

Reflections of the Understanding of Assessment Adopted in the 4th and 5th Grade Science and Technology Curriculum in Textbooks

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Abstract

The purpose of this study is to determine to what extent the understanding of assessment adopted in the renewed Primary Education 4th and 5th grade Science and Technology Curriculum is reflected in textbooks – student course books, student workbooks and teachers' books- prepared by the related publishers and approved for use by the Turkish Republic of Ministry of National Education. The research is a qualitative study based on a document analysis. The analysis in the curriculum revealed that the understanding of assessment of the curriculum focused on “diversity in measurement techniques”, “multi-purpose use of measurement results” and “continuity in measurement practices and process evaluation”. In this context, the analysis of the textbooks revealed that i) the understanding of assessment adopted in the curriculum is not completely reflected in the related textbooks in terms of “diversity in measurement techniques” and “multi-purpose use of measurement results” while ii) it is reflected in the textbooks in terms of “continuity of measurement practices and process evaluation”. The importance of the findings was discussed with regard to assessment practices required by the curriculum and some suggestions were put forward for possible solutions of the determined problems.

Introduction

The rapid advances in social, economic and especially science and technology fields in information age have largely changed lifestyles of people and essential features an individual must have for a quality life. Displaying a scientific attitude and behavior, researching, creativity, critical thinking, problem solving, effective and timely use of resources, healthy communication, knowing where and how to acquire knowledge, perceiving complex relations and using technological devices and tools have become a necessity and a must (NCREL, 2008).

From the point of view that the existing education systems are far from educating the defined human type, the efforts to educate an individual equipped with the features required by the information age have brought about studies for “reform in education” and in this framework have resulted in drastic changes such as redevelopment of curriculums in education systems of many countries and reconstruction of schools and classrooms (Kozma, 2008).

With the same opinion, Republic of Turkey Ministry of National Education decided to make significant changes in primary and secondary education curriculums in 2004 and has been implementing these since the academic year 2005-2006.

One of the courses changed in the curriculum is the Science course. Science course was renamed as Science and Technology with the inclusion of the technology dimension in the new curriculum and it took its place in curriculums starting from the 4th grade in primary education. Like other courses changed in curriculum, the curriculum of Science and Technology course was prepared by taking into consideration the constructivist learning

approach. Therefore, evaluation component of the curriculum as well as aim, content and learning-teaching process components was prepared, in compatible with other components, with an understanding based on the constructivist learning approach. The striking points in the evaluation element of the renewed Science and Technology Curriculum and thus in the understanding of assessment is given as follows (MEB, 2004):

1. Assessment is “a multi-step and systematic process which is performed to define effectiveness of teaching and learning and which includes collection and interpretation of data related to education”. Assessment can be used in science and technology education in line with the purposes, examples of which are given below.

- Identifying learning status of students in science subjects and determining acquiring level of the acquisitions stated in the curriculum,
- Providing feedback to make learning more meaningful and profound,
- Determining future learning needs of students,
- Giving information to parents about their children’s learning,
- Monitoring effectiveness of teaching strategies and content of the curriculum.

2. Constructivist understanding takes into account the individual differences in learning. Focusing on uniqueness of an individual, it argues that everybody distinctively constructs the existing knowledge with the newly gained knowledge. It also emphasizes that teaching methods and techniques should be diversified as much as possible. For these reasons, it underlines that, in measurement and evaluation, students should be provided multi opportunities in which they can show their knowledge, abilities and attitudes. Within the scope of multi assessment opportunities to be provided to students, the measurement techniques stated in the curriculum and which teachers are asked to use during teaching process are as seen in Table 1.

Table1. Traditional and Alternative Measurement Techniques

Traditional Measurement Techniques	Alternative Measurement Techniques
Multiple choice questions	Performance assessment
Short answer questions	Portfolio assessment
True-false questions	Project studies
Matching type questions	Poster studies
Essay type (open ended) questions	Written reports
	Concept maps
	Word association tests
	Branching trees
	Structural communication grid
	Presentation
	Interview
	Group, peer and self-assessment

3. In parallel with the constructivist learning approach, learning and teaching strategies shift from a teacher-centered structure to a student-centered structure. Therefore, the assessment understanding must be reconstructed in this respect. In this context, the point of view of Science and Technology curriculum to assessment and the emphasized points are as seen in Table 2 below.

