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Full Length Research Paper

Turkish physics instructors' attitude towards the 2007 physics teaching program and its execution

Redioe Adreid

Boğaziçi University Faculty of Education, Department of Secondary School Science and Mathematics Education, 34342 Beşiktaş/İstanbul. Turkey.

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The renewal of the secondary school physics teaching program was initiated in 2008, however, there is limited research investigating physics teachers' enactment of the teaching program in their classes. The purpose of this study was to identify and describe teachers' views about the official teaching program and its implementation. The participants consisted of 39 teachers working in 27 different schools in Istanbul. Data were collected using semi-structured interviews and were analyzed using constant comparative method. The data showed that 90% of the teachers stated that the aim of physics teaching is to prepare students for the university entrance examinations, 77% of the teachers said that their teaching methods remain unchanged, and 90% of the teachers said that they did not do experiments in their classes. The data showed that the teachers viewed the university entrance exams as the real criterion for assessment, and therefore they stressed the need for the alignment of the content and format of these exams with the teaching program. The results imply that the university entrance exams must be aligned with the teaching programs in order for the teachers to change their teaching methods.

Key words: Curriculum, physics teaching program, teaching programs, teacher views.

INTRODUCTION

Turkey has been going through a comprehensive curricular reform which started in 2005 with the renewal of elementary science and technology curriculum and continued in 2008 with the renewal of the secondary science curricula. The aims of the Turkish curricular reform are parallel to international reforms (Gür et al., 2012), which are shaped by multiple aims (Ryder and Banner, 2011). One of the central aims of science education is to prepare citizens to become scientifically literate in order to make informed decisions in a democratic society (OECD, 2003). Scientific literacy is a shared vision for both the elementary science and technology teaching program and the 2007 Physics Teaching Program (PTP) (Erdoğan and Köseoğlu, 2012; Ministry of National Education (MNE, 2005); MNE, 2011). Scientific literacy entails the totality of the knowledge, skills, attitudes and values that students will need in their lifetime. In the 2007 PTP scientific literacy is operationalized as building conceptual understanding of scientific knowledge and developing scientific skills, attitudes, and values, as well as developing communication and information, problem solving, and science-technology-society-environment competencies (MNE, 2011). A second aim for secondary science education is stated as preparing students for higher levels of education and developing the academic human resources of Turkey (MNE, 2009). Existence of multiple goals for science education and the novel emphasis on scientific literacy is reflected as comprehensive changes in the 2007 PTP. These changes are revealed in the content objectives, which provide guidance for teachers including the appropriate teaching methods. For instance, in the 9th grade force and motion unit a content objective is: "Students discover by experience the motion of an object

E-mail: redioe_Adreid@yahoo.com, Tel: +90 212 359 727

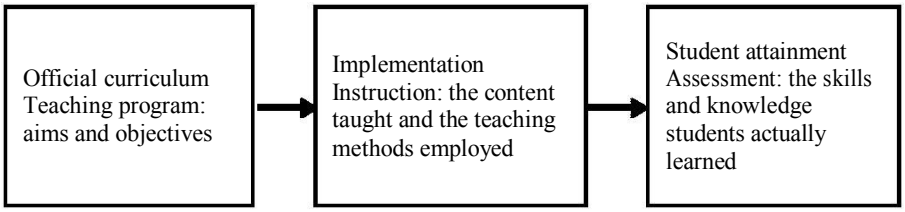

Figure 1. The theoretical framework for curriculum adapted from Schmidt et al., 1996.

under the influence of balanced forces" (MNE, 2011, p.55). Clearly, students are expected to generate a research question, design an experiment to seek answers to the research question, conduct the experiment and collect data, reach a conclusion based on their data processing and interpretation, and finally present the results they have reached. Furthermore, this content objective is associated with a limitation "refrain from solving textbook problems" (p. 55), which indicates that teachers are discouraged from teaching by solving standard textbook problems. Moreover, the 2007 PTP explicitly states that the purpose of assessment is not solely assigning grades to students; rather, its purpose also includes diagnosing students' readiness and providing feedback. Hence, assessment needs to be done while students are learning and needs to be based on student performance, whenever possible. Task formats recommended in the 2007 PTP for assessment also include selection (matching and, true or false) and completions (fill in the blanks, and open ended questions).

The broad changes introduced in the 2007 PTP require a thorough analysis of teachers' responses to these changes (Kurnaz and Çepni, 2012) because teachers play an important role in implementing the curriculum. How teachers interpret the teaching programs shapes what and how they teach in their classes (Van Driel et al., 2008). In order to understand how the physics curriculum is being implemented, it is necessary to understand teachers' views about the teaching program and its implementation. However, the research base about physics teachers' views about the 2007 PTP and its implementation is limited. This study aims to contribute to the knowledge base about teachers' views on the curriculum by identifying and describing how physics teachers view the 2007 PTP, how they implement it, and what they perceive as misalignments between the teaching program and its implementation.

