literature review	454	388	85.5
h) Result	454	354	78.0

Document review method was employed in the present study where documents were subjected to analysis. The projects were accessed via the "Bu Benim Eserim Matematik ve Fen Bilimleri Proje Yarışması (This Is My Work: Mathematics and Science Project Competition)" (http://tegm.meb.gov.tr/bubenimeserim/) page located on the homepage of the official website of the MNE (www.meb.gov.tr). The projects were separately evaluated by two different experts in accordance with the predetermined criteria. The obtained qualitative data were quantified through content analysis. The data obtained by expert evaluators were subjected to an analysis of normality. The related results are demonstrated in the Table 2.

Table 2. The analysis of normality of the data obtained by expert evaluators

Criteria	N		SD	Kolmogorov-Smirnov Z	p
a) The determination of problem	454	0.551	0.384	0.107	0.00*
b) Originality and creativity	454	0.412	0.515	0.292	0.00*

c) Scientific method	454	0.315	0.375	0.201	0.00*
d) Consistency and contribution	454	0.403	0.308	0.323	0.00*
e) Usefulness	454	0.189	0.306	0.349	0.00*
f) Implementability	454	0.189	0.384	0.478	0.00*
g) Literature review	454	0.266	0.289	0.216	0.00*
h) Result	454	1.117	0.404	0.227	0.00*

*p<0.05

According to the Table 2, the data obtained by expert evaluators do not display a normal distribution.

Table 3. The results of inter-evaluators kendall's tau-c analysis

Criteria	**N**	**Kendall's tau-c (τ_c)**	**P**
a) The determination of problem	454	0.678**	0.00
b) Originality and creativity	454	0.612**	0.00
c) Scientific method	454	0.708**	0.00
d) Consistency and contribution	454	0.579**	0.00
e) Usefulness	454	0.517**	0.00
f) Implementability	454	0.380*	0.00
g) Literature review	454	0.670**	0.00
h) Result	454	0.577**	0.00

* 0.36-0.49

** >0.50

According to the table 3, there is a high correspondence between the scores of expert evaluators pertaining to the criteria of The Determination of Problem (τc= 0.678). Originality and Creativity (τc= 0.612), Scientific Method (τc= 0.708), Consistency and Contribution (τc= 0.579), Usefulness (τc= 0.517), Literature Review (τc= 0.670), and Result (τc= 0.577), and there is a significant correspondence between the scores of expert evaluators pertaining to the criterion of Implement ability (τc= 0.380).

Results

In the present study, 454 science projects participating in the Science Projects Event for Primary School Students were evaluated. The distribution of the projects applying to competition between 2007 and 2011 by years is given in the Table 4.

Table 4. The number of projects in sciences

Science Field	The Number of Projects					Total
	2007	**2008**	**2009**	**2010**	**2011**	
Comer To Regional Science Board	118	50	85	113	88	454
Invited To Bursa Regional Exhibition	48	20	41	33	39	181
Invited To Turkey Selections	5	2	3	4	4	20
The Award-Winning By Being Placed In The First Fifty In Turkey Selections	1	1	3	1	3	9

According to the table 4, 181 of 454 projects coming to the Regional Science Board were invited to Bursa Regional Exhibition. Of these projects, 20 projects were found worthy of being exhibited in Ankara for competition across Turkey. Of these projects, 9 ranked among the top 50 and received awards. The criteria were not the same during the selection of these projects. In the first elimination, the projects were mostly evaluated based on the specific criteria of teachers in provinces. The projects were subjected to a second elimination at the provincial department of review and the regional science board consisting of the representatives of each province, who were experienced teachers. A short training was provided to this board in regard to evaluation criteria. Then, a 5-person board composed of specialized faculty members put the projects into a third elimination process in the region. This board performed evaluation based on the criteria set by TUBITAK BIDEB (2012). It was seen that selection criteria came to the forefront more in this third evaluation stage. It was determined that disregard for criteria during project evaluation caused some works that were not suitable for exhibition to appear at the regional exhibition.

Distribution of the current school types by provinces is given in the table 5 (based on official data). Based on the data in the table, it is understood that public schools are 97.29%, private schools are 2.43%, and science & arts centers are 0.28%, which is very low.

Table 5. The distribution of the projects coming to MNE and TUBITAK regional science boards by provinces and school types

	The Number of Public Schools		The Number of Private Schools		The Number of Science and Arts Centers		All Schools Available	The Number of Schools Coming to RSB* and TUBITAK
Provinces	MNE f	Coming to RSB* and TUBITAK F	Available f	Coming to RSB* and TUBITAK f	Available f	Coming to RSB* and TUBITAK f	Total	Total
Afyonkarahisar	479 (98.96%)	32 (84.21%)	4 (0.83%)	-	1 (0.21%)	6 (15.79%)	484	38
Balıkesir	555 (98.23%)	39 (90.7%)	9 (1.59%)	4 (9.30%)	1 (0.18%)	-	565	43
Bilecik	77 (96.25%)	34 (54.84%)	2 (2.50%)	16 (25.81%)	1 (1.25%)	12 (19.35%)	80	62
Bolu	85 (97.7%)	4 (100%)	2 (2.3%)	-	-	-	87	4
Bursa	584 (95.58%)	71 (58.19%)	25 (4.09%)	39 (31.97%)	2 (0.33%)	12 (9.84%)	611	122
Çanakkale	194 (98.48%)	18 (94.74%)	3 (1.52%)	1 (5.26%)	-	-	197	19
Düzce	201 (98.05%)	24 (100%)	3 (1.46%)	-	1 (0.49%)	-	205	24
Eskişehir	237 (96.73%)	19 (90.48%)	7 (2.86%)	1 (4.76%)	1 (0.41%)	1 (4.76%)	245	21
Kocaeli	340 (95.51%)	11 (68.75%)	15 (4.21%)	5 (31.25%)	1 (0.28%)	-	356	16
Kütahya	338 (97.69%)	57 (85.07%)	8 (2.31%)	7 (10.45%)	-	3 (4.48%)	346	67
Sakarya	375 (97.91%)	10 (100%)	7 (1.83%)	-	1 (0.26%)	-	383	10
Yalova	57 (93.44%)	21 (75%)	3 (4.92%)	6 (21.43%)	1 (1.64%)	1 (3.57%)	61	28
Total	3522 (97.29%)	340 (74.9%)	88 (2.43%)	79 (17.4%)	10 (0.28%)	35 (7.7%)	3620	454

*Regional Science Boards

The table 6 shows that of 454 science projects 340 (74.9%) belonged to public schools (PS), 79 (17.4%) belonged to private schools (PrS), and 35 (7.7%) belonged to science and arts centers (SAC). These ratios show that although the number of public schools was higher than other organizations, the participation was lower at these schools. On the other hand, it is seen that science and arts centers, which made up the segment of 7.7% with 35 projects, came up with projects of a higher percentage. This situation is parallel with the existence of students with special interests and skills at science and art centers. These data also show that the number of project applications is not proportional to the number of schools.

Table 6. The distribution of the projects subject to application by school types and years

			Years					**Total**
			2007	**2008**	**2009**	**2010**	**2011**	
School Types	**Private Schools**	f	17 (3.7%)	7 (1.5%)	16 (3.5%)	19 (4.2%)	20 (4.4%)	79 (17.4%)
	Public Schools	f	100 (22%)	37 (8.1%)	62 (13.7%)	78 (17.2%)	63 (13.9%)	340 (74.9%)
	Science and Arts Centers	f	1 (0.2%)	6 (1.3%)	7 (1.6%)	16 (3.5%)	5 (1.1%)	35 (7.7%)
	Total	f	118 (26%)	50 (11%)	85 (18.7%)	113 (24.9%)	88 (19.4%)	454 (100%)

According to the table 6, the biggest number of applications was in 2007 in which 118 (26%) projects were submitted, and the fewest number of applications was in 2008 in which just 50 (11%) projects were submitted. This table also demonstrates that the biggest number of applications from PrSs was in 2011 (4.4%), from PSs was in 2007 (22%), and from SACs was in 2010 (3.5%). The numbers of project applications vary by years. Based on the numbers, it is understood that there is a disorder in applications. The 50 to 118 range is an indicator of this situation.

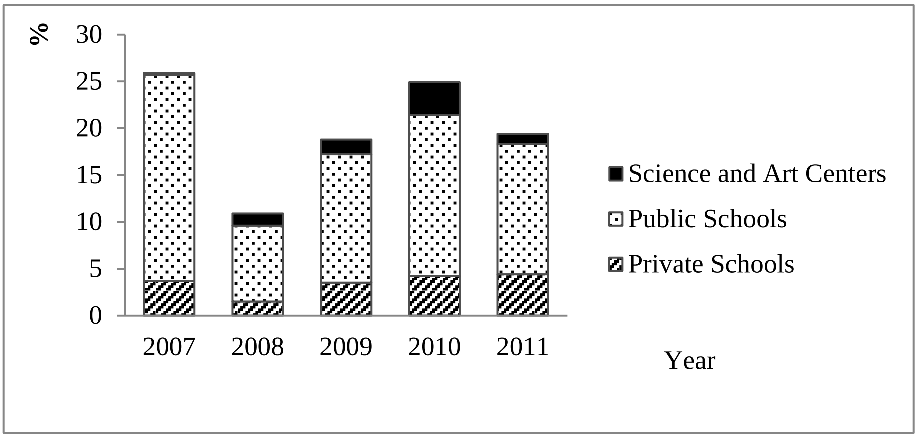

Figure 1. Project applications by school types and years

The Figure 1 shows that the number of applications from PSs and PrSs decreased in 2008, an increase occurred towards 2010, but another fall took place in applications from PSs in 2011. On the other hand, there was an increase in the number of project applications from SACs until 2011, but a considerable fall occurred in 2011.

