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Evaluation of New Primary Science and Technology Curriculum: Sample of Adıyaman

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ABSTRACT

The main purpose of this study is to examine primary school teachers' problems that they encounter in application of program and investigate how the science and technology lesson curriculum which has been applied since 2005-2006 spring semester was evaluated by the main practitioner of the program. The teachers' views are considered and reviewed regarding the evaluation and problems of instruction program. This study was conducted with primary school teachers worked in elementary schools in Adıyaman. The scale developed by researchers with the contribution of the experts was used for gathering data in the study. Data of survey were analyzed with SPSS by using techniques of frequency, percentage, Independent Samples t-test, one way Anova and Scheffe tests. Cronbach Alpha consistency coefficient was found 0.80 (α=0.80) for reliability analysis with respect to the scale. It is concluded that deficiency of materials, equipment and science and technology laboratories in schools has been prevented the efficient application of the curriculum and this curriculum was not harmonized with the central examination system used in our country with respect to processing and evaluation basis.

Keywords: Science and Technology, Instruction Program, Elementary Education

INTRODUCTION

Nowadays, the experienced rapid economic, social, scientific and technological developments have changed our life styles in a significant manner. Especially, the effects of scientific and technological developments to our lives have been seen obviously in a manner that has not been seen in the past.

Globalization, international economic competition and rapid scientific and technological developments would continue to affect our lives in future. The developed countries consciously have beliefs that every citizen should have science and technology literacy and the key role of science lessons in this period to form a powerful future in consideration of all of the above (Topsakal, 2005). Science and technology literacy is a combination of skills, attitudes, values, understandings and information related to science that is necessary for developing the people's research-inquiry, critical thinking, problem solving and

making decision; becoming life-long learners and continuing curiosity about the world and their environments in general (Kıroğlu, 2006).

Reconstitutions of teaching curriculums have been made in our education system in different times since foundation of Turkish Republic. After the foundation of Turkish Republic in 1923, basic reconstitution of primary school teaching curriculums were made in 1924, 1926, 1936, 1948, 1962 and 1968. Compulsory primary education was planned as five years in Turkish National Education System from 1924 to 1997. Compulsory primary education was raised to eight years after 1997 and elementary school teaching curriculums have been planned again with reference to this change (Kılıç, 2002).

The need of structural organizations in the development of educational curriculums were stated in Education Programs and Teaching Professors Council (EPT) by Gömleksiz et.al (2006) in the period of obligation for social transformations aiming to adapt European Union. The last constitution was applied in some pilot schools during 2004-2005 academic year first and then it was applied in all schools of Turkey in 2005-2006 academic year. The new curriculum includes many changes in terms of various types of aspect. It was aimed that the educational objectives would be gained by using a constructive learning approach and active participation of students during the learning process. This new curriculum is based on active participation of students to learning and teaching process instead of students' memorization of knowledge presented by the teachers in a passive manner. Shortly, the new curriculum defines the goal of Science & Technology courses as helping students "to become science and technology literate" in spite of their personal differences (MEB, 2005). Besides this, it is emphasized that science and technology literacy does not consist in knowing scientific principles and theories, but includes acquiring knowledge on the nature of scientific thinking and processes, on scientific values, the general nature of science and technology, and science-technology-society interactions (TÜBA Report, 2004).

It is very important to change the name of science lesson as "Science and Technology". Science and technology concepts are different in terms of their purposes but related with each other because of using similar skills, intellectual habits in scientific researches and technological design processes (Bahar, 2006). It was given up with some applications and curriculum in education area in the past. Some of them can be given as examples: Subject Promotion and Credit System, Limne Project etc. These applications can be discussed with advantages and disadvantages in our education system but some structural deficiencies like deficiency of teachers, materials and physical conditions caused to failure of the applications. It can be more realistic to evaluate the efforts of developing curriculum apart from these applications, because, the education and teaching studies should be updated continuously with respect to dynamics of the present time.