THEORETICAL FRAMEWORK

In this study, the theoretical framework employed to view curriculum is based on a model developed by Schmidt et al. (1996). This model was selected in order to operationalize curriculum, a term with no agreed upon definition (Marsh, 2009; Oliva, 2008; Portelli, 1987) and to match the purposes of the study, which was to describe teachers' views on the 2007 PTP and its implementation, which includes not only the course of study but also teaching methods and assessment. In this model curriculum consists of (a) official teaching program, (b) implementation of the teaching program, and (c) student attainment dimensions as shown in Figure 1. The official teaching program describes the aims of the educational system, states the knowledge and skills students are required to learn, and articulates the methods teachers are expected to use for helping students attain the knowledge and skills prescribed. Implementation of the teaching program refers to instruction and covers what is actually taught to students and how it is taught (Porter, 2002). The teaching program only provides the content for instruction but it is not automatically implemented by the teachers (Ball and Cohen, 1996; Fullan, 2007). Individual teachers interpret the teaching program differently depending on the social context and the teacher's beliefs about the content and learning resulting in different decisions on the teaching methods to be employed (Remillard, 1999, 2005). Student attainment is what students actually learned, which includes the knowledge and skills students reached as a result of their learning experiences. Student attainment is usually assessed through state mandated exams; however, such a state mandated exam that assesses the outcome of secondary schooling does not exist in Turkey. It may be possible to use the Transition to Higher Education Exam (YGS) and the University Placement Exam (LYS) for assessing student attainment, however, the purpose of these exams is to rank and place students to higher education institutions and students are not required to take these exams.

The official teaching program, its implementation and student attainment are related. Implementation mediates the official teaching program and student attainment; students learn via instruction, the knowledge and skills that students attain are related more to what they do in

the classroom than what is written in the official teaching program. An indicator of success of a curricular reform is the degree of alignment among the teaching program, its implementation, and student attainment (Martone and Sireci, 2009; Webb, 1997).

REVIEW OF TEACHERS' VIEWS ON THE 2007 PHYSICS TEACHING PROGRAM AND ITS IMPLEMENTATION

The 2007 PTP has been implemented only recently; therefore there are few studies that investigated teachers' views on the 2007 PTP and its implementation. Despite its limitations this research base suggests that teachers' views about the 2007 PTP are diverse (Ergin, 2013). According to these studies, the majority of the teachers agreed that the aims in the 2007 PTP were well articulated (Baybars and Kocakülah, 2009; Karal, 2010; Şafak, 2010). Moreover, most of the teachers expressed that they held positive dispositions towards these aims (Balta and Eryılmaz, 2011; Kapucu, 2012; Söğüt et al., 2010; Tortop, 2012). Teachers seem to have recognized helping students form a functional scientific knowledge base through making physics relevant to students' lives as an important aim of the 2007 PTP (Akdeniz and Paniç, 2012; Sadi and Yıldız, 2012). However, when it came to implementation, only a minority of the teachers enacted the aim of building a general scientific knowledge base (Engin and Bülbül, 2009); it seems that for most teachers the major aim of physics teaching was preparing students for the university entrance exams (Kapucu, 2010; Tortop, 2012).

Few studies reported that teachers recognized the teaching and learning approach of the 2007 PTP as being student centered in which the teacher acted as a guide (Akdeniz and Paniç, 2012). On the other hand, it seems that teachers were not clear about the meaning and application of the student centered teaching methods introduced in the 2007 PTP (Taşçı, 2010; Yolbaşı, 2010). Baybars and Kocakülah (2009) found that less than half of the teachers agreed that the teaching and learning approach in the teaching programs was well articulated. Similarly, teachers' knowledge about student centered teaching appears to be inadequate. According to Ayvacı (2010), the teachers equated context based teaching with student centered teaching. Moreover, Ayvacı et al. (2012) reported that teachers did not possess adequate knowledge about teaching methods involving technology design and simply considered it as student centered teaching. In contrast, the teachers seem to be aware of the increased emphasis on hands-on activities in the 2007 PTP (Akdeniz and Paniç, 2012; Baybars and Kocakülah, 2009; Sadi and Yıldız, 2012). Nevertheless, most teachers did not do hands-on activities in their classes for the reasons of time limitation, lack of laboratories and equipment, and crowdedness of the classes; instead, the teachers continued to teach by traditional lecturing and solving standard textbook problems (Ayvacı et al., 2012; Baybars and Kocakülah, 2009; Demir and Demir, 2012; Kapucu, 2010; Sadi and Yıldız, 2012).