Table2. Emphasis on Assessment in Science and Technology Curriculum

Less emphasis	More emphasis
Traditional measurement techniques.	Alternative measurement techniques
Evaluation independent from learning and teaching.	Evaluation as a part of learning and teaching
Measurement and evaluation of memorized and easily learned knowledge.	Measurement and evaluation of meaningful and deeply learned knowledge.
Measurement and evaluation of knowledge independent from each other.	Measurement and evaluation of related and well-structured knowledge net.
Measurement and evaluation of scientific knowledge.	Measurement and evaluation of scientific understanding and scientific logic.
Measurement and evaluation to determine what a student does not know.	Measurement and evaluation to determine what a student understands.
Measurement and evaluation practices at the end of semester.	Measurement and evaluation practices throughout the semester.
Assessment only by teacher	Self and peer assessment with teacher.

Considering the above-mentioned explanations, it can be said that the understanding of assessment adopted in the curriculum focuses on a) multi-purpose use of measurement results, b) diversity in terms of measurement techniques and c) continuity in measurement practices and process evaluation.

After the completion of studies to prepare Science and Technology Curriculum, the process continued with writing the textbooks in line with the curriculum. In this process, the Ministry of National Education adopted an approach which can be called a tri-some set superseding one textbook practice. Accordingly, the related publishers were obliged to write not only a textbook in line with the curriculum but also a workbook for students and a book for teachers.

The Purpose of the Research

The study was carried out in order to determine to what extent the understanding of measurement and evaluation adopted in the renewed Primary Education Science and Technology Curriculum is reflected in textbooks – student course books, student workbooks and teachers’ books – prepared by the related publishers and approved for use by Ministry of National Education.

This study looks for answers to the following questions in parallel with the above-mentioned purpose.

Research Question 1: To what extent is the assessment adopted in the renewed Science and Technology curriculum reflected in the related textbooks in terms of “diversity in measurement techniques”?

Research Question 2: To what extent is the understanding of assessment adopted in the renewed Science and Technology curriculum reflected in the related textbooks in terms of “continuity of measurement practices and process evaluation”?

Research Question 3: To what extent is the understanding of assessment adopted in the renewed Science and Technology curriculum reflected in the related textbooks in terms of “multi-purpose use of measurement results”?

The Importance of the Research

In related literature, it is observed that the renewed Science and Technology Curriculum is analyzed taking into consideration many aspects (Kaptan, 2005; Erdoğan, 2005; Ercan and Altun, 2005; Bozyılmaz and Kılıç, 2005; Yangın and Dindar, 2007; Dindar ve Yangın, 2007; Orhan 2007; Gömleksiz and Bulut, 2007; Özçelik and others, 2008). However, there exists no study on the understanding of assessment adopted in the curriculum and to what extent it is reflected in textbooks. This study is considered important for being the first to be carried out in this respect and the contribution the results will make to the experts in the process of textbook writing and examination.

Method

This section includes explanations about the research model and analysis process.

Research Model

This research is a qualitative study based on document analysis. The purpose of this study is to define to what extent the understanding of assessment adopted in Primary Education Science and Technology Curriculum is reflected in the textbooks. As known, Science and Technology Curriculum include the 4-8th grades in primary education. This study is limited to the level of 4th and 5th grades of the curriculum. To this end, totally 6 textbooks were chosen, 3 for the 4th grade and 3 for the 5th grade, among the textbooks written in line with the curriculum of the 4-5th grade Science and Technology curriculum and allowed by Ministry of National Education to be put into use. For the selection of textbooks, random sampling method was used. Afterwards, the study continued with the selection of four of seven units in each textbook on condition that each represented a different learning subject. The distribution of the selected units according to learning subjects and grades and the figures of acquisition in units are given in the table below.