The changes in the curriculum can meet the expectations of the society but sometimes the desired result can not be obtained. Therefore, feedbacks about the new curriculum should be evaluated after the end of application process. The feedbacks derived from the application up to now, would give an idea about the structure of the curriculum and applications. It is important to evaluate the four components of the curriculum with respect to Stufflebeam's environment, input, process and output model. Evaluation of the process has been made during the application of curriculum and serves to make decisions with respect to the application of curriculum. It is checked overlapping plans in the curriculum with the real applications (Akdağ, 2004).

The teachers certainly play key role in the application of the new curriculum. There are many researches emphasizing the important role of the teachers' views, beliefs and attitudes toward curriculum about the application of curriculum (Olson, 1981; Crawley and Salyer, 1995; Tobin, 1987). For example, it has been emphasized that the teachers' beliefs

and attitudes toward curriculum determined the structure of teaching activities with respect to the study made by Huinker and Madison in 1997. Similarly, some other researchers (Smith and Anderson, 1984; Clark and Elmore, 1981; Cronin-Jones, 1991) stated that the teachers adapted the curriculum to the classroom with respect to their own beliefs, attitudes, preferences, information and needs.

The teachers' beliefs toward curriculum are strong indicators of the planning, teaching strategy, making decision and how to perform activities in classroom (Pajares, 1992; Clark & Peterson, 1985). Tobin and et.al (1990) have stated that the teachers' beliefs toward learning and teaching of the curriculum were the most determining factor for communication and activities performed in the classroom. Thus, investigation of the teachers' beliefs toward curriculum would be important (Pajares, 1992). Tobin, Tippins and Gallard (1994) explained clearly that there was an important need to determine the teachers' beliefs and attitudes in the study of curriculum reform and development in 1994. Many researchers emphasized this important relationship between the study of curriculum reform, development and the teachers' beliefs toward curriculum (Cornett, Yoetis, & Terwilliger, 1990; Crawley & Salyer, 1995; Haney, Czerniak & Lumpe, 1996; Hashweh, 1996; McDevitt, Heikkinen, Alcorn, Ambrosio, & Gardner, 1993). Deringöl and Barış (2006) found that there were some deficiencies in application of the curriculum despite the elementary school teachers had information about content of the science and technology lesson. This study is also important in terms of representing the validity of beliefs and attitudes in the conditions of Turkey.

It has been aimed to examine primary school teachers' problems they encounter in application of the program and investigate how the science and technology lesson curriculum which has been applied since 2005-2006 spring semester was evaluated by the main practitioner of the program in this study.

METHODOLOGY

The research is descriptive study. In this study, it has been tried to determine the views and reactions of elementary school teachers performing science and technology lesson toward science and technology curriculum which is applied at the present time.

A) Sampling

The sample of this study consists of elementary school teachers worked in elementary schools in second semester of 2005-2006 academic year in Adıyaman.

B) Data Collection and Analysis

The data collection instrument has been developed by the researchers after considering experts' (teachers and instructors) views and the literature. This instrument is in form of Likert scale with five scales (strongly agree, agree, disagree, etc.). The data collected by this scale are analyzed by SPSS (Statistics Package for Socials Sciences) packet program. Percentages, frequencies, One-way Analysis of Variance (ANOVA), Independent Samples t-test evaluations, Scheffe tests to determine the differences between groups were used in the analysis. The significance level was taken as $p=0.05$. Only the different items in the comparative analysis were interpreted and represented as tables. The internal reliability of the survey was calculated by using Cronbach's Alpha formulae and found 0.80 ($\alpha=0.80$).

FINDINGS

Table 1. *The Descriptive Statistics of Teachers in the Population with respect to Gender*

	N	%
Male	151	67.4
Female	73	32.6
TOTAL	224	100

Table 1 show that 67.4 percentage of population was male and 32.6 percentage was female teachers in the research.

Table 2. *The Descriptive Statistics of Teachers in the Population with respect to Experience in Profession*

	N	%
0-5 years	9	4.0
6-10 years	73	32.6
11-15 years	56	25.0
16-20 years	35	15.6
21 and more years	51	22.8
TOTAL	224	100

Experience of teachers has been shown in Table 2 as years. It can be seen that 4 percentage of teachers have 0-5 years of experience; 32,6 percentage have 6-10 years of experience; 25 percentage have 11-15 years of experience; 15,6 percentage have 16-20 years of experience and 22,8 percentage have 21 years or more than 21 years of experience.