It appears that teachers have difficulty in understanding the assessment approach of the 2007 PTP (Baybars and Kocakülah, 2009). Akdeniz and Paniç (2012) found that though many teachers talked about alternative assessment in the 2007 PTP, they did not completely understand what it means and how it is applied. As a result, most teachers did not use performance assessment tasks (Sadi and Yıldız, 2012) or technology design projects (Ayvacı et al., 2012) at all. The teachers provided the misalignment of the 2007 PTP with the university entrance exams as the major reason for not complying with the assessment approach prescribed (Kapucu, 2010; Künbet, 2010; Marulcu and Doğan, 2010; Sadi and Yıldız, 2012; Söğüt et al., 2010).

PURPOSE

The purpose of this study was to identify and describe physics teachers' views on the 2007 PTP and its implementation. Specifically the following research questions were investigated:

1. What are the views of physics teachers on the aims, teaching methods, and assessment approach of the 2007 PTP?
2. How do physics teachers implement the 2007 PTP, how do they teach?
3. What are the sources of misalignment of the 2007 PTP and its implementation, if any?

METHOD

Research design

In this study the qualitative case study approach (Yin, 2003), which allows an interactive process between the researchers and the participants was adopted. The physics teachers' views about the 2007 PTP and its implementation were the case explored. The University Ethics Review Board's and Istanbul National Education Administration's approval were obtained, before conduc-ting the study.

Participants

The participants were 39 physics teachers working at state Anatolian high schools (18 schools) and general high schools (9 schools) during the 2010 to 2011 spring semester. Participation in the study was voluntary and the sample was selected by employing maximum diversity sampling in order to obtain information rich cases that represent a wide range of experiences (Seidman, 2006).

Table 1. Frequency distribution of the characteristics of the study participants (n=39).

Years of experience	Anatolian High school	General High school	Total
5-10 years	3	0	3
11-15 years	8	4	12
16-20 years	8	4	12
21-25 years	5	2	7
> 25 years	1	4	5
Total	25	14	39
Gender			
Male	18	12	30
Female	7	2	9
Total	25	14	39

There are different types of high schools in Turkey, general high schools accepts all students whereas Anatolian high schools are academically selective and accepts students based on a national exam they take after graduating from elementary school. To reflect the diversity, two types of high schools, Anatolian and general high schools, from different districts were selected. The number of participants was determined by employing data saturation method (Glasser and Strauss, 1967), recruiting of participants stopped when the new participants were not providing new information, a judgment made based on the data analysis. The charac-teristics of the participants are shown in Table 1.

Data collection

Data were collected through semi-structured interviews, which allows the researcher access the meanings of the participants and understand how they view and interpret the events and at the same time maintain the focus on the topic (Guba and Lincoln, 1981; Merriam, 1998). The interviews were conducted by the researcher and two research assistants in the schools, took between 15 and 60 minutes, and were audio recorded.

The interview protocol, which is presented in the appendix, was prepared by reviewing the literature. The interview protocol con-sisted of two parts, the first part involved demographic information and the second part involved questions about the teaching program and its implementation. In order to establish validity of the protocol, two science education researchers were consulted for the content and coverage of the interview questions, which resulted in changes in some of the original questions for clarification.

Data analysis

The data analyses consisted of cyclic processes of data reduction, data display, and conclusion drawing/ verification (Miles and Huberman, 1994). The interviews were transcribed verbatim and all transcripts were imported to the qualitative analysis software QSR NVIVO 9 to manage and organize the data as well as to keep track of the analytic progress. Data reduction continued with coding, condensing the dataset into analyzable units by creating categories from the data (Coffey and Atkinson, 1996). Constant comparative method (Glasser and Strauss, 1967) was used by following open coding, axial coding, and selective coding strategies suggested by Strauss and Corbin (1990).

In order to ensure trustworthiness of the study member checks were deployed (Lincoln and Guba, 1985). Furthermore, the research process was explained in detail and the analysis was based on convergence, agreement, and coverage among the researchers (Gee and Green, 1998). Additionally, all quotations were presented in a descriptive manner without any interpretation. Moreover, each participant was assigned an identification number in order to ensure confidentiality.

RESULTS

As a result of the qualitative data analysis three major themes emerged: (a) aims, (b) teaching methods, and (c) assessment practices related to the 2007 PTP and its implementation. Each of the research questions, teachers' views related to the 2007 PTP, teachers' views about implementation, and sources of misalignment of the 2007 PTP and its implementation, is presented around these major themes.

TEACHERS' VIEWS ABOUT THE 2007 PTP

In this section, the results of the data analysis presented to answer the first research question, which is about the teachers' views on the 2007 PTP. The teachers' respon-ses are shown in Table 2. The results are described and illustrated within the major themes of aims, teaching methods, and assessment.

Aims

The teachers articulated two distinct aims in the 2007

Table 2. Frequency and percentage distribution of teachers' views about the 2007 PTP. [a]Anatolian high school. [b]General high school.