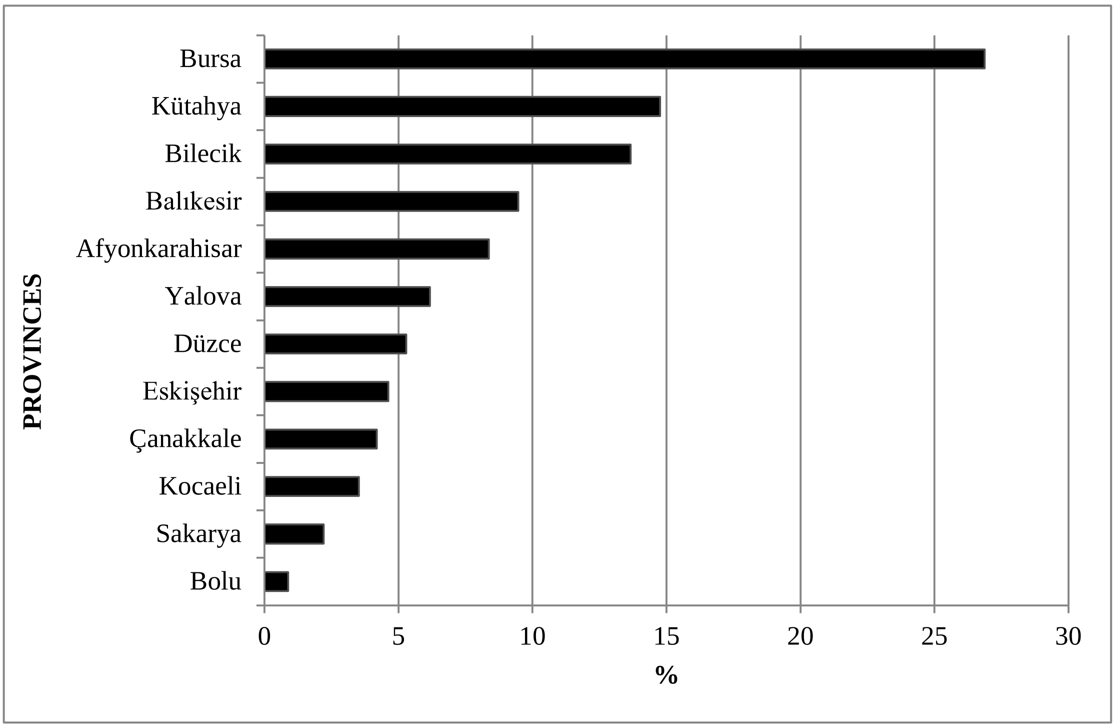

Figure 2. The distribution of project applications between 2007 and 2011 by provinces

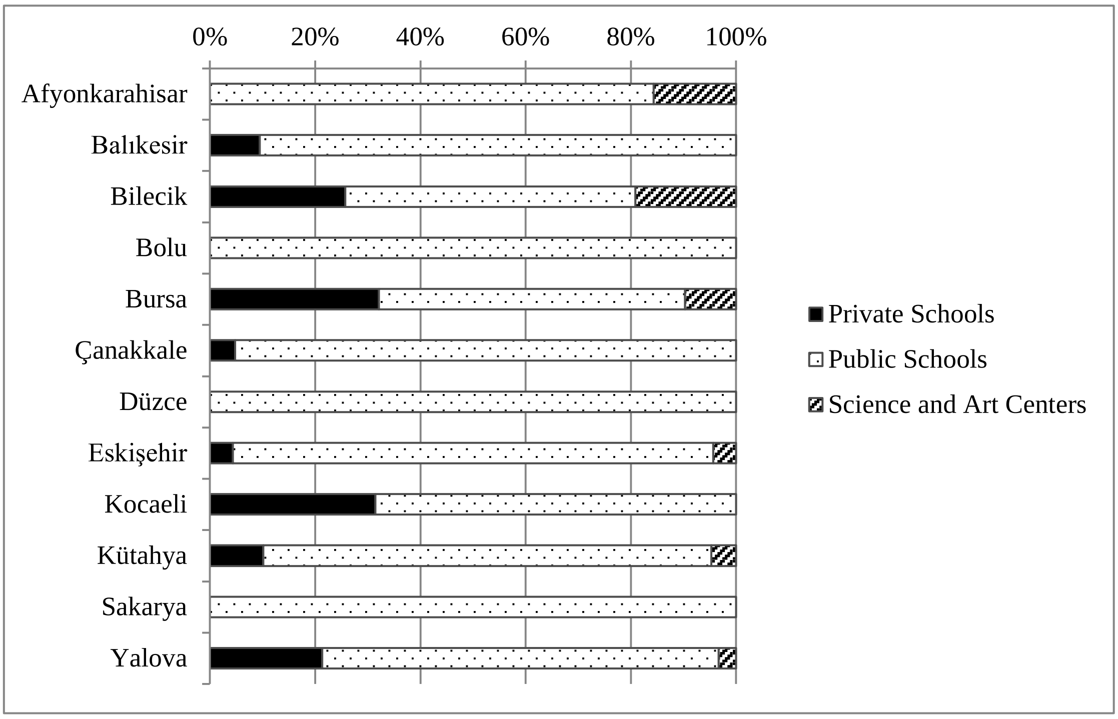

Figure 3. The distribution of project applications between 2007 and 2011 by school types

According to the figure 3, only PSs made applications from Sakarya and Düzce provinces; PSs and PrSs made applications from Kocaeli, Çanakkale, and Balıkesir; PSs and SACs made applications from Afyonkarahisar; and PSs, PrSs, and SACs made applications from Yalova, Kütahya, Eskişehir, Bursa, and Bilecik.

Table 7. The distribution of project applications between 2007 and 2011 by years, provinces, and school types

Provinces	2007 (N:118)			2008 (N:50)			2009 (N:85)			2010 (N:113)			2011 (N:88)			Total (%)			Total
	PS	PrS	SAC	PS	PrS	SAC	PS	PrS	SAC	PS	PrS	SAC	PS	PrS	SAC	PS	PrS	SAC	
Afyonkarahisar**	-	-	-	3 (6%)	-	1 (2%)	14 (16.5%)	-	4 (4.6%)	10 (8.8%)	-	-	5 (5.9%)	-	1 (1.1%)	32 (9.4%)	-	6 (17.1%)	38 (8.4%)
Balıkesir	6 (5%)	-	-	3 (6%)	-	-	8 (9.4%)	1 (1.2%)	-	10 (8.8%)	-	-	12 (13.6%)	3 (3.4%)	-	39 (11.5%)	4 (5.1%)	-	43 (9.5%)
Bilecik	23 (19.5%)	1 (0.8%)	-	4 (8%)	-	3 (6%)	5 (5.9%)	5 (5.8%)	1 (1.2%)	1 (0.9%)	6 (5.3%)	8 (7.1%)	1 (1.1%)	4 (4.6%)	-	34 (10%)	16 (20.3%)	12 (34.3%)	62 (13.7%)
Bolu*	4 (3.4%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4 (1.2%)	-	-	4 (0.9%)
Bursa	16 (13.6%)	11 (9.2%)	1 (0.8%)	8 (16%)	4 (8%)	2 (4%)	9 (10.6%)	6 (7.1%)	2 (2.4%)	26 (23%)	6 (5.3%)	7 (6.2%)	12 (13.6%)	12 (13.6%)	-	71 (20.9%)	39 (49.3%)	12 (34.3%)	122 (26.8%)
Çanakkale	4 (3.4%)	-	-	2 (4%)	-	-	4 (4.6%)	-	-	2 (1.8%)	1 (0.9%)	-	6 (6.8%)	-	-	18 (5.3%)	1 (1.3%)	-	19 (4.2%)
Düzce*	24 (20.3%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24 (7.1%)	-	-	24 (5.3%)
Eskişehir**	-	-	-	2 (4%)	-	-	7 (8.2%)	-	-	4 (3.5%)	-	-	6 (6.8%)	1 (1.1%)	1 (1.1%)	19 (5.6%)	1 (1.3%)	1 (2.9%)	21 (4.6%)
Kocaeli*	11 (9.3%)	5 (4.2%)	-	-	-	-	-	-	-	-	-	-	-	-	-	11 (3.2%)	5 (6.3%)	-	16 (3.5%)
Kütahya**	-	-	-	13 (26%)	-	-	9 (10.6%)	3 (3.5%)	-	20 (17.8%)	4 (3.5%)	1 (0.9%)	15 (17%)	-	2 (2.4%)	57 (16.8%)	7 (8.8%)	3 (8.5%)	67 (14.7%)
Sakarya*	10 (8.5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10 (2.8%)	-	-	10 (2.2%)
Yalova	2 (1.7%)	-	-	2 (4%)	3 (6%)	-	6 (7.1%)	1 (1.2%)	-	5 (4.4%)	2 (1.8%)	-	6 (6.8%)	-	1 (1.1%)	21 (6.2%)	6 (7.6%)	1 (2.9%)	28 (6.2%)
Total	100 (84.7%)	17 (14.4%)	1 (0.8%)	37 (74%)	7 (14%)	6 (12%)	62 (72.9%)	16 (18.8%)	7 (8.2%)	78 (69%)	19 (16.8%)	16 (14.2%)	63 (71.6%)	20 (22.7%)	5 (5.7%)	340 (100%)	79 (100%)	35 (100%)	454 (100%)