Table 3. *The Descriptive Statistics of Teachers in the Population with respect to Faculty of Graduation*

	N	%
Faculty of Education	117	52.2
Faculty of Science and Art	20	8.9
Institute of Education	34	15.2
Other	53	23.7
TOTAL	224	100

As it can be seen in Table 3, 52,2 percent of the teachers graduated from Faculty of Education; 8,9 percent graduated from Faculty of Science and Arts; 15,2 percent from Institute of Education and 23,7 percent graduated from other institutions.

Table 4. *The Descriptive Statistics of Teachers in the Population with respect to In-service Training Status*

In-service Training	N	%
Participated	60	26.8
Not Participated	159	71.0
Other	5	2.2
TOTAL	224	100

26.8 percent of the teachers in the research have participated in-service training about the subject; 71 percent of the teachers have not participated in-service training and the rest of the teachers have participated to other activities as can be seen in Table 4.

Table 5. *The Frequency and Percentages of Methods and Techniques used in Science and Technology Lesson by the teachers*

METHODS	**Never**		**Sometimes**		**Often**		**Always**	
	f	%	f	%	f	%	f	%
Laboratory	41	18,3	99	44,2	26	11,6	15	6,7
Demonstration	14	6,3	70	31,3	56	25,0	28	12,5
Experiment	0,0	0,0	76	33,9	93	41,5	46	20,5
Cooperative Learning	3	1,3	48	21,4	78	34,8	57	25,4
Drama	10	4,5	100	44,6	56	25,0	33	14,7
Trip-Observation	30	13,4	130	58,0	15	6,7	10	4,5
Question-Answer	0,0	0,0	9	4,0	76	33,9	129	57,6
Computer Assisted Instruction	112	50,0	42	18,8	11	4,9	6	2,7
Problem Solving	1	0,4	55	24,6	98	43,8	48	21,4
Simulation	12	5,4	61	27,2	70	31,3	30	13,4
Project	14	6,3	96	42,9	54	24,1	25	11,2
Brain Storming	3	1,3	50	22,3	88	39,3	66	29,5
Lecture	18	8,0	115	51,3	37	16,5	36	16,1

As it can be seen in Table 5, it can be thought that the elementary teachers had difficulty related with the methods required to use materials. For example, 44.2 percent of the teachers answered "sometimes" related with usage of laboratory method. Likewise, half of the teachers in the research have stated that they have never used the computer assisted instruction method. Furthermore, it has been seen that the teachers used the methods like brain storming, lecture and question-answer more than other methods. It is quite remarkable that the 44.6 percent of the teachers used drama method sometimes and 31,3 percent of the teachers used simulation method often.

Table 6. *The views of the teachers about the new Science and Technology Curriculum*

	Strongly Agree		Partly Agree		No Idea		Partly Disagree		Strongly Disagree	
	f	%	f	%	f	%	f	%	f	%
1-The teachers have been participated in-service training in a sufficient level before application of the new curriculum.	13	5.8	58	25.9	3	1.3	96	42.9	52	23.2
2- The new curriculum helps the students to learn natural world.	96	42.9	113	50.4	1	0.4	10	4.5	1	0.4
3- The new curriculum encourages curiousness to scientific and technological developments by students.	133	59.4	71	31.7	3	1.3	13	5.8	2	0.9
4- The new curriculum is student centered program.	133	59.4	72	32.1	4	1.8	11	4.9	4	1.8

Table 6. Continued..