Theme	Subtheme	AL		GL		Total	
		f	%	f	%	f	%
Aims	Helping students acquire a general knowledge base about physics	7	28	8	57	15	38
	Preparing students for higher education	18	72	6	43	24	62
Teaching methods	Student research and presentations	11	44	4	29	15	38
	Hands-on activities	23	92	11	79	34	87
Assessment	Task and response formats are varied	10	40	7	50	17	44
	Multiple choice items are less emphasized	18	72	8	57	26	67

PTP and in general they approved these aims. The first aim, stated by 38% of the teachers, was helping students acquire a general knowledge base about physics. The teachers stated that the 2007 PTP intended students to become cultured citizens, the physics knowledge that students will learn should be part of the well-rounded education they will get. According to these teachers, as part of this culture, the students are expected to able to understand the physical phenomena happening around them, appreciate the scientific explanations of these phenomena, recognize how knowledge in physics shapes technology and our ways of living, and see the relevance of physics knowledge to their lives. The teachers particularly referred to the pragmatic use of physics knowledge that students can use in everyday life, but not to using this knowledge for informed participation in a democratic society. For example a teacher stated:

1. One of my students told me once that physics was irrelevant. Then we met at the
2. hospital and he told me that they came to have a laser eye surgery. I asked him if he
3. still thinks physics is irrelevant. Physics is used everywhere, it opens up your mind, it
4. changes lives. Physics must be taught to form general knowledge and how this
5. knowledge is used. This is what the new teaching program wants us to do (2007).

In line 1 of this excerpt, the teacher (identified by the number 2007) says that one of his students told him that physics is irrelevant, which the teacher probably faces as a common attitude of students. In lines 2 and 3 the teacher says that he confronted the student when he saw him at a hospital where he was going to have a laser eye surgery. Although the teacher does not explicitly say it, he means that if we did not have the knowledge of lasers we would not have the technology to conduct eye surgeries. Then in lines 3 and 4, the teacher says that physics knowledge can be found everywhere in our everyday life and it shapes our ways of living, but one has to know how to see it. In lines 4 and 5, the teacher identifies one aim of the 2007 PTP by stating that physics teaching should be for helping students gain general knowledge and understand how that knowledge is applied in daily life, which means learning how to see physics knowledge in everyday life. In general the teacher states that teaching physics should be for helping students develop a general knowledge base about physics, which is relevant for and functional in daily life. However, the teacher neither refers to nature of science, processes of production and evaluation of scientific knowledge nor to using this knowledge in the decisions students are expected to make.

The second aim in the 2007 PTP stated that 62% of the teachers were preparing students for higher levels of education. According to these teachers, at secondary level students must develop the foundation physics knowledge and skills which are prerequisites for higher education. These teachers reasoned that students who will pursue science related careers must master the basic physics knowledge in high school in order to be successful in the courses they will take in the university. For these teachers, without this foundation physics knowledge their students would be disadvantaged in higher education because physics knowledge is connected and built upon prior concepts. According to these teachers, students would not be able to grasp advanced physics concepts and associated mathematical techniques unless they first acquired basic physics concepts and accompanying basic mathematical skills. Although the teachers stressed the concepts and mathematics involved in physics, they did not mention the experimental and practical skills students need to have acquired before beginning higher education. For example a teacher stated:

1. The new curriculum states that we should prepare the

students for the university
2. education. It says you have to train those who will get academic education. We are
3. expected to prepare a foundation for scientific training in the university. They are
4. going to learn quantum mechanics and calculus in the university. How can they
5. manage it if they don't know Newton's laws and algebra (1051)?

In this excerpt between lines 1 through 3, the teacher (identified by the number 1051) states that the 2007 PTP expects them to prepare students for higher education, by providing students with the foundation knowledge required in scientific training. In lines 4 and 5 the teacher exemplifies what she means by preparing students for higher education. According to the teacher, the foundation for learning quantum mechanics is having a firm grasp of Newton's laws, and the foundation for learning calculus is having mastered algebra. Hence, for this teacher the 2007 PTP aimed at helping students develop the basic knowledge and skills required for further education.

The teachers working at general high schools appear to be more sensitive to the aim of helping students develop a general knowledge base of physics (57% for general high schools versus 28% for Anatolian high schools), whereas the teachers working in Anatolian high schools seem to be more sensitive to the aim of preparing students for higher education (72% for Anatolian high schools versus 43% for general high schools). The difference in sensitivity with respect to the aims can be explained by the academic selectivity of the school type. As stated in the participants section, the general high schools accept all students whereas Anatolian high schools are academically selective. Hence the teachers in general high schools may regard their job as preparing students for life after secondary education, whereas the teachers in Anatolian high schools may view their primary goal as preparing students for higher education after they graduate from high school.

Teaching methods

Many of the teachers recognized that teaching methods offered in the 2007 PTP involved a move towards using students centered teaching approach. These teachers were aware that in the 2007 PTP students are expected to be active in the instruction process. The teachers expressed that the emphasis on student centered approach was manifested particularly through two teaching methods: student research and presentations and hands-on activities.