* It was removed from Bursa region in 2008
** It attended to Bursa region after 2007.
PS: Public Schools
PrS: Private Schools
SAC: Science and Arts Centers
N: The total number of projects

Table 8. The distribution of project applications between 2007 and 2011 by years, provinces, and invitation to exhibition

Provinces	2007				2008				2009				2010				2011				Total			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Afyonkarahisar	-	-	-	-	1 (5%)	3 (10%)	-	-	8 (19%)	10 (23.3%)	-	1 (33.3%)	1 (3%)	9 (11.3%)	-	-	2 (5.1%)	4 (8.2%)	-	-	12 (6.6%)	26 (9.5%)	-	1 (11.1%)
Balıkesir	3 (6.4%)	3 (4.2%)	1 (20%)	-	2 (10%)	1 (3.3%)	-	-	6 (14.3%)	3 (7%)	-	-	1 (3%)	9 (11.3%)	-	-	7 (17.9%)	8 (16.3%)	1 (25%)	1 (33.3%)	19 (10.5%)	24 (8.8%)	2 (11.8%)	1 (11.1%)
Bilecik	5 (10.6%)	19 (26.8%)	-	-	1 (5%)	6 (20%)	-	-	7 (16.7%)	4 (9.3%)	-	-	6 (18.2%)	9 (11.3%)	-	-	1 (2.6%)	4 (8.2%)	-	-	20 (11%)	42 (15.4%)	-	-
Bolu	1 (2.1%)	3 (4.2%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (0.6%)	3 (1.1%)	-	-
Bursa	15 (31.9%)	13 (18.3%)	2 (40%)	1 (100%)	7 (35%)	7 (23.3%)	-	-	10 (23.8%)	7 (16.3%)	1 (50%)	1 (33.3%)	10 (30.3%)	29 (36.3%)	1 (25%)	-	11 (28.2%)	13 (26.5%)	1 (25%)	1 (33.3%)	53 (29.3%)	69 (25.3%)	5 (29.4%)	3 (33.3%)
Çanakkale	3 (6.4%)	1 (1.4%)	-	-	-	2 (6.7%)	-	-	-	4 (9.3%)	-	-	2 (6.1%)	1 (1.3%)	-	-	4 (10.3%)	2 (4.1%)	-	-	9 (5%)	10 (3.7%)	-	-
Düzce	4 (8.5%)	20 (28.2%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4 (2.2%)	20 (7.3%)	-	-
Eskişehir	-	-	-	-	1 (5%)	1 (3.3%)	-	-	3 (7.1%)	4 (9.3%)	-	-	1 (3%)	3 (3.8%)	-	-	4 (10.3%)	4 (8.2%)	2 (50%)	1 (33.3%)	9 (5%)	12 (4.4%)	2 (11.8%)	1 (11.1%)
Kocaeli	10 (21.3%)	6 (8.5%)	1 (20%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10 (5.5%)	6 (2.2%)	1 (5.9%)	-
Kütahya	-	-	-	-	5 (25%)	8 (26.7%)	-	-	4 (9.5%)	8 (18.6%)	-	-	8 (24.2%)	17 (21.3%)	3 (75%)	1 (100%)	7 (17.9%)	10 (20.4%)	-	-	24 (13.3%)	43 (15.8%)	3 (17.6%)	1 (11.1%)
Sakarya	5 (10.6%)	5 (7%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 (2.8%)	5 (1.8%)	-	-
Yalova	1 (2.1%)	1 (1.4%)	1 (20%)	-	3 (15%)	2 (6.7%)	2 (100%)	1 (100%)	4 (9.5%)	3 (7%)	1 (50%)	1 (33.3%)	4 (12.1%)	3 (3.8%)	-	-	3 (7.7%)	4 (8.2%)	-	-	15 (8.3%)	13 (4.8%)	4 (23.5%)	2 (22.2%)
Total	47 (100%)	71 (100%)	5 (100%)	1 (100%)	20 (100%)	30 (100%)	2 (100%)	1 (100%)	42 (100%)	43 (100%)	2 (100%)	3 (100%)	33 (100%)	80 (100%)	4 (100%)	1 (100%)	39 (100%)	49 (100%)	4 (100%)	3 (100%)	181 (100%)	273 (100%)	17 (100%)	9 (100%)

A: Invited To The Exhibition
B: Not Invited To The Exhibition
C: Invited To Turkey Selections
D: Those Be Placed in Turkey Selections

The table 7 shows the distribution of project applications by years, provinces, and school types. According to this table, PSs rank first (74.9%) in the distribution of projects by school types. They are followed by PrS projects (17.4%), and SAC projects (7.7%). Based on the distribution by provinces, it has been observed that the biggest number of applications came from the following provinces: Bursa (26.8%), Kütahya (14.7%), Bilecik (13.7%), Balıkesir (9.5%), Afyonkarahisar (8.4%), Yalova (6.2%), Düzce (5.3%), Eskişehir (4.6%), Çanakkale (4.2%), Kocaeli (3.5%), Sakarya (2.2%), and Bolu (0.9%).

Table 9. Gender distribution by years

			Years					Total
			2007	**2008**	**2009**	**2010**	**2011**	
Gender	**Females**	f	99 (13.71%)	51 (7.07%)	48 (6.65%)	91 (12.6%)	85 (11.77%)	374 (51.8%)
	Males	f	98 (13.58%)	32 (4.43%)	78 (10.8%)	79 (10.94%)	61 (8.45%)	348 (48.2%)
Total		f	197 (27.29%)	83 (11.5%)	126 (17.45%)	170 (23.54%)	146 (20.22%)	722 (100%)

Based on the gender distribution of the students designing projects, it has been observed that 99 females/98 males designed projects in 2007; 51 females/32 males designed projects in 2008; 48 females/78 males designed projects in 2009; 91 females/79 males designed projects in 2010; and 85 females/61 males designed projects in 2011 (Table 9).

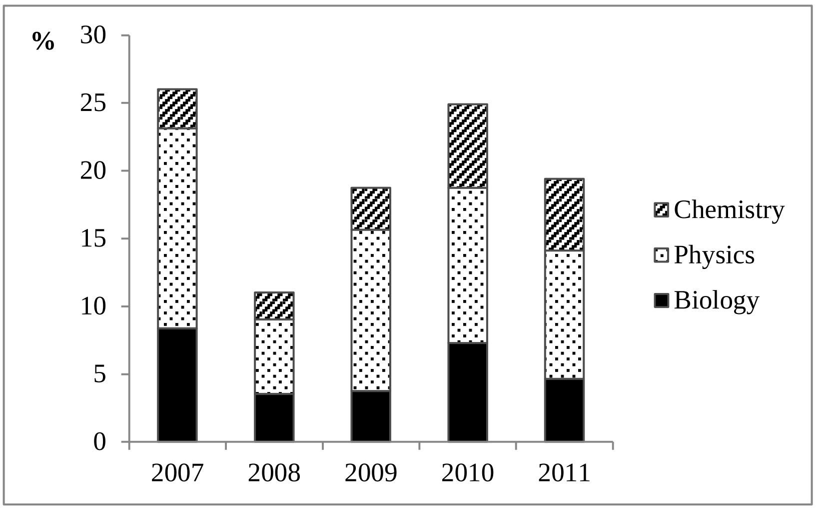

Figure 4. The subject area distribution of projects by years

Based on the subject area distribution of the project applications, it has been observed there were 241 (53.8%) projects about Physics, 125 (27.54%) projects about Biology, and 88 (19.38%) projects about Chemistry. These data show that there were more projects about Physics subjects in comparison to other subject areas (Figure 4).