5- The new curriculum provides understanding interactions between science, technology, society and environment by students.	106	47.3	97	43.3	6	2.7	12	5.4	1	0.4
6- The new curriculum encourages making research and investigation by students.	129	57.6	77	34.4	1	0.4	11	4.9	1	0.4
7-Activities and applications have been found more than information in the new curriculum.	152	67.9	54	24.1	7	3.1	11	4.9	0	0
8- The new curriculum overlaps with the central examination systems.	17	7.6	37	16.5	16	7.1	66	29.5	85	37.9
9- The new curriculum has caused to change the teacher's role.	88	39.3	103	46	4	1.8	22	9.8	6	2.7
10-The student's objectives are not clear and satisfactory enough in the new curriculum.	34	15.2	111	49.6	10	4.5	61	27.2	5	2.2
11-The frequent change of the curriculums defected the process of teaching and education.	121	54,0	62	27,7	4	1.8	26	11.6	5	2.2
12-The new curriculum has been prepared considering the students' cognitive development levels.	61	27.2	105	46.9	12	5.4	35	15.6	7	3.1
13- The new curriculum has not been applied effectively because there is no laboratory in the school.	79	35.3	63	28.1	7	3.1	49	21.9	20	8.9
14- The new curriculum provides using technology by the students.	92	41.1	97	43.3	2	0.9	22	9.8	7	3.1
15- The new curriculum provides to gain scientific viewpoint to the daily life events for the students.	88	39.3	104	46.4	7	3.1	17	7.6	4	1.8
16- There is need to the educational technologies (overhead projector, projector etc.) for using the new curriculum effectively.	188	83.9	27	12.1	2	0.9	4	1.8	0	0
17- The new curriculum has been prepared to draw attention and to get curious by the students.	89	39.7	116	51.8	2	0.9	10	4.5	4	1.8
18-The students have learned by exploration through the new curriculum.	92	41.1	104	46.4	6	2.7	18	8	3	1.3
19-The new curriculum has contributed to form students' science and technology literacy on a large scale.	73	32.6	114	50.9	12	5.4	21	9.4	2	0.9
20-Science and technology lesson teachers should lecture in science and technology lesson for applying the new curriculum effectively.	88	39.3	39	17.4	5	2.2	49	21.9	40	17.9
21-The lesson period is not enough to perform new curriculum.	91	40.6	66	29.5	4	1.8	48	21.4	14	6.3
22-Our school has not enough instruments, material and equipment required to perform the new curriculum.	120	53.6	61	27.2	3	1.3	25	11.2	14	6.3
23- The new curriculum has been prepared over the development levels of the students.	39	17.4	96	42.9	10	4.5	63	28.1	16	7.1
24- The new curriculum provides richness of method to teachers.	94	42	104	46.4	2	0.9	15	6.7	9	4
25- The new curriculum provides flexibility in application.	69	30.8	118	52.7	6	2.7	17	7.6	12	5.4

As can be seen in Table 6, 42.9 percent of the teachers have stated that they disagreed with the statement "The teachers have been participated in-service training in a sufficient level before application of the new curriculum." 50.4 percent of the teachers have stated that they agreed partly and 42.9 percent of the teachers have stated that they completely agreed with the statement "The new curriculum helps the students to learn natural world." Likewise, 59.4 percent of the teachers have stated that they completely agreed with the statements "The new curriculum encourages curiousness to scientific and technological developments by students." and "The new curriculum is student centered."

The teachers agreed with the statements "The new curriculum provides to understand interactions between science, technology, society and environment by students."; "The new curriculum encourages to make research and investigation by students." and "Activities and applications have been found more than information in the new curriculum." on a large scale. Furthermore, majority of the teachers stated that the new curriculum has not overlapped with the central examination systems (37.9%-29.5%). 46 percent of the teachers have stated that they agreed partly and 39.3 percent of the teachers have stated that they completely agreed with the statement "The new curriculum has caused to change the teacher's role". 49.6 percent of the teachers stated that they agreed partly with the statement "The student's objectives are not clear and satisfactory enough in the new curriculum".

Many of the students have thought that the frequent change of the curriculums harmed the process of teaching and education (54.0%). Likewise, the teachers have believed that the new curriculum has been prepared considering the students' cognitive development levels (46.9%). 35.3 percent of the teachers have explained that the new curriculum has not been applied effectively because the absence of the laboratory in the school. Özden and Tekin (2006) have emphasized that majority of the teachers agreed that laboratory conditions were not enough in the schools in their study named "Problems with Science and Technology Education in Turkey.

The teachers expressed that the new curriculum provided to use technology by the students (41.1%- 43.3%). Beside this, the teachers have believed that the new curriculum provided to gain scientific viewpoint to the daily life events for the students (46.4%-39.3%).