Pertaining to student research and presentations as a teaching method, 38% of the teachers said that the 2007 PTP recommends using this teaching method. For these teachers, student research and presentations meant that students were assigned a topic, usually as homework, which they searched sources of information and prepared an oral presentation that they delivered in the classroom. For instance, a teacher stated:

1. The curriculum expects us to put the student at the center of teaching. It says
2. students should research physics topics and present what they learned. We are
3. supposed to give students project or research homework. Then the students will
4. search for information on the topic and prepare a presentation. With these
5. assignments they present in the class they are going to be more involved in the
6. physics lesson (2025).

In this excerpt, the teacher (identified by the number 2025) expresses that in the 2007 PTP a student centered approach to teaching is adopted (line 1). In lines 2 through 4, the teacher explains what she understands from student centered teaching as assigning topics to the students for which they search for information and prepare an oral presentation. In lines 4 through 6, the teacher states that the 2007 PTP envisions that students will become more active in learning if they are engaged in researching and presenting information about physics topics. Clearly, according to this teacher, student research and presentations is a student centered teaching method offered in the 2007 PTP.

The second teaching method that the teachers recognized as recommended in the 2007 PTP was hands-on activities, which they classified as a student centered teaching method. For these teachers, hands-on activities meant engaging students in observations of physical phenomena and in conducting practical work and experiments on their own. These teachers recognized that the 2007 PTP recommended hands-on activities because it was thought that students learned better if they were engaged in such activities. According to these teachers, the emphasis on hands-on activities was particularly evident in the official textbook; almost every unit involved several hands-on activities. For example, a teacher expressed:

1. The curriculum says that students should do experiments on their own. It says
2. students learn better and they don't forget easily if they observe the events and do
3. experiments about the subject they are learning. So it advises us not to lecture so
4. much but to do hands-on work. If you look at the book there are so many hands-on
5. activities and experiments. For instance, the curriculum says that students should

6. construct a circuit and take measurements when they are learning Ohm's law (2005).

In this excerpt, the teacher (identified by the number 2005) says in line 1 that the 2007 PTP emphasizes student practical work particularly experiments that students do by themselves. Between lines 1 through 3, the teacher says that the reason behind the emphasis on hands-on activities is the assertion that students learn better and their knowledge becomes more durable when they engage in hands-on work. The teacher is clearly aware of the recommendation in the 2007 PTP related to teaching methods, to reduce the emphasis on lecturing and increase the emphasis on hands-on activities, as evidenced with his words in lines 3 and 4. The teacher supports his argument by referring to the activities in the official textbook and by offering the example of circuit construction activities in the textbook, in lines 4 through 6. Obviously, this teacher interpreted hands-on activities as a form of student centered teaching approach recommended in the 2007 PTP.

More teachers working at Anatolian high schools (44%) than those working in general high schools (29%) identified student research and presentations as a teaching method recommended in the 2007 PTP. The majority of the teachers working in both Anatolian (92%) and general (79%) high schools identified hands-on activities as a teaching method recommended in the 2007 PTP. One explanation of the result that the teachers working at Anatolian high schools were more alert to the changes in teaching methods may be that they were more challenged by their students, because their students might have been more academically demanding.

Assessment

Concerning assessment in the 2007 PTP the teachers identified two main points. The first point about assessment, stated by 44% of the teachers, was the inclusion of different task and response formats. According to these teachers, the new task formats included matching concepts with definitions or examples, selecting whether a statement is true or false, filling in the blanks in a statement, solving puzzles, constructing concept maps, and explaining one's reasoning in open ended questions. The teachers perceived the inclusion of the different task and response formats as an important change in the 2007 PTP because according to them, traditionally physics assessment was considered as solving problems, which can be presented in closed or open ended formats. Hence, for these teachers, these task formats were novel in terms of assessing physics learning. For example, a teacher stated:

1. They changed the question types. Now they want us to ask true or false, fill in the
2. blanks, and vocabulary matching questions. They also put puzzles in the books, I
3. mean crossword puzzles but the questions are from physics. And they want us to ask
4. concept maps in the exams as well (1059).

In this excerpt in line 1, the teacher (identified by the number 1059) states that in the 2007 PTP in terms of assessment the question types are changed. In lines 2 through 4 the teacher explains what she means by question types. According to this teacher, new question types were true and false, fill in the blank, and vocabulary matching questions as well as crossword puzzles and concept maps. Clearly, for this teacher, question type refers to task and response formats of items included in assessment, which is a major change in the 2007 PTP.