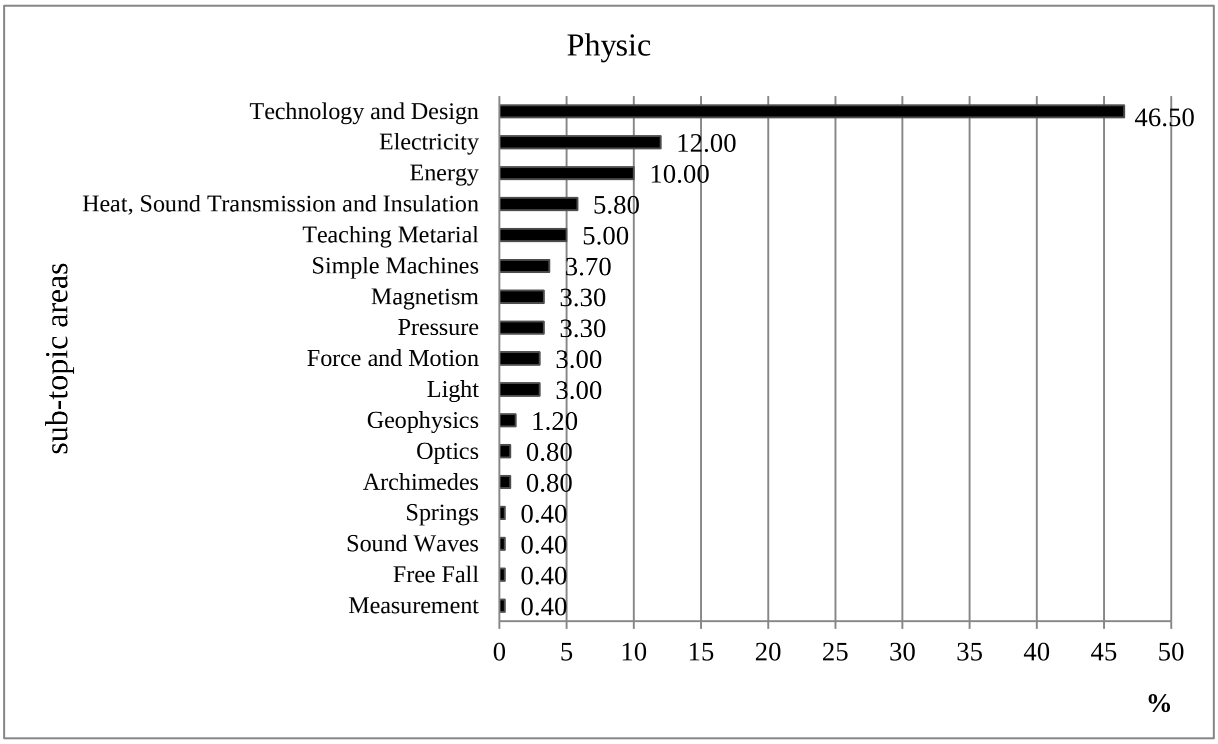

Figure 5. The distribution of physics projects by sub-subject areas

It is understood that there were more projects about Technological Design (46.5%), Electricity (12%), and Energy (10%) in comparison to other sub-subject areas (Figure 5).

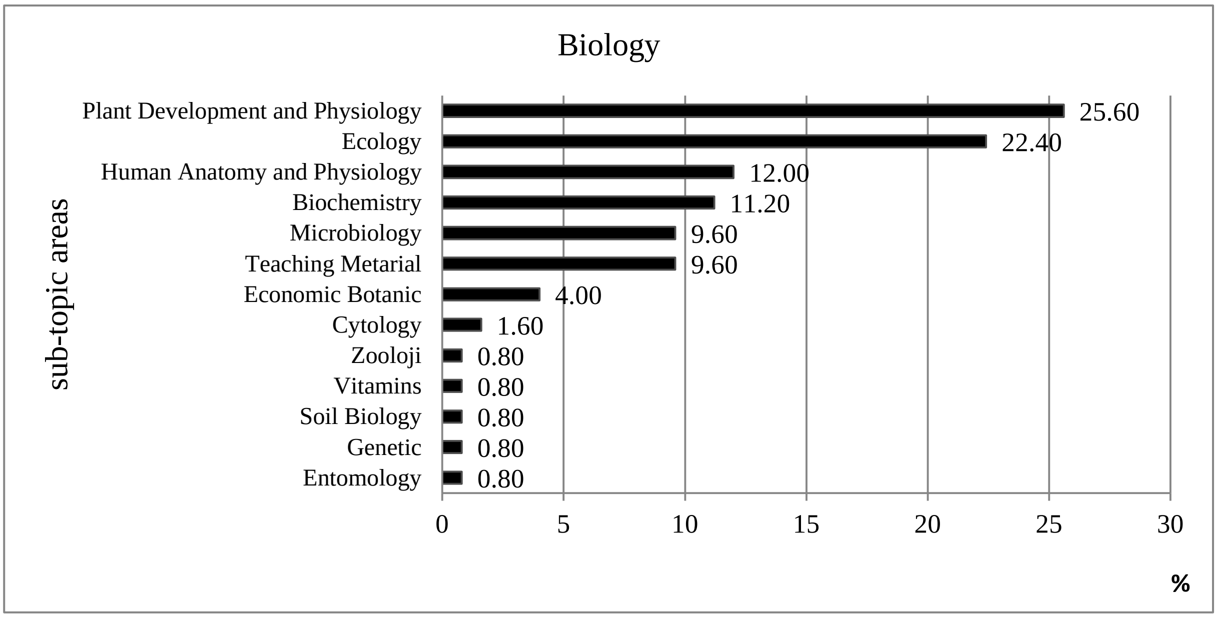

Figure 6. The distribution of biology projects by sub-subject areas

It is understood that there were more projects about Plant Development and Physiology (25.6%), Ecology (22.4%), Human Anatomy and Physiology (12%), Biochemistry (11.2%), Microbiology (9.6%), and Education Materials (9.6%) in comparison to other sub-subject areas (Figure 6).

It is understood that there were more projects about Organic Chemistry (23.6%), Chemical Reactions and Bonds (10.3%), Biochemistry (8%), and Acids and Bases (7.9%) in comparison to other sub-subject areas (Figure 7).

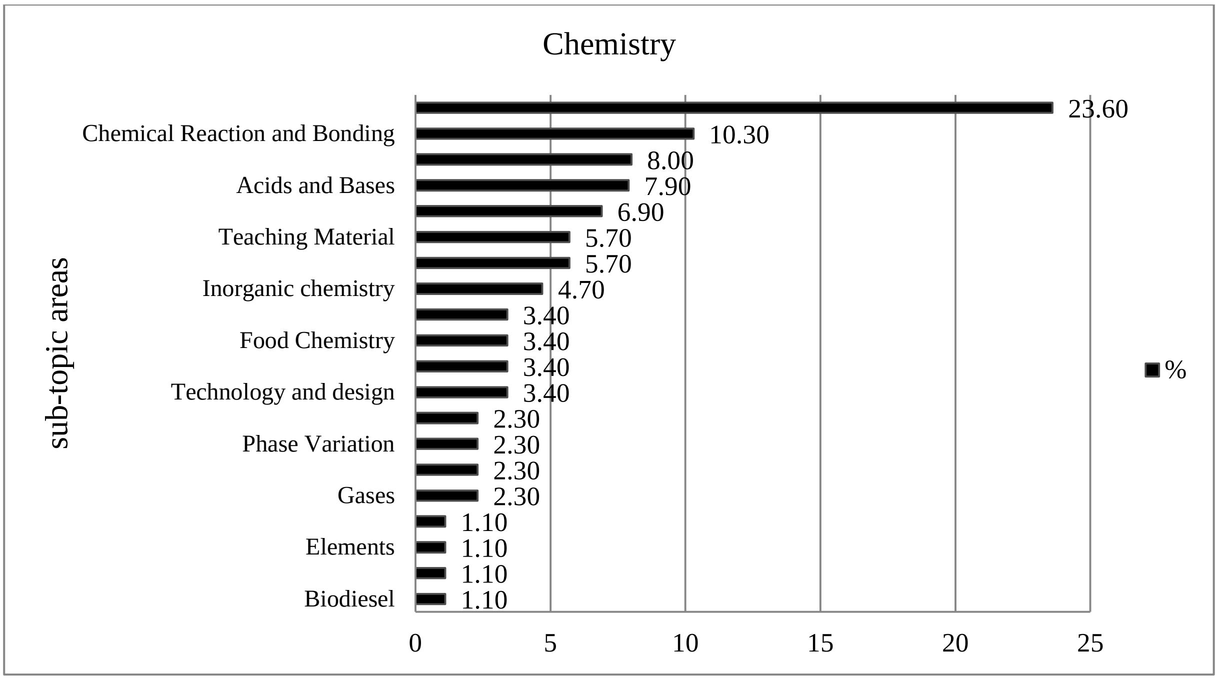

Figure 7. The distribution of chemistry projects by sub-subject areas

The table 10 presents the findings obtained from the Evaluation Chart for Science Projects Event for Primary School Students. The results were interpreted by taking the average of two different expert evaluators.