Majority of the teachers have agreed that there was need to the educational technologies (overhead projector, projector etc.) for using the new curriculum effectively (83.9%). Many of the students agreed that "the students have learned by exploration through the new curriculum and the new curriculum has contributed to form students' science and technology literacy on a large scale". The view of "Science and technology lesson teachers should lectured in science and technology lesson for applying the new curriculum effectively" was shared completely with 39.3 % and 21.9 percent of the teachers have disagreed and 17.9 percentage have strongly disagreed to this view.

40.6 percent of the teachers have explained that the lesson period was not enough to perform new curriculum. Many teachers have stated that their school has not got enough instrument, material and equipment required to perform the new curriculum (53.6%-27.2%). 42.9 percent of the teachers have stated that they partly agreed and 28.1 percent of the teachers disagreed with the statement "The new curriculum has been prepared over the development levels of the students". This result shows that the views of the teachers would be clear after applying the new curriculum for a while. Many teachers believed that the new curriculum provided richness of method to them (42%- 46.4%) and the new curriculum provided flexibility in application (30.8%- 52.7%).

Table 7. *The Results of one way ANOVA Related to the Teachers' Faculty of Graduation*

	Graduation	**N**	$\overline{x}$	**SS**	**p**	**Scheffe**
Brain Storming	Faculty of Educ.	111	3,14	0,76	0,02	Faculty of Educ.-Institute of Educ.
	Faculty of Science and Art	19	3,21	0,54		
	Institute of Educ.	27	2,63	0,79		
	other	50	3,04	0,85		
The teachers have been participated in-service training in a sufficient level before application of the new curriculum.	Faculty of Educ.	117	2,32	1,19	0,01	Faculty of Educ.-Institute of Educ.
	Faculty of Science and Art	18	2,22	1,22		
	Institute of Educ.	34	3,12	1,41		
	other	53	2,51	1,25		
The new curriculum is "pupil centered" program.	Faculty of Educ.	117	4,52	0,76	0,00	Faculty of Educ.-other Faculty of Science and Art.-other
	Faculty of Science and Art	20	4,8	0,41		
	Institute of Educ.	34	4,41	0,82		
	other	53	4,08	1,19		
The students have learned by exploration through the new curriculum.	Faculty of Educ.	116	4,33	0,79	0,01	Faculty of Educ.-other
	Faculty of Science and Art	20	4,2	0,62		
	Institute of Educ.	34	4,24	0,78		
	other	53	3,83	1,25		

Sd= 223

As it can been seen in Table 7, there were significant differences related to use brain storming technique by the primary school teachers in the science and technology lesson. ($\overline{x}$ Fac.of Ed= 3.14; $\overline{x}$ Ins.of. Ed= 2.63). Likewise, it has been determined that there were significant differences between the teachers graduated from Faculty of Education and Institute of Education related to the view of "The teachers have been participated in-service training in a sufficient level before application of the new curriculum" ($\overline{x}$ Fac.of Ed.= 2,32; $\overline{x}$ Ins.of. Ed.= 3,12). It has been concluded that there were significant differences between the teachers graduated from Faculty of Education and others; the teachers graduated from Faculty of Science and Art and others with respect to the view of "The new curriculum is "pupil centered" program" ($\overline{x}$ Fac.of Ed.= 4,52; $\overline{x}$ others= 3,12; $\overline{x}$ Faculty of Science and Art=4,8). In addition to these findings, it has been found that there were significant differences between the teachers graduated from Faculty of Education and others related to the view of "The students have learned by exploration through the new curriculum" ($\overline{x}$ Fac.of Ed.= 4,33; $\overline{x}$ others= 3,83).