The second point about assessment in the 2007 PTP, stated by 61% of the teachers, was the lessened emphasis on multiple choice items. The teachers expressed that for a long time they have been heavily using multiple choice items, which included a problem in the item root and presented several possible results for the solution. According to these teachers, the basic reason for the heavy use of multiple choice items was that the university entrance examinations were exclusively based on multiple choice response format. On the other hand, these teachers stated that the 2007 PTP asked teachers to include fewer multiple choice questions in the exams. For example, a teacher expressed:

1. For many years we have been mostly using tests. The main reason was
2. obviously the university entrance exams. We want the students to learn the test taking
3. techniques. Because these tests do not only measure knowledge, they also measure
4. how fast you can use that knowledge. So we are trying help students solve the tests
5. qucikly. Then with this new curriculum, they say do not ask so many test questions.
6. Well they are not saying dont ask any multiple choice, but ask fewer (1053).

In this excerpt in line 1, the teacher (identified by the number 1053) says that teachers have been employing tests for a long time. The teacher uses tests as a synonym for multiple choice questions, which is commonly used in Turkish language. Then in lines 1 and 2 the teacher explains their reliance on multiple choice items with the task and response format of the university entrance exams, which are exclusively based on multiple choice format. In lines 2 and 3 the teacher says that they want to help students learn the technique for solving multiple choice questions and in line 3 and 4 the teacher explains the nature of the technique, which is primarily

Table 3. Frequency and percentage distribution of teachers' views about the implementation of the 2007 PTP. [a]Anatolian high school. [b]General high school. [c]Some teachers have expressed more than one aim.

Theme	Subtheme	AL		GL		Total	
		f	%	f	%	f	%
Aims	Helping students acquire a general knowledge base about physics	3	12	3	21	6	15[c]
	Preparing students for higher education	4	16	2	14	6	15[c]
	Preparing students for the university entrance exams	24	96	11	79	35	90[c]
Teaching Methods	Student research and presentations	7	28	0	0	7	18
	Hands-on activities	3	12	1	7	4	10
	Lecturing and solving textbook questions	20	80	10	71	30	77
	We do not conduct hands-on activities	22	88	13	93	35	90
	Class time is limited	22	88	12	85	34	87[c]
	We do not have the necessary equipment	17	68	9	64	26	67[c]
	The test items in the university entrance exams are not related to hands-on activities	20	80	12	86	32	82[c]
	The activities are too easy for the students	13	52	8	57	21	54[c]
Assessment	Task and response formats are varied	11	44	5	36	16	41
	Multiple choice items are less emphasized	7	28	3	21	10	26
	Real criterion is university entrance exams	24	96	10	71	34	87
	The university entrance exam and the 2007 PTP are incompatible	17	68	8	57	25	64

about increasing the speed of solving multiple choice questions. Then in lines 5 and 6, the teacher says that the 2007 PTP asks them to rely less on multiple choice questions, but not to abandon using this task and response format completely.

The ratios of teachers who identified inclusion of new task and response formats in assessment as an important aspect of the 2007 PTP were similar for both the teachers working in Anatolian high schools (40%) and general high schools (50%). On the other hand, the teachers working in Anatolian high schools (72%) appear to be more sensitive to detecting the lessened emphasis on the multiple choice items compared to the teachers working in general high schools (57%). One explanation of the higher sensitivity of the teachers working in Anatolian high schools may be that the student body is selected with respect to their academic achievement, and these students were on the university track. Because the road to university passes through the university entrance exams and these exams are exclusively multiple choice, the teachers working at Anatolian high schools might have been particularly alerted towards any change in multiple choice format.

TEACHERS VIEWS ABOUT IMPLEMENTATION OF THE 2007 PTP

The results of the data analysis presented in this section are intended to answer the second research question, how teachers implement the 2007 PTP. The teachers' responses related to the implementation are shown in Table 3 and are presented within the major themes: aims, teaching methods, and assessment. The common entries in Table 3, which have been already described and illustrated in the previous section are described but not illustrated in this section.

Aims

As described in the previous section, in general, the teachers approved the aims in the 2007 PTP. The two aims identified as the aims in the 2007, helping students develop a general knowledge base in physics and preparing students for higher education, were also identified as aims in implementation. However, in implementation few teachers' actually regarded these two aims as shaping their instruction. With respect to both the aim of helping students develop a general knowledge base in physics and the aim of preparing students for higher education, only 15% of the teachers expressed that they actually implemented these aims. Moreover, the ratios of participants who expressed these two as implemented aims were similar for both the teachers working in Anatolian high schools and general high schools. It seems that although the teachers regarded helping students develop a general knowledge base in physics

and preparing them for further education as important aims in principle, in practice they did not value these aims as much.