Table 10. Evaluation chart for science projects event for primary school students

Criteria	2007-2011			
	YES (%)	**PARTLY (%)**	**NO (%)**	**TOTAL (%)**
a) The Determination of Problem				
1) Problem was determined.	101.5 (22.4)	248 (54.6)	104.5 (23)	100
2) Problem was clearly defined.	35 (7.7)	219.5 (48.3)	199.5 (44)	100
3) Sub-problems were determined.	1 (0.2)	8.5 (1.8)	444.5 (98)	100
b) Originality and Creativity				
1) Subject is original.	23 (5.1)	167 (36.8)	264 (58.1)	100
2) A method different from the previous ones is used for dealing with the subject.	22 (4.8)	123.5 (27.2)	308.5 (68)	100
c) Scientific Method				

1) Hypothesis was established.	4 (0.9)	21.5 (4.7)	428.5 (94.4)	100
2) A plan was developed for the method to be followed.	33.5 (7.4)	214 (47.1)	206.5 (45.5)	100
3) Method contained necessary variables for testing the hypothesis.	7.5 (1.7)	90 (19.8)	356.5 (78.5)	100
4) Experimental processes were carried out.	26.5 (5.9)	159.5 (35.1)	268 (59)	100
5) Sufficient data were collected.	8 (1.8)	93.5 (20.6)	352.5 (77.6)	100
6) Data analysis was properly performed.	13.5 (3)	93 (20.5)	347.5 (76.5)	100
d) Consistency and Contribution				
1) There is a consistency between purpose and result.	42 (9.3)	332 (73.1)	80 (17.6)	100
2) There is a consistency between problem and sub-problems.	2.5 (0.6)	74.5 (16.4)	377 (83)	100
3) Provides a new approach to impart a new method or field.	2 (0.4)	49 (10.8)	403 (88.8)	100
e) Usefulness				
1) It can be used for different scientific and technical fields.	5 (1.1)	86.5 (19.1)	362.5 (79.8)	100
2) An added value can be introduced to economy.	5.5 (1.2)	73 (16.1)	375.5 (82.7)	100
3) Benefits can be provided to society.	8 (1.6)	60.5 (13.5)	385.5 (84.9)	100
f) Implementability				
1) It can be used to solve other problems related to the field results have been presented.	1.5 (0.3)	83 (18.3)	369.5 (81.4)	100
g) Literature Review				
1) Necessary sources were reached.	79.5 (17.5)	172 (37.9)	202.5 (44.6)	100
2) Sources were used in the Project Report.	3 (0.7)	19.5 (4.3)	431.5 (95)	100
3) Sources were associated with the project subject.	0 (0)	6 (1.3)	448 (98.7)	100
h) Result				
1) The project was finalized.	361 (79.5)	69.5 (15.3)	23.5 (5.2)	100
2) Data were correctly interpreted.	12 (2.6)	199 (43.8)	243 (53.6)	100

According to the table 10, the subject and problem were clearly determined in 22.4% of 454 projects and partly determined in 54.6%. 48.3% of students provided a partial clear definition of the problem intended to be solved through project. However, 44% of students failed to provide any clear definition. It was seen that sub-problems were not determined in 98% of the projects.

It was found that 58% of the projects did not have original subjects and 68% did not have a creative nature.

It was determined that no hypothesis was established in 94.4% of the projects 47.1% of the projects had a partial plan concerning the method to be followed for reaching a solution, 45.5% did not develop any plan concerning the method to be followed for reaching a solution and 78.5% had methods not containing the variables required for testing the project hypothesis. It was concluded that 35.1% of students performed the experimental processes as required by projects, but 59% did not perform such processes. 77.6% of students failed to collect sufficient data at the end of these processes. The proper analysis of the collected data was partly conducted by 20.5% of students. 76.5% of students failed to conduct a proper analysis of the collected data.

Based on the examination of consistency between purposes and solutions, it is seen that there was just a partial consistency between purpose and solution in 73.1% of the projects. 83% of the projects failed to ensure a consistency between problems and sub-problems. 88.8% of the projects did not introduce any new method to literature, and 10.8% partly achieved it.

Based on the examination of the usage of the projects in different scientific and technical fields and usefulness for the economy and society, it was observed that 79.8% of the projects did not have any feature to be used in different scientific and technical fields. 82.7% could not create any added value for the economy if they were implemented. 16.1% provide a partial added value for the economy if they are implemented, and 84.9% did not provide any benefit to society. It was seen that 81.4% of the projects put forward solutions that could be used for solving the problems about related fields.

Based on the examination of the projects in terms of literature review and report writing, it is seen that 17.5% of the projects reached necessary scientific sources, 37.9% partly reached such sources, and 95% did not use such sources in the project report. 98.7% of students failed to associate the sources that were argued to be used in their projects with related project subjects.

79.5% of the projects were finalized. In 53.6% of the projects, obtained data could not be interpreted by establishing a cause and effect relationship.

Kruskal-Wallis test was carried out for determining whether there was any year-dependent significant difference between the results introduced by 8 criteria included in the Evaluation Chart for Science Projects Event for Primary School Students (Table 11). This test is a non-parametric alternative of the inter-group one way analysis of variance. This analysis allows making a comparison of three or more groups that have continuous variables.

Since significance level is lower than 0.05 in all criteria, it can be said that there is a significant difference between criteria by years (Table 11).

Table 11. The results of analysis of the criteria included in the evaluation chart for science projects event for primary school students by years

	Year	N	Criteria							
The Mean Ranks	**2007**	118	270.77 **(DP)**	233.15 **(LR)**	232.85 **(SM)**	191.56 **(R)**	179.50 **(I)**	172.36 **(CC)**	165.51 **(OC)**	162.51 **(U)**
	2008	50	228.06 **(SM)**	222.25 **(I)**	191.65 **(U)**	183.16 **(CC)**	182.31 **(OC)**	180.39 **(R)**	174.18 **(LR)**	168.22 **(DP)**
	2009	85	308.90 **(OC)**	269.92 **(CC)**	267.81 **(I)**	265.53 **(U)**	248.35 **(R)**	225.5 **(DP)**	174.78 **(SM)**	164.50 **(LR)**
	2010	113	249.77 **(U)**	245.27 **(R)**	243.92 **(OC)**	240.16 **(CC)**	233.73 **(SM)**	229.94 **(I)**	226.86 **(LR)**	188.25 **(DP)**
	2011	88	311.90 **(LR)**	269.68 **(U)**	269.40 **(CC)**	262.93 **(SM)**	259.51 **(R)**	255.49 **(DP)**	252.78 **(I)**	236.59 **(OC)**

The Table 12 shows the results of the analysis performed in order to determine whether there was any significant difference between the 8 criteria included in the Evaluation Chart for Science Projects Event for Primary School Students by school types. It was found that the scores obtained from The Determination of Problem, Originality and Creativity, Scientific Method, Consistency and Contribution, Usefulness, Implementability, Literature Review, and Result varied by school types.

Table 12. The results of the analysis of the criteria included in the evaluation chart for science projects event for primary school students by school types

Criteria	df	The Value of Kruskal-Wallis	p
a) The determination of problem	2	2.309	0.315
b) Originality and creativity	2	3.608	0.165
c) Scientific method	2	2.720	0.257
d) Consistency and contribution	2	8.702	0.013*
e) Usefulness	2	14.092	0.001*
f) Implementability	2	7.118	0.028*
g) Literature review	2	13.556	0.001*
h) Result	2	7.118	0.028*

*p<0.05

The effectiveness of specific school types in particular criteria was determined based on mean ranks. Accordingly, it was seen that Private Schools were more successful in Literature Review and Usefulness. Public Schools were more successful in The Determination of Problem, Scientific Method and Implementability, and Science and Arts Centers were more successful in Implementability, Consistency and Contribution, and Usefulness. On the other hand, it was found that Private Schools were unsuccessful in Implementability, Public Schools were unsuccessful in Usefulness, and Science and Arts Centers were unsuccessful in Literature Review and The Determination of Problem (Table 12a).

Table 12a. The mean ranks of the criteria included in the evaluation chart for science projects event for primary school students by school types

	School Types	N	Criteria							
The Mean Ranks	Private Schools	79	273.65 **(LR)**	262.04 **(U)**	254.91 **(R)**	253.30 **(CC)**	248.58 **(SM)**	244.97 **(OC)**	242.20 **(DP)**	234.24 **(I)**
	Public Schools	340	226.64 **(DP)**	222.33 **(SM)**	222.10 **(I)**	221.22 **(OC)**	219.18 **(LR)**	218.36 **(R)**	217.95 **(CC)**	215.84 **(U)**
	Science and Arts Centers	35	264.71 **(I)**	262.77 **(U)**	262.01 **(CC)**	254.40 **(R)**	249.10 **(OC)**	230.14 **(SM)**	204.20 **(LR)**	202.64 **(DP)**

It was tested whether there was any significant difference between the criteria included in the chart by Physics, Chemistry, and Biology subject areas. The related results are given in the Table 13. Accordingly, it was determined that there was a significant difference (p<0.05) between *The Determination of Problem* (p=0.006), *Originality and Creativity* (p=0.008), *Scientific Method* (p=0.036), and *Literature Review* (p=0.001) in physics, chemistry, and biology projects.

Table 13. The results of the analysis of the criteria included in the evaluation chart for science projects event for primary school students by subject areas

Criteria	df	The Value of Kruskal-Wallis	p
a) The determination of problem	2	10.34	0.006*
b) Originality and creativity	2	9.74	0.008*
c) Scientific method	2	6.67	0.036*
d) Consistency and contribution	2	4.33	0.115
e) Usefulness	2	3.18	0.204
f) Implementability	2	1.91	0.386
g) Literature review	2	14.12	0.001*
h) Result	2	1.20	0.550

*p<0.05

Based on the mean orders, it is understood that a higher success was achieved in *The Determination of Problem* in physics projects, in *Scientific Method* and *Literature Review* in biology projects, and in *Originality and Creativity* in chemistry projects. On the other hand, there was a failure in *Literature Review* in physic projects, in *Originality and Creativity* in biology projects, and in *The Determination of Problem* in chemistry projects (Table 13a).