Table3. The Distribution of Units in Analysis Process According to Learning Subjects and Acquisition Figures

Learning Subject	Selected Units (4 th Grade)	Selected Units (5 th Grade)
Living Creatures and Life	Let's Solve the Secret of Our Body (23)	Let's Solve the Secret of Our Body (22)
Material and Transition	Let's Learn the Material (46)	Transition and Recognition of Material (46)
Physical Phenomenon	Force and Motion (13)	Force and Motion (21)
The Earth and Universe	Our Planet: the Earth (17)	The Earth, Sun and Moon (19)

Analysis Process

The analysis of the textbooks was made in a way to answer each question directed under the purpose of the research. As stated earlier, the textbooks are a threesome set consisting of student course books, student workbooks and teachers' books. Student course books, student workbooks and teachers' books are complimentary in terms of discussion of the acquisitions in the course. Therefore, this threesome set was analyzed as a whole in all analysis.

The steps taken during the process of textbook analysis are given below.

The first question of the research is related to diversity of measurement techniques. In order to answer the first question of the research, the number of use of each measurement technique mentioned in the curriculum in each textbook on the basis of units and also the total number was calculated and the results are given in tables. In this stage, the measurement techniques mentioned in the curriculum were divided into four categories by the researcher. These categories were named "questions related to product", "questions related to process", "performance studies" and "others", respectively. The main reason for need of such a classification is explained below.

The measurement techniques in the curriculum discussed in this research were grouped under two headings such as traditional and alternative, as can be seen in Table 1. Traditional measurement techniques are quite insufficient in identifying students' learning and examine knowledge based on memorization, according to the explanations in the curriculum. Thus, they are not appropriate for the constructivist understanding. On the other hand, alternative measurement techniques are designed in line with the constructivist understanding and free from insufficiencies of traditional measurement techniques. Therefore, they are really alternative to traditional measurement techniques. However, measurement techniques are a whole. What is important is to know to use which measurement techniques in which cases and to use the related techniques in necessary cases. The fact that each technique has unique peculiarities and measurement and evaluation carried out on a basis of only one technique does not meet all the purposes of use in educational system should never be ignored. This is related to validity of measurement techniques, in other words, the level to serve the purpose. When the main features of the measurement techniques mentioned in the curriculum are examined, it is observed that some are questions related to product or questions related to process some are studies requiring performance and some are structured in a way to require self assessment of students or peer assessment. For this reason, the measurement techniques mentioned in the curriculum were classified under four groups taking into consideration these main features. Each group and the measurement techniques in these groups are given as a list below.

- Questions related to product: multiple choice question, short answer questions, matching type questions, true/false questions.
- Questions related to process: open ended questions, structural communication grid, word association, branching trees, concept map, mind map.
- Performance study: poster study, observation, interview, experiment, research, project, drama study, story writing, portfolio assessment.
- Others: self assessment, peer assessment.

The second question of the research is related to what extent the “continuity of measurement practices and process evaluation” reflects in textbooks. In this stage, the analysis were made based on in which stages of the teaching process the related measurement techniques were used and the frequency of use of measurement techniques for process evaluation.

The third question of the research is related to what extent the “multi-purpose use of measurement results” reflects in the textbooks. In order to answer this question, the measurement techniques used in the textbooks were analyzed and a conclusion was drawn whether the measurement results obtained by the use of these techniques would serve the purposes stated in the curriculum.

In the analysis process, the 4th grade textbooks and 5th grade textbooks were examined, respectively.

Findings and Interpretation

This section discusses the findings related to questions directed in line with the purpose of the research and the interpretation based on these findings.

Findings related to the first research question

Research question 1: To what extent is the understanding of assessment adopted in the renewed Science and Technology curriculum reflected in the related textbooks in terms of “diversity in measurement techniques”?