According to the teachers, the most prominent aim in implementation was preparing students for the university entrance exams. Preparing students for the university entrance exams is distinct from preparing them for university education. Preparing students for the university entrance exams does not necessarily entail helping them acquire the prerequisite knowledge and skill base for higher education. Rather, it is about cracking the test technique of the university entrance exams, learning which content is covered to what extent, what types of items may be included in the exam, and how to solve questions in a small amount of time. The teachers were well aware that preparing students for the university entrance exams was not an aim in the 2007 PTP at all, however, it was the aim in their instruction. Almost all of the teachers (90%) stated that the implemented aim of physics teaching is to prepare students for the university entrance exams. The teachers expressed that this aim was a consequence of the pressure from the parents and school administration, as well as a feeling of responsibility to help students get accepted to reputable universities. For instance, a teacher said:

1. The purpose of teaching physics at the secondary level has deviated from preparing
2. students for the university to preparing for the entrance exam. The tendency to prepare
3. students for the university entrance exam is determined by school administrations,
4. parents and private tutoring institutions. Students want this as well. So as teachers we
5. are left alone. Instead of teaching students the fundamental concepts that will help them
6. in their university education or to prepare citizens who has an idea about what physics
7. is, we are trying to push the kids to solve the questions for the university entrance exam (1019).

In this excerpt in line 1 and 2, the teacher (identified by the number 1019) expresses that the aim of teaching physics at secondary level should be preparing students for higher education, however, this aim is replaced by teaching to the test. In lines 2 through 4 the teacher explains the reasons for teaching to the test with the pressure of the school administration, parents, and the private tutoring institutions from which students get additional help to prepare for the university entrance exams. In lines 4 and 5 the teacher expresses his feeling of loneliness and frustration against all these pressuring agents. In lines 5 through 7, the teacher admits that he surrendered to these pressures, and instead of preparing the students for university education or helping them become knowledgeable citizens about physics, he is actually aiming for preparing the students for the university entrance exams. Clearly, this teacher is not only aware of but also supports the aim of preparing students for higher education and helping students develop a general knowledge base in physics. However, he appears to view his convictions for these aims faded in practice, for him in practice these aims seem to have little weight compared to preparing students for the university en-trance exams.

Although the majority of the teachers stated that preparing students for the university entrance examinations was the main aim in implementation of the 2007 PTP, the Anatolian high school teachers (96%) seem to be more sensitive in expressing this aim than the general high school teachers (79%). Almost all of the teachers working in Anatolian high schools considered their major aim for teaching physics as preparing their students for the university entrance exams. Again, this result may be explained by the nature of the student body at Anatolian high schools, remembering that the students are on university track, and that these schools were academically selective. It may be considered reasonable for the teachers working at academically selective Anatolian high schools to focus heavily on the means to be placed in a university, but the majority of the teachers working in general high schools did also focus on preparation for the university entrance exams. Then for both types of schools, the teachers may be valuing being accepted to a university as an important result of secondary science teaching.

Teaching methods

As stated in addressing the first research question, many of the teachers recognized that teaching methods offered in the 2007 PTP involved a move towards using students centered teaching approach, manifested in student research and presentations and hands-on activities as teaching methods. The teachers expressed that student centered approach may be effective in helping students become knowledgeable in science and prepare them for higher education, however, in practice it is rarely employed, if employed at all.

Pertaining to student research and presentations, only 18% of the teachers stated that they actually use this teaching method in their instruction. All of the teachers, who stated that they used student research and presentations as a teaching method, worked at Anatolian high schools; none of the teachers working in general high schools stated that they used this teaching method. This result is puzzling because one might have expected the opposite; because Anatolian high schools are academically selective and the students are on university track, hence, the teachers could have considered student research and presentations as irrelevant for preparing the

students for the university entrance exams. It is also difficult to explain why none of the teachers working at general high schools referred to using student research and presentations as a teaching method. On the other hand, the teachers who reported that they used student research and presentations expressed that it was a positive change for their instruction. For example, a teacher stated:

1. I gave a research and presentation assignment to the students. Everyone found a book
2. about relativity, read it, prepared a summary and a five minute presentation. In 9th
3. grade we did the classification of renewable energy resources. Each student prepared a
4. project and a presentation. They went to the libraries in the universities for research.
5. They had to use resources beside the internet. It was a very good assignment. Everyone
6. had fun and learned too (1061).

In this excerpt in lines 1 and 2, the teacher (identified by the number 1061) says that he assigned the students a research and presentation homework about special relativity, in which the students searched and selected a book and prepared a five minute presentation. In lines 2 and 3 the teacher gives another example of student research and presentations, which was about classification of renewable energy resources. Between lines 3 through 5, the teacher describes the research phase of the assignment, that the students searched university libraries for resources because using the internet alone was not adequate for the assignment. In lines 5 and 6 the teacher evaluates this assignment as a successful and enjoyable learning experience. Clearly, the teacher had a positive attitude towards using student research and presentations as a teaching method.

With respect to hands-on activities as a teaching method, only 10% of the teachers stated that they actually do hands-on activities in their classes. The rest of the teachers (90%) stated that they do not conduct hands-on activities at all. The percentages were very close for the teachers working at Anatolian high schools (88%) and general high schools (93%), who stated that they did not conduct hands-on activities. Moreover, 77% of the teachers said that they used lecturing and solving standard textbook questions as their primary teaching method. Again, the percentages of the teachers who used lecturing and solving textbook questions as the primary teaching method were similar for Anatolian high schools (80%) and general high schools (71%).