Table 13a. The mean ranks of the criteria included in the evaluation chart for science projects event for primary school students by subject areas

	Subject Areas	N	Criteria							
The Mean Ranks	Physic	241	245.8 (DP)	237.07 (OC)	231.08 (R)	230.53 (I)	228.24 (U)	225.4 (CC)	215.96 (SM)	207.8 (LR)
	Biology	125	252.12 (SM)	241.6 (LR)	217.81 (I)	217.05 (R)	215.8 (CC)	214.99 (U)	209.51 (DP)	198.64 (OC)
	Chemistry	88	261.41 (LR)	249.88 (CC)	243.24 (U)	242.27 (OC)	232.97 (I)	232.55 (R)	224.13 (SM)	202.93 (DP)

Based on the evaluation of the projects by status of being invited to exhibition, it is seen that there was a significant difference between those invited to the exhibition and those not invited to the exhibition in terms of all criteria ($p<0.05$). In addition, it was determined that the projects invited to the exhibition were more successful in Originality and Creativity, Consistency and Contribution, Usefulness, and The Determination of Problem, but showed an intermediate success in other criteria. The projects not invited to exhibition were successful in Literature Review but were unsuccessful in other criteria.

Kruskal-Wallis test was carried out for determining whether there was any significant difference between the scores obtained through project evaluation chart by provinces. It was found that there was no significant difference between scores pertaining to the criteria apart from Scientific Method ($p=0.165$) by provinces ($p<0.05$) (Table 14).

Table 14. The results of the analysis of the criteria included in the evaluation chart for science projects event for primary school students by provinces

Criteria	df	The Value of Kruskal-Wallis	p
a) The determination of problem	11	26.56	0.005*
b) Originality and creativity	11	38.93	0.000*
c) Scientific method	11	15.41	0.165
d) Consistency and contribution	11	40.87	0.000*
e) Usefulness	11	44.54	0.000*
f) Implementability	11	26.65	0.005*
g) Literature review	11	43.06	0.000*
h) Result	11	26.04	0.006*

*p<0.05

Based on the data in the table, it can be said that the projects coming from 12 provinces showed success similar to one another in terms of The Determination of Problem, Originality and Creativity, Consistency and Contribution, Usefulness, Implementability, Literature Review, and Result.

In the table 14a, the average evaluations of expert researchers were calculated in regard to the projects of 12 provinces. It was understood that the projects from Bursa, Bilecik and Çanakkale were more successful in Literature Review the projects from Düzce, Sakarya, Kocaeli and Bolu were more successful in The

Determination of Problem, the projects from Kütahya were more successful in Result, the projects from Eskişehir and Afyonkarahisar were more successful in Originality and Creativity, the projects from Yalova were more successful in Consistency and Contribution, and projects from Balıkesir were more successful in Usefulness. On the other hand, the projects from Bursa and Eskişehir were unsuccessful in The Determination of Problem, the projects from Düzce were unsuccessful in Consistency and Contribution, the projects from Bilecik and Çanakkale were unsuccessful in Result, the projects from Kütahya, Afyonkarahisar and Yalova were unsuccessful in Literature Review, and projects from Sakarya, Balıkesir, Kocaeli and Bolu were unsuccessful in Originality and Creativity.

Table 14a. The mean ranks of the criteria included in the evaluation chart for science projects event for primary school students by provinces

	Provinces	N	Criteria							
The Mean Ranks	Afyonkarahisar	38	256.66 (OC)	256.12 (R)	245.66 (CC)	244.54 (I)	240.7 (U)	195.47 (SM)	184.26 (DP)	164.88 (LR)
	Balıkesir	43	283.49 (U)	278.19 (CC)	269.79 (R)	267.84 (LR)	258.38 (DP)	250.6 (SM)	250.21 (I)	247.88 (OC)
	Bilecik	62	234.31 (LR)	217.09 (I)	212.53 (DP)	212.03 (OC)	207.75 (U)	204.88 (CC)	203.18 (SM)	184.89 (R)
	Bolu	4	249.63 (DP)	210.5 (CC)	190.5 (LR)	179.5 (I)	161.75 (SM)	141 (U)	116.13 (R)	114 (OC)
	Bursa	122	256.07 (LR)	236.81 (SM)	231.82 (U)	229.21 (R)	227.67 (CC)	223.22 (OC)	222.73 (I)	205.04 (DP)
	Çanakkale	19	269.34 (LR)	227.03 (I)	226.95 (SM)	218.76 (DP)	212.16 (OC)	198.63 (CC)	196.63 (U)	167.82 (R)
	Düzce	24	261.71 (DP)	210.50 (LR)	206.85 (R)	198.65 (SM)	179.50 (I)	156.71 (OC)	149.50 (U)	129.38 (CC)
	Eskişehir	21	300.5 (OC)	271.12 (U)	267.21 (I)	262.5 (SM)	253.52 (LR)	249.38 (CC)	243.55 (R)	225.07 (DP)
	Kocaeli	16	313.44 (DP)	253.16 (LR)	227.03 (SM)	198.63 (R)	179.5 (I)	179.25 (U)	166.25 (CC)	161.5 (OC)
	Kütahya	67	239.51 (R)	238.13 (OC)	234.66 (I)	228.69 (CC)	225.87 (DP)	217.99 (U)	215.74 (SM)	163.28 (LR)
	Sakarya	10	294.2 (DP)	279.1 (SM)	241.65 (CC)	230.7 (LR)	219.35 (R)	179.5 (I)	168 (U)	148 (OC)
	Yalova	28	291.16 (CC)	287.55 (U)	282.75 (OC)	276.02 (DP)	267 (SM)	263.38 (R)	259.29 (I)	220.8 (LR)

Conclusion

13922 online project applications were made to the project competition in 2007 18313 were made in 2008, 31866 were made in 2009, 33264 were made in 2010, and 63247 were made in 2011. Of these projects, 959 were considered worthy of being exhibited at regional level in 2007, 902 were in 2008, 1045 were in 2009, 1004 were in 2010, and 1048 were in 2011. 62 science projects ranked among the top 100 in 2007, 62 in 2008, 66 in 2009, 68 in 2010, and 65 in 2011 (MNE, 2007a; MNE, 2008; MNE, 2009; MNE, 2010; MNE, 2011). A total of 454 project applications were made in Bursa region in the project competition titled “This Is My Work”, jointly conducted by MNE and TUBITAK Department of Supporting Scientists in the field of science between 2007 and 2011. At the first stage, 181 of these projects were considered by the science boards composed of faculty members in Bursa region worthy of being exhibited. 20 of the exhibited projects were deemed suitable for being sent to Ankara to be exhibited for country-wide eliminations. 9 of these projects received awards by ranking among the top 50 in Turkey at the exhibition held in Ankara. The projects within the scope of “This Is My Work: Mathematics and Science Project Competition” underwent quite detailed long evaluation processes at different levels in schools, districts, provinces, and regions until this final stage. Certain scientific principles and criteria were not sufficiently and effectively used by relevant people during the evaluation of the projects that went through evaluation boards of different levels. These evaluations need to be revised in accordance with certain criteria. It was determined at our information meetings in Bursa, and the interviews during the exhibition that the projects sent to an upper level competition without paying attention to evaluation criteria had a negative effect on both the teachers guiding the projects and the students preparing the projects. Thus students lost self-confidence to a considerable extent or formed a defense texture based on knowledge without any scientific basis, and mostly exhibited reactive attitudes. Based on the review of the evaluation chart employed by juries composed of teachers and faculty members, it is seen that required attention was not paid to scientific criteria. Based on the re-evaluation of projects through main titles and sub-titles included in the evaluation chart prepared in accordance with scientific criteria, it is realized that there are certain aspects, which are lack of particular qualifications, and cannot be improved or changed. In this regard, this section gives a brief evaluation of the data obtained from findings in accordance with the main titles in the evaluation chart.

Based on the distribution of the project applications by school types, it is seen that Public Schools ranked first (74.9%), which were followed by Private Schools (17.4%) and Science and Arts Centers (7.7%).

Although there are 3522 public primary schools and 88 private primary schools in the Bursa region, there are just 10 Science and Arts Centers. Science and Arts Centers are the institutions affiliated to the MNE that provide special education in order to enable highly or specially talented students attending pre-school education, primary education, and secondary education institutions to be aware of their individual skills and to make best of them by improving themselves. Standing for 0.28% of the schools in our region, Science and Arts Centers have a share of 7.7% in a total of 454 science projects participating in the competition. The fact that 35 projects participated in the competition from such few number of institutions results from the fact that students with superior abilities and high capacities are dense at these institutions, the students at such institutions have adequate motivation, such institutions have enough physical equipment, and family, teacher and school support are sufficiently provided to students at these kinds of institutions.