Table4. Frequency of Use of the Measurement Techniques in the 4th Grade Textbooks

	Measurement Tech.	Textbook 1					Textbook 2					Textbook 3				
		Units				Total	Units				Total	Units				Total
		1	2	3	4		1	2	3	4		1	2	3	4	
Questions related to product	Multiple Choice Questions	20	7	7	12	46	5	6	2	-	13	6	5	8	7	26
	Short Answer Questions	19	23	8	4	54	5	31	15	14	65	17	22	18	26	83
	Matching Type Questions	2	1	1	-	4	1	1	1	-	3	1	-	1	1	3
	True/False Questions	9	9	-	12	30	5	5	-	4	14	-	-	-	-	-
	Open Ended Questions	49	77	15	33	174	34	43	9	18	104	13	9	6	6	34
Questions related to process	Structural Communication Grid	1	1	1	2	5	-	-	-	-	-	-	-	-	-	-
	Word Association Test	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
	Branching Trees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Concept Maps	2	1	1	-	4	-	-	-	-	-	3	2	1	1	7
	Mind Maps	-	-	-	-	-	-	-	-	-	-	3	1	-	-	4
Performance Studies	Poster Study	-	3	-	-	3	-	-	-	-	-	1	1	-	-	2
	Observation	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-
	Interview	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Experiment	10	27	12	6	55	9	22	4	6	41	5	17	5	6	33
	Research	-	-	-	2	2	4	5	5	4	18	-	-	-	3	3
	Project	2	3	3	-	8	-	2	-	1	3	1	-	-	-	1
	Presentation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Portfolio Assessment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	Self Assessment	-	-	-	-	-	-	-	-	-	2	1	-	2	5	
	Peer Assessment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Frequency of use of the measurement techniques stated in the curriculum in the 4th and 5th grade textbooks are given in Tables 4 and 5, respectively. In the first column of the tables are the categories of the measurement techniques; in the second column are the names of the measurement techniques stated in the curriculum and in other columns are the textbooks included in the research, the units in these textbooks and the frequency of use of each measurement techniques both in the related units and the textbook as a whole.

When Table 4 is examined, it is observed that short answer questions, in “questions related to product”, are the one to be used the most in the three textbooks of the 4th grade. It is observed that this question type is used 54 times in the first textbook, 65 times and 83 times in the second and third textbooks, respectively. Multiple choice questions are the second to be used most frequently. The frequency of use of this question type in these three textbooks is 46, 13 and 26, respectively. True/false questions were used 30 times in the first textbook, 14 times in the second textbook but were not used in the third textbook. The question type to be used the least in all textbooks is matching type questions. This question type was used 4 times in the first textbook while it was used for 3 times in the second and the third textbooks. In the

analysis based on units in the textbooks, it was observed that all questions related to product were designed and used as “progress tests” at the end of the units.

When the questions related to process are examined, it is observed that open ended questions are the one to be used the most frequently in all textbooks. The frequency of use of this question type in the first, second and third textbook is 174, 104 and 34 respectively. It is understood from the examinations that this question type is used at the beginning of the textbooks to test preparation to the unit and precondition behaviors while it is used during and at the end of the teaching process to determine the learning level. Frequent use of open ended questions in all textbooks can be explained by easy preparation. On the other hand, it is observed that the frequency of use of other questions related to process in all textbooks is quite low and even they are not used at all in some textbooks. Such that, structural communication grid technique was used 5 times and word association technique was used once in only the first textbook. Similarly, mind map was used 4 times only in the third textbook. The frequency of use of mind maps is 4 in the first textbook and 7 in the third textbook. This technique was never used in the second textbook. The most interesting thing is that the branching tree technique was not used in any textbooks at all. The fact that the frequency of use of “questions related to process”, except for the open ended questions, is low can be explained by the difficulty in preparing these questions. Besides, it should be noted that techniques such as branching tree and structural communication grid are quite new to everyone and the resources to be used by the textbook writers are very limited. In addition, insufficiency of members of the commission, who examined these textbooks, on these techniques may have laid a ground for them to ignore the deficiencies of these textbooks in terms of the techniques.

It is observed that the measurement techniques considered under performance study get dense in especially experiments because of the nature of the course. The frequency of experimental studies is 55 in the first textbook, 41 in the second textbook and 33 in the third. For other techniques, the number of the ones which require research is 2, 18 and 3 for the three textbook, respectively; and 8, 3 and 1 for projects. The fact that the frequency of use of studies requiring research in the second textbook and projects in the first textbook is higher is striking when compared to other textbooks. Studies that require poster preparation was used 3 times in the first textbook and 2 times in the third textbook whereas it was not used in the second textbook. On the other side, studies requiring observation was used once only in the second textbook. It is also very striking that, though included in the curriculum, presentation and interview techniques were never used in any of the textbooks.