Table 8. *The Results of one way ANOVA Related to the Teachers' In-service Training Status*

	In-service	$\overline{x}$	SS	p	Scheffe
Simulation	participated	2,95	0,87	0,05	participated - not participated
	not participated	2,59	0,81		
	other	2,67	1,15		
The teachers have been participated in-service training in a sufficient level before application of the new curriculum.	participated	2,95	1,32	0,04	participated - not participated
	not participated	2,31	1,21		
	other	2,2	1,1		
The new curriculum has been prepared over the development levels of the students.	participated	3,72	1,15	0,02	participated - not participated
	not participated	3,23	1,26		
	other	2,8	1,64		

Sd= 223

Significant differences were found related to use simulation technique according to case of the elementary teachers have been participated in-service training about science and technology or not as can be seen Table 8 ($\overline{x}$ participated= 2.95; $\overline{x}$ not participated= 2.59). It has been found significant differences between the views of "The teachers have been participated in-service training in a sufficient level before application of the new curriculum related to science and technology lesson. ($\overline{x}$ participated = 2,95; $\overline{x}$ not participated=2,31). There were significant differences between the teachers participated or not participated in-service training about science and technology lesson related to the view of "The new curriculum has been prepared over the development levels of the students" ($\overline{x}$ participated= 3,72; $\overline{x}$ not participated= 3,23).

DISCUSSION and RESULTS

The science and technology curriculum was perceived as student centered programme to enable learning about natural world, encouraging investigations of the students and giving opportunity to learn by exploration through the new curriculum (Table 6). There is parallelism between the teachers' views and one of the aims of new science and technology lesson curriculum that is learning and understanding students' natural world; supplying excitement with intellectual wealth (Kıroğlu, 2006). In the same way, Ateş and Akdağ (2006) have stated that the learning-teaching activities proposed in the new curriculum was clear, comprehensible and appropriate with the level of students in the class with respect to this result.

Another result coming out with applying the science and technology lesson curriculum in the first year was hindering to apply the curriculum effectively due to insufficiency of materials, technology, laboratory and equipment in the schools. This result is consistent with the results of the research conducted by Özden and Tekin in 2006. In the same way, Akamca, Hamurcu and Günay (2005) found that the teachers had no enough information and resources about the new curriculum devoted to evaluate the views of the teachers with the new science and technology curriculum.

The need of teachers' in-service training related to science and technology curriculum is in remarkable level (Table 6). The need of main practitioner's education about this subject should not be ignored before and during application of the curriculum. Similarly, Özden and Tekin (2006) emphasized the insufficient number of science and technology teachers' taking active role in the preparation of the programs, the insufficient in-service training of the science teacher in the transition state of a new program and the broken link with other lessons (e.g. mathematics programme).

The new science and technology curriculum was not harmonized with the central examination system used in our country with respect to processing and evaluation basis. While the new curriculum has been based on duration and evaluation of the product, the product was evaluated predominantly in the central examination system and this case is conflicted with the vision of the new curriculum. Özden (2005) stated that the students have tended to the private courses and teaching institution because of this confliction.

The science and technology lesson period per week has been seen inadequate (Table 6). The application of the modern instruction methods has required much more lesson period. The methods used in science and technology lesson by the teachers were usually lecture, question-answer and brain storming techniques that were not required to use (Table 5). However, the usage of demonstration, laboratory and computer assisted instruction techniques that were required to use technology and instrument was restricted. Çavaş and Kesercioğlu (2004) reported that Turkish students have more positive attitudes toward science and technology than developed countries' students in the project named Relevance of Science Education (ROSE). Çavaş and Kesercioğlu (2004) also have pointed out the importance of providing the students to understand the subject best about science and technology and to investigate, observe, make research more by the support of new instruction methods and techniques. İflazoğlu and Bilgiç (2005) have stated that multiple intelligence theory supported cooperative learning method used in the class was enjoyable and provided much more participation for the 5th class students in science and technology lesson.

SUGGESTIONS

The effective application of curriculum by teachers is related to the level of schools' instrument, equipment and technology. Since it is possible to use modern methods, techniques and present to the usage for the students with the instruments and technologies, these deficiencies should be eliminated urgently.

The proficiency of the teachers about science and technology lesson should be developed. For this reason, the teachers' need of education should be determined and in-service training programme should be organized to satisfy the needs.

The central exams should be reorganized with respect to the new curriculum by considering the students' living in the schools since the new curriculum contains alternative evaluation approaches.

The views of main practitioners about the deficiency of science and technology lesson period per week should be reconsidered by the authorities.

This research includes primary school teachers worked in elementary schools in Adıyaman only. It can be helpful to represent larger universe for further researches.

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