The fact that the private schools, which have 2.43% of primary school students have a share of 17.4% in all project applications is caused to a considerable extent by that an effective teacher and family support is provided at these schools and the projects are subjected to an elimination beforehand. It is understood that a special effort is made for students to participate in project competitions, which means that students at these schools are more motivated for participating in scientific activities. This situation strengthens the impression that the same scientific support and encouragement, as well as, assistance required for project design and management are not provided at public schools. Although the ratio of public schools in the region is 97.29%, the ratio of participation in scientific research and project activities is just 74.9%. The study conducted by Argon and Yılmaz (2006) where the dimensions having an effect on the educational processes at primary schools were examined demonstrated "administrators" had the highest influence, and "students" and "school environment and parents" had the lowest influence. Non-inclusion of the environment where the school is located in educational processes through school activities causes students to be educated through a process where students are not integrated with the environment. The study conducted by Gür and Batır (2009) determined that the students receiving education at public schools and their parents did not find adequate this free service of the state, thus spent much money for private educational institutions and training centers. This situation shows that there are important problems in the inclusion of students in active educational processes at these educational institutions.

Although private primary schools make up 17.4% of all primary schools located in 12 provinces, it is clear that the students of these schools are prepared by their teachers for participating in these kinds of activities more, and their wishes for participating in scientific activities receive more support by their institutions in comparison to their peers at PSs. The effective reflection of this support in tools, materials, self-confidence, original thinking, and reporting is easily understood from the evaluated projects. In this regard, the students attending PrSs and SACs have similar features. Moreover, it is understood that the students at SACs are prone to project generation, implementation, and finalization, have good facilities, receive support from their families, and their projects are supervised and evaluated by chosen teachers, thus have better conditions in comparison to the students studying at PSs. These results are closely related to project design in the context of the use of scientific methods besides the reflection of outlook on research, motivation and socio-economic level in education (Çeken, 2011). Project design is included in the MNE Science and Technology curriculum under the titles of “project assignments” and “performance assignments” (MNE, 2005). It is seen that the evaluated 454 projects failed to satisfy the related expectations of the Council of Education and Morality, as well as, 2005 Science and Technology curriculum. The teachers taking part in provincial and regional science boards for evaluating the projects submitted to competitions need to acquire realistic and consistent evaluation criteria as well as the qualifications to implement such criteria through an effective in-service training. It is understood that the projects sent from schools were prepared without complying with particular criteria, and that the goal was to increase the number of the projects sent. Although some studies conducted abroad demonstrate that public school students are more successful than private school students (Cutts and Moseley, 2001), the situation in Turkey is contrary to this finding (Köse, 1997; Erdoğan, 2002). It is obvious that the approach adopted by private schools for the selection of students is an important factor in this sense.

There are differences in the distribution of the projects by school types and years. The biggest number of project applications was made in 2007 in which 118 projects (26% of all projects under examination) were submitted. The fewest number of applications were made in 2008 in which 50 projects were submitted. Although it is possible to say that the fact that the projects started to be evaluated via electronic media in 2008 had an effect, the programs and encouragements of the authorities on the projects were not influential over the years, which can be understood from the figures belonging to years. The biggest number of applications from PSs came in 2007 (22%), from PrSs came in 2011 (4.4%), and from SACs came in 2010 (3.5%), which shows that a specific ratio was not ensured in the participation in project competitions and the generalization effort made in this matter failed.

The ranking in project applications based on provinces is as follows: Bursa-Kütahya-Balıkesir for PS; Bursa-Bilecik-Kütahya for PrS; and Bursa-Bilecik-Afyonkarahisar for SAC. We are of the opinion that the officials serving at the Provincial Directorate of National Education at related periods have an effect on this ranking.

Although there is no significant difference between projects by gender, female students predominate (51.8%).

The distribution of the projects participating in competition by sub-fields of Science and Technology is as follows: Physics: 241 (53.8%) – Biology: 125 (27.54%) – Chemistry: 88 (19.38%). This situation indicates that subjects were mostly selected from daily life. Making life easy, providing energy saving or making use of any mechanism for other purposes outweighed in the selection of subjects. Of the projects prepared in the field of physics, 46.5% were about Technological Design, 12% were about Electricity, and 10% were about energy.

When the projects were revised in accordance with evaluation criteria, it was seen that projects were mostly below the desired level or the level expected from related age groups, and the subjects were not processed well and planning was not good in the projects in which advanced level project subjects were selected. Moreover, the fields to which some subjects were close could not be determined by guidance counselors or related jury members until the final stage. In this sense, the incompetence of teachers in the matter of project preparation should be taken into account, especially in physics-related subjects.

The subjects selected for projects should motivate students for studying. Provide them with skills to use tools and equipment, be about real life, pave the way for different studies. Give an opportunity to improve mental and physical abilities, cover desired activities, be freed from useless endeavors, should be worth of the investment made in the tools, equipment and references employed, and ended up with a proper output (Gözüm et al., 2005). The projects in the field of biology are mostly about plants and the environment. The fact that the studies on animals and certain microorganisms are considered harmful for human health and inconvenient in terms of animal rights has an important role in the prominence of the subject of plants. Project designs in the field of biology inspired by daily life can be regarded as a realistic approach. The fact that tools and equipment were easily supplied and plants were good experimental materials caused 25.6% of the submitted projects to be about Plant Physiology and Development, which was followed by Ecology (22.4%), Human Anatomy and Physiology (12%), Biochemistry (11.20%), and Microbiology and Teaching Materials (9.6%). Total ratio of the biology-related subjects mentioned under the aforesaid six sub-titles is 90.4%. The fact that the projects about Entomology, Inheritance, Teaching Materials, Soil Biology, Vitamins, Cell, and certain animals constituted 9.6% of all projects shows that some project subjects were selected completely independently from the Science and Technology curriculum. This situation should be regarded in the sense that it requires an additional good preparation for research subjects. On the other hand, the diversity of subjects in biology provides participants with important conveniences in project design.

23.6% of the project applications are about Organic Chemistry, and 8% are about Biochemistry. This indicates that some projects failed to go beyond the field of chemistry in terms of content. The fewness of the number of the projects dealing with Chemical Reactions (10.3%) and Acids and Bases (7.9%) demonstrates that chemistry subjects should be taken into consideration in the project preparation process and that the selected subjects should be put under the microscope. It is understood that there is an important deficiency in this field.

The fact that physics, biology, and chemistry subjects included in Science and Technology curriculum are not prepared with the aim of teaching and solving the issues that students are interested in or regard as problems in their daily lives not only impedes the generalization of research culture, but also leads to certain misperceptions and mistakes about the field. The project works that are not based on scientific terms, concepts, and approaches do not only cause loss of time and effort for non-interesting subjects, but also make teaching difficult by causing a misunderstanding of many concepts. This kind of learning difficulty should not be fed by project works.

Since it is necessary to conduct and finalize projects in coherence, the experts, teachers, and officials who are to take part in the selection of competition projects must act sensitively and carefully. This is why; it is required to ensure the use of the points such as originality, problem selection, hypothesis, consistency, scientific contribution, implementability, social benefit, and general effect as criteria in the evaluation of projects, and to teach that project preparation, implementation, and finalization refers to a process that must be conducted within the framework of scientific research methods and techniques. The selectors not having the above-mentioned competence should not be assigned. A separate teaching or recall is needed for each one of these criteria.

Supporting the place of a well-prepared project in the current structure of science and technology in a justifiable manner and through literature studies, reasoning over the hypotheses of it, and determining the conceptual and theoretical framework of it well increase the originality of the project. It should be noted that the methods chosen should be compatible with the purpose, support the suggested solution approach, and contain necessary variables. There should be appropriate infrastructure facilities for the project to be carried out. In addition, the project should be prone to obtaining broad results that can be employed in different fields, and have a capability to generate solutions to the problems of society. The achievement of all these expectations depends on the sufficiency of the evaluation criteria that are explicitly or implicitly used in the project evaluations. In this regard, an attempt was made to constitute a set of project evaluation criteria in the present study. The correspondence of the data collected through these criteria with the results obtained in the competition processes was examined. 23 sub-titles included in the project evaluation chart were scrutinized by two expert researchers and one consultant. The results were evaluated as “yes”, “no”, and “partly”. In addition, an attempt was made to make the criteria more effective and useful by examining whether there was any difference between the opinions of experts who evaluated sub-titles independently from one another. Since the study was conducted via survey method, new criteria that would cover the presentations and allow the evaluation of these kinds of titles were included. Since it was thought that a 5-point likert type evaluation would be more useful, the criteria were finalized to include The Determination of Problem, Scientific Method, Originality, Consistency, Contribution, Usefulness, Implementability, Source Usage, Result, and Presentation. The set of criteria came to consist of 10 main items and 33 sub-items. In fact, this approach is based on the intention for enabling the criteria to be used more effectively and more sensitively when evaluating projects.

The fact that researchers were not able to give the answer of "yes" to any one of the sub-titles during evaluations evidences that criteria were not fulfilled during project preparation. The answer, "partly" was given only to two sub-titles. 17 of 23 sub-titles were answered "no" by experts. This shows that our region was below the expected level concerning project design in accordance with competition conditions.