Another technique under the performance study heading is portfolio assessment. Although this technique has different types (pgcps, 2008), it generally necessitates collection of student outcomes in a file called product file according to some rules (Poulson ve diğ, 2001). Projects, posters, research reports, excursion-observation-interview reports and etc. are some of the studies that can be included in this file. Although the textbooks include such studies, there is no information about which studies should be included in the student files in which cases. Considering the directions of the Ministry of National Education that student files should be included in the process in determining the grades which are indicators of students' success (MEB, 2008), it can be said that there is a significant deficiency in the textbooks in this respect.

As known, studies such as project, research, poster, observation, experiment and etc. are discussed under performance tasks in the literature (Instructional Intranet, 2008). One of

the main characteristics of such studies is the use of grading keys which are called rubric created exclusively for the study to define sufficiency level of studies. When the related textbooks are analyzed, it is observed that they include no rubrics peculiar to studies but general rubrics not peculiar to studies which can be used in grading studies such as projects and posters only in teachers' books. For this reason, the fact that some of the measurement techniques expected to be used in performance studies are rarely or never included in the textbooks and the textbooks with measurement techniques do not include grading keys can be considered as a very important deficiency.

Table5. Frequency of Use of Measurement Techniques in the 5th Grade Textbooks

	Measurement Tech.	Textbook 1					Textbook 2					Textbook 3				
		Units				Total	Units				Total	Units				Total
		1	2	3	4		1	2	3	4		1	2	3	4	
Questions related to product	Multiple Choice Questions	34	45	32	24	135	14	18	16	8	56	32	40	30	26	128
	Short Answer Questions	4	11	10	9	34	12	41	11	5	69	5	10	10	9	34
	Matching Type Questions	15	14	16	8	53	6	1	2	1	10	13	10	16	7	46
	True/False Questions	9	10	16	11	46	12	22	17	11	62	10	12	14	10	46
	Open-ended questions	59	60	42	41	202	74	111	48	27	260	60	61	40	40	201
Questions related to process	Structural Communication Grid	-	1	1	-	2	-	1	2	1	4	-	-	-	-	-
	Word Association Test	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Branching Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Concept Map	2	1	-	-	3	2	3	1	1	7	2	2	-	-	4
	Mind Map	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Performance Studies	Poster Study	1	1	2	1	5	3	3	-	1	7	1	1	1	1	4
	Observation	4	4	2	3	13	-	-	-	-	-	4	5	3	3	15
	Interview	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Experiment	1	25	5	2	33	7	20	5	4	36	2	24	4	3	33
	Research	7	9	6	6	28	-	3	-	-	3	1	1	1	1	4
	Project	2	4	2	3	11	3	6	4	5	18	2	3	1	3	9
	Presentation	2	1	1	1	5	1	-	-	-	1	1	1	1	1	4
	Portfolio Assessment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	Self-evaluation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Peer evaluation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The techniques under the heading of others require defining the learning level of a student by himself (self assessment) or peers (peer assessment). It was found that self assessment studies were used 5 times only in the third textbook whereas peer assessment was not used in any of the textbooks. While the importance of effective participation of students in measurement and evaluation process is emphasized in the curriculum, it is quite surprising that this is not reflected in the textbooks.

When Table 5 is examined, it is observed that multiple choice questions, one of the questions related to product, are the one to be used the most in all the three 5th grade textbooks. This question type was used 135 times in the first textbook and 56 and 128 times in the second and third textbook, respectively. The second question type in terms of the frequency of use is short answer questions. The frequency of use of this question type is 34, 69 and 34 for the three textbooks respectively. While matching type questions were used 53 times in the first textbook, 10 times in the second textbook and 46 times in the third textbook, the frequency of use of true/false questions is 46, 62 and 46 for the three textbooks, respectively. It is observed, in the textbooks examined on the basis of units, that all questions related to product were designed and used at the end of the units as “progress tests” as in the fourth grade textbooks.

When the questions related to process are examined, it is observed that open-ended questions are quite frequently used in all textbooks. The frequency of use of this question type in the first, second and third textbook is 202, 260 and 201, respectively. The examinations reveal that this question type is used at the beginning of the textbooks to assess preparation to the unit and precondition behaviors while it is used during and at the end of the teaching process to determine the learning level. Frequent use of open ended questions in all textbooks can be explained by easy preparation. On the other hand, it is observed that the frequency of use of other questions related to process in all textbooks is quite low and even they are not used at all in some textbooks. Such that, structural communication grid technique was used 2 times in the first textbook, 4 times in the second textbook but never used in the third textbook. The frequency of use of concept maps in the three textbooks is 3, 7 and 4, respectively. One of the most significant points noticed in the fifth grade textbooks is that the techniques stated in the curriculum such as the word association tests, branching trees and mind maps were not used in any of the textbooks. The low frequency of use or nonexistence of the questions related to process, except for the open-ended questions, is believed to result from the same reasons explained for the fourth grade textbooks.

It is observed that measurement techniques considered under performance studies get dense in experiments due to the nature of the course, as in the fourth grade textbooks. The frequency of experimental studies is 33 in the first textbook, 36 in the second textbook and 33 in the third textbook. The frequent use of experimental studies may have resulted from the fact that example activities given in the curriculum focus on such studies and from the opinion that experimental studies reflect the understanding of student-centrism required by the curriculum. The frequency of use of the ones requiring research is 28, 3 and 4 for the three textbooks and 11, 18 and 9 for project studies, respectively. The high frequency of use of studies requiring research in the first textbook and of project studies in the second textbook is very striking, when compared to other textbooks. Studies requiring poster preparation were used 5 times in the first textbook, 7 times in the second textbook and 2 times in the third textbook. On the other side, studies requiring observation were used 13 times in the first textbook and 15 times in the third textbook but never used in the second textbook. The frequency of use of presentation studies is 5, 1 and 4 for the three textbooks, respectively. Interview technique was not used in any of the fifth grade textbooks. Similar to the findings of the fourth grade textbooks, the textbooks do not include student product files consisting of studies such as project, poster, research reports, excursion-observation-interview reports, and thus information about the studies related to portfolio evaluation. This is one of the significant deficiencies in the textbooks.

As in the fourth grade textbooks, it is observed that the fifth grade textbooks do not include rubrics peculiar to studies such as project, research, poster, observation, experiment and etc. but they include general rubrics not peculiar to the study which can be used in grading studies such as project and poster in only teachers' books. For this reason, nonexistence of grading keys peculiar to such studies can be considered as a significant deficiency for the fifth grade textbooks.

The analyses reveal that the fifth grade textbooks do not include self assessment and peer assessment. While the importance of effective participation of students in measurement and evaluation process is emphasized in the curriculum, it is quite surprising that this is not reflected in the textbooks.

Findings Related to the Second Research Question

The second research question: To what extent is the understanding of assessment adopted in the renewed Science and Technology curriculum reflected in the related textbooks in terms of “continuity of measurement practices and process evaluation”?

Considering the data in Table 2 in the introduction section, the research on the assessment understanding adopted in the Science and Technology curriculum reveals that:

1. Measurement and evaluation practices are a part of the learning and teaching process. These practices should be applied not only at the end of the teaching process but also in each phase of teaching process (continuity).
2. In measurement and evaluation practices, techniques related to process rather than product should be emphasized (process evaluation).

In the examinations in Table 4 and 5 to define to what extent the mentioned understanding is reflected in the 4th and 5th grade textbooks, it is observed that various measurement techniques are used in various frequencies in all units of each textbook. For example, when the first textbook in Table 4 is examined, it is observed that open-ended questions are used 49 times in the first unit, 77 times in the second unit, 15 times in the third unit and 33 times in the fourth unit. According to the examinations in the textbooks based on the units, especially measurement techniques under “questions related to process” and measurement techniques in “performance studies” are used in all phases of the teaching process. Yet, it is observed that the “questions related to product” are used generally in tests at the end of units. These findings can be interpreted such that the measurement and evaluation practices have become a part of teaching process and thus the understanding of “continuity” is reflected in the textbooks. On the other side, the fact that the measurement techniques especially used at the beginning and during the teaching process rather consist of open-ended questions and studies such as experiment, research, project, and poster and these techniques give information about the process rather than the product can be interpreted as the effort to reflect the measurement understanding adopted in the curriculum in the textbooks. However, rare use or nonexistence of such techniques as structural communication grid, word association, mind maps, branching trees and portfolio evaluation in process evaluation studies can be regarded as a significant deficiency.