It is understood from the table 11 that a partial success was achieved in such criteria as the determination of problem (54.6%), the planning of method (47.1%), and the consistency between the purpose and solution of problem (73.1%). This partial success indicates that the effort made in the matter of the MNE project and performance assignments was not sufficiently understood and effectively implemented at educational institutions and organizations. If what was prescribed in the related regulations and other instructions had been performed, it would have been possible for these values to be found higher.

It goes without saying that originality has a special place in projects. If a project is based on research culture and problem-solving demands, it is needed to meticulously abide by a scientific research method, carefully plan such method, duly manage the process, and prepare result report. In consideration of the originality values of 454 Science and Technology projects under examination, it is seen that those with the highest originality values only have an originality value of 5%, which points to another basic deficiency of the projects under examination.

Establishing a hypothesis is one of the most important stages of scientific research. Based on the evaluations made by experts in accordance with project evaluation criteria, it has seen that 94.4% of the projects are unsuccessful in making a prediction for the solution of the problem and determining the way to be followed for reaching solution. If school administrators and other institutions and organizations make an effort in the matter of project management and support students and teachers, more successful results can be obtained (Özer and Özkan, 2012).

It was determined that the methods employed in most of the projects (78.5%) did not contain the variables necessary for testing the project hypotheses and that the experimental processes required by the projects were not carried out (59%). It was observed that teachers and students were incompetent about scientific process skills despite high-level expectations in the MNE legislation.

Another problem is about proper data collection. It was understood that there were significant deficiencies in both recording the collected data (77.6%) and analyzing such data (76.5%). However, it is not technically difficult to eliminate this deficiency.

It was seen that although there was a partial consistency between the purposes and the solutions of the projects, there was no consistency between the problems and sub-problems (83%). It was found that there was no search for a new method or for implementing a known method in another field within the scope of the projects under examination (88.8%). This situation evidently resulted from the deficiency in effective construction and association of scientific methods.

The points of usefulness and implementability were not sufficiently taken into account. It was determined that majority of 454 projects did not have any feature to be used in different scientific and technical fields, did not contribute to economy and society, and did not have any capability to put forward any broad and usable result related to their fields.

It is remarkable that the level of use of the sources reached through literature review within project report was quite low (0.7%). The fact that none of the projects associated the reached sources with project subjects indicates an important issue that must be focused on. This is obviously a very important deficiency. It means that the existing knowledge base about the project subject was not reached or effectively used. Accordingly, there is a deficiency about reaching the information, using the information, and associating the information with project outputs, which results from lack of mental preliminary preparation about the subject. It is thought that reminding our teachers of the fact that it is necessary to consider the research subject and knowledge and findings in the literature together through appropriate environments and conditions will make important contributions to advancement. Guidance counselors are required to review term papers and performance assignments based on the Science and Technology Curriculum 2005 of MNE Council of Education and Morality. Knowledge can be reached by doing and experiencing, however it should be noted that past experiences should not be ignored.

It is an expected result that 79.5% of the projects were finalized. Only 2.6% of 454 projects had a difficulty in interpreting cause and effect relationships. Students had a difficulty in putting forward a product.

Kruskal-Wallis test was carried out to determine whether there was any year-dependent significant difference between the criteria of The Determination of Problem, Originality and Creativity, Scientific Method, Consistency and Contribution, Usefulness, Implementability, Literature Review, and Result included, in the Evaluation Chart for Science Projects Event for Primary School Students. The test results showed that there was a significant difference between the criteria by years ($p<0.05$). In addition, the mean ranking of the projects showed that they were more successful in The Determination of Problem in 2007 and 2011, in Originality and Creativity in 2009 and 2010, Scientific Method in 2010 and 2011, in Consistency and Contribution in 2009 and 2011, in Usefulness in 2009 and 2011, in Implementability in 2009 and 2011, in Literature Review in 2007 and 2011, and in Result in 2009 and 2011. This situation points to the fact that no regular and meaningful advancement was achieved in the course of time.

It was found that there was a significant difference between The Determination of Problem, Originality and Creativity, Scientific Method, and Literature Review in physics, chemistry, and biology by subject areas ($p<0.05$). The mean ranking of the projects demonstrated that the projects about physics were more successful in The Determination of Problem, the projects about biology were more successful in Scientific Method, and the projects about chemistry were more successful in Originality and Creativity, Consistency and Contribution, Usefulness, Implementability, Literature Review, and Result.

Mann-Whitney U test was performed to determine whether there was any significant difference between the statuses of being invited to the exhibition of the projects making an application. It was seen that there was a significant difference in favor of the projects invited to the exhibition in terms of 8 criteria ($p<0.05$). This is an indicator of the fact that there is a consistency between the results obtained through our evaluation criteria, and the previous evaluations.

Kruskal-Wallis test was carried out to investigate whether there was any significant difference between the scores obtained through project evaluation chart by provinces. There was no significant difference ($p>0.05$) between provinces in any criteria other than the scientific method employed ($p=0.165$). The mean ranking of the projects demonstrated that the projects were more successful in The Determination of Problem in Kocaeli, in Originality and Creativity and Implementability in Eskişehir, in Scientific Method in Sakarya, in Consistency and

Contribution and Usefulness in Yalova, in Literature Review in Çanakkale, and in Result in Balıkesir.

Although projects and performance assignments and information concerning the assessment and evaluations of such works had a wide coverage in the legislation of the MNE as well as in the directives of the General Directorate of Primary Education besides related regulations, these kinds of expectations and requirements did not make sufficient impact at schools (MNE, 2011). The evaluation of projects and performance assignments via a grading key requires preparing criteria accordingly. The prepared grading keys should be shared with students and teachers. Since projects can be carried out individually or in groups, a long period is required sometimes. The process should be supported by such skills as curiousness, research, and communication. Within the framework of project design, students should acquire knowledge by doing and experiencing or examining. The chart suggested by the Council of Education and Morality to be used in the evaluation of project works was limited to motivation, planning, data collection, report writing, and presentation. These criteria are far from competency for evaluating the competition projects. They are mostly aimed at evaluating the term papers. Considering this deficiency, the project evaluation and scoring system was re-arranged. Through this kind of an arrangement, the chart may be turned into a scoring chart that can be used under a single title by assigning a separate score for each sub-title. However, we are of the opinion that total scores to be assigned to criteria in the projects aimed at generalization of competition and research culture should concentrate on originality, implementability, and presentation.

Recommendations

The following recommendations should be taken into consideration by the relevant authorities in order to increase the participation of middle schools in Science and Technology projects, to generalize the research culture, to eliminate the differences of participation between schools, to accommodate participation ratio to schooling rate, to raise the scientific and technological level of projects, and to make schools, teachers, students, and parents to be more interested in this matter:

1. Cooperation should be ensured between administration, teachers, students, and parents to provide participation in project competitions in accordance with the numbers of public schools,

2. The local reasons for low level of participation from public schools should be determined, and necessary measures should be taken,
3. Teachers and students should be provided with foreknowledge concerning project planning, content, method, and report writing,
4. The main problems projects should be selected from daily life; necessary time should be given to teachers serving as project managers; these teachers should be financially supported by school administrations,
5. Tool and equipment support should be provided to students who prepare projects by school administrators, teachers, families, and other organizations,
6. The people or institutions that conduct, exhibit, organize, and publish scientific activities at the middle school level should be introduced to participants,
7. Encouraging students to do research or conduct a project should be turned into a consistent educational policy at public schools,
8. The exaggerated desire to guide and manage at private schools should not turn into an instrument of pressure fear, intimidation, or tedium in the course of time,
9. Since it is possible to provide the same special interests and laboratory and other favorable conditions as those available at Science and Arts Centers also in the other school environments, certain attempts should be made for schools to be perceived as an environment of learning and research. In addition, short-term and long-term measures should be taken to ensure that schools are not regarded as a competition environment for either learning or projects, and no secondary position is attributed to them for any reason including,
10. The fulfillment or non-fulfillment of particular rules or the degree to which such rules are fulfilled during project management should be determined through a project evaluation chart,
11. Ateliers, laboratories, libraries, and internet should be kept available for students to access when they want or need while designing or implementing a project,
12. Project subjects should be realistic and based on scientific data bases; scientific reality and imaginariness should not be confused; imaginariness and other similar approaches should be kept out of attention by both guiding counselors and students,
13. A particular attention should be paid to the preparation of management and work flow plan for projects that are practical and will end up with an output through experimental activities,

14. It should be taken into consideration that the evaluation criteria are not different from the criteria featured in the implementation of scientific research methods,
15. Project guide counselors and students should be warned that competition projects, term projects, assignments, or any survey-based general projects designed for solving certain problems must not be confused,
16. Experts, consultants or teachers chosen for evaluating projects should be informed that they must be objective, obey confidentiality principle, perform an evaluation or ranking in accordance with the sub-titles included in the chart, and ensure a careful and meticulous evaluation. If necessary, these experts, consultants, or teachers should be supported via an in-service training,
17. Project proposals should come from students in consideration of the fact that a process managed through instructions alone cannot make the expected contribution to the improvement of cognitive and affective skills of students,
18. The development of critical thinking, discussing, and questioning skills of students should not be suppressed in competition projects.

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