Findings Related to the Third Research Question

The third research question: To what extent is the understanding of assessment adopted in the renewed Science and Technology curriculum reflected in the related textbooks in terms of “multi-purpose use of measurement results”?

According to the examinations in the textbooks, it can be said that the measurement techniques used in the textbooks are sufficient in producing the necessary data (measurement results) in order to;

- determine acquiring level of the students in acquisitions related to the course and provide feedback,
- determine future learning needs of students,
- define the effectiveness level of teaching services provided by the teacher, and
- provide information to parents about their children's learning level.

However, as stated earlier, it was observed that some measurement techniques were used rarely or never used in the textbooks. Therefore, the future contribution of the test results, which will be obtained in the event that these techniques are put into use, to "multi purpose use" should never be ignored.

Using measurement techniques for different purposes requires applying various statistics and processes on measurement results, and interpreting and reporting the results. Accordingly, teachers are expected to be sufficient in these fields. Measurement and evaluation practices to be carried out under the insufficiency of teachers shall lose their meaning largely. For this reason, explanations about the job and process to be carried out on measurement results are expected to be made in teachers' books, considering the possible insufficiency of teachers. Yet, there exists no such finding in the analysis carried out.

Conclusion and Suggestions

Questions related to product are frequently used in the textbooks, especially in tests at the end of units. For formative questions, open-ended questions are used frequently while the frequency of use of other question types is very low. The performance studies focus on especially experiments, projects and researches. However, rubrics peculiar to the study, which were expected to be used in the process of grading studies based on performance, were not found in the related textbooks. The related textbooks do not include information about how to run the "portfolio assessment" process, which is emphasized in the new curriculum. It was also observed that most of the related textbooks did not include self and peer assessment studies that would ensure effective participation of students in the measurement and evaluation process. Consequently, the understanding of assessment adopted in the new curriculum was not reflected in the related textbooks completely.

According to the examinations about the places of use of measurement techniques in the textbooks, measurement techniques are used in all places such as at the beginning, during and at the end of teaching process. It was observed that especially questions related to process and performance studies are used in the teaching process while questions related to product are generally used in tests at the end of the units. Consequently, the understanding of assessment adopted in the new curriculum was reflected in the related textbooks in terms of "continuity of measurement practices and process evaluation".

The measurement techniques used in the textbooks are qualified and sufficient to produce data to serve the purpose of use of measurement and evaluation within the education system. However, considering the existence of rarely used or unused measurement techniques in the textbooks, though they are stated in the curriculum, it is not possible to say that the

understanding of assessment adopted in the curriculum was completely reflected in the related textbooks.

All these results show that there are significant difficulties with respect to reflection of the understanding of assessment within the Science and Technology curriculum, renewed based on the constructivist learning approach, in the practices in the textbooks; and textbook writers and textbook reviewers and the institutions and authorities to approve textbooks' sufficiency do not attach the necessary importance to the evaluation component of the curriculum. Probably, one of the most important findings of this study is that it opens to question how "valid" the evaluation criteria are, which ensure textbook reviewing commissions approve textbooks which partially reflect the understanding of assessment required by the curriculum.

Publishers taking part in the process of textbook writing should surely ensure participation of experts with advanced education on measurement and evaluation in the teams responsible for textbook writing.

Experts with advanced education on measurement and evaluation and academicians contributing to curriculum development and revision should take part in the commissions responsible for revision of textbooks prepared by related publishers and submitted to Republic of Turkey, Ministry of National Education.

After an analysis to be carried out by the related commissions in the textbooks prepared by the related publishers and submitted to Republic of Turkey Ministry of National Education, the textbooks which fail to reflect the understanding of assessment adopted in the curriculum should be determined and returned to the publishers for necessary corrections.

Textbook revising commissions should revise the criteria used in decision-making process related to the sufficiency of measurement and evaluation practices in textbooks.

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