The teachers offered several reasons for not doing hands-on activities. The inadequacy of class time (87%) and lack of equipment (67%) were among the reasons for not conducting hands-on activities. According to most of the teachers, two hours per week was too little for physics, if they also had to do hands-on activities. Beside class time and lack of equipment, as a reason for not doing hands-on activities, 82% of the teachers stated that the questions in the university exams were not related to hands-on activities. Because of this perceived mismatch between the university exams and hands-on activities, the teachers were teaching by lecturing and solving questions. For instance, a teacher said:

1. I don't do the activities very much. These students are going to take the university
2. entrance exams. So my goal is to help them understand the concepts and use them to
3. solve the questions in the university entrance exams. So for the students to understand
4. the concepts, I first teach the logic by lecturing then apply the concept in solving
5. questions (1067).

In this excerpt in line 1, the teacher (identified by the number 1067) says that he does not conduct hands-on activities. In lines 2 and 3 the teacher explains why he does not do hands-on activities by deploying the university entrance exams as a reason. As the teacher articulates in lines 2 and 3, his goal is to help the students solve the questions in the university entrance exam, which he sees understanding the concepts as a means towards being able to solve the questions. In lines 3 through 5 the teacher expresses that understanding the concepts is possible through his main teaching method, lecturing and solving questions, and therefore he employs this teaching method. Clearly, the teacher aims for preparing the students for the university entrance exam and to do that he employs lecturing and solving questions as the teaching method.

As another reason for not conducting hands-on activities, 54% of the physics teachers stated that the hands-on activities included in the textbooks were too easy for the students. These teachers said that the students mocked these activities. Instead of doing hands-on activities, the students were asking for solving more questions, so that they can prepare for the university entrance exams. For example, a teacher stated:

1. Now when we attempt to do these activities, it takes at least half an hour and the
2. students are not satisfied with what they learn from doing the activity. They say why
3. don't you just tell us what this topic is about in a few sentences. So they think that the
4. level of the activities is too low. So instead, we solve more questions. We want to expose
5. the students to as many different questions types as we can. This is a confession. Yes we
6. want them to learn physics, but more importantly we want them to be successful in the

7. university entrance exams (1036).

In this excerpt in lines 1 and 2, the teacher (identified by the number 1036) says that when he conducts hands-on activities it takes most of the class time and the students often are not satisfied with what they have learned. In lines 2 and 3 he says that students expect him to summarize the topic in a few sentences, which implies a short lecture. In lines 3 and 4 he states that the students think that the level of the hands-on activities is low for them. In line 4 and 5 the teacher articulates his instruction as solving more questions in order to expose the students to more question types. Finally, in lines 5 through 7, the teacher confesses that he values preparing the students to the test more than helping them learn physics.

An interesting finding is for all of the reasons that the teachers offered for not doing hands-on activities, the percentages were similar for the teachers working in Anatolian high schools and in general high schools. One explanation of this finding, as suggested for a similar result by Demir and Demir (2012), may be that the teachers regardless of the school type they are working are merely using these reasons, not as genuine explanations for not doing hands-on activities but merely as excuses.

Assessment

While the teachers were talking about assessment methods they actually use, 41% of the teachers stated that they added new task and response formats to the exams and homework assignments. According to these teachers, the exams and assignments incorporated open ended questions, true and false choices, filling in the blanks, matching, and concept maps. For example, a teacher said:

1. The curriculum asks us to include true or false, matching, open ended questions in the
2. exams. Before, we used to ask really difficult classical questions. With these new types
3. of questions, students do better. It is less boring now. So we changed the exams and ask
4. questions similar to those in the textbook. But we are very concerned with the questions
5. that will be in the university entrance exams, will they ask the new type of questions, we
6. hope so (1021).

In this excerpt in line 1, the teacher (identified by the number 1021) says that the 2007 PTP requires teachers to vary the task and response format of the assessments by including true or false, matching, and open ended questions. In lines 1 and 2, the teacher says that they have changed their assessment by adopting these new task and response formats, before they were only using classical questions. In lines 2 and 3 the teacher evaluates the inclusion of these new task and response formats positively and argues that this change contributed to student learning and enjoyment of physics. Then in lines 3 and 4, the teacher explicitly states that they have changed their exams by including the new task and response formats, in which they were inspired by the textbook. Finally, between lines 4 and 6, the teacher expresses her concern about the items in the upcoming university entrance exam later that year. Obviously, she is concerned about the inclusion of the new task and response formats in the university entrance exam and expressed that she hoped that they will be similar to the response formats introduced in the 2007 PTP.

According to most of the teachers (87%), the real criterion of success and hence the crucial assessment was the university entrance exam. The teachers working in Anatolian high schools (96%) were more sensitive to considering the university entrance exams as the real criterion of success than the teachers working in general high schools (71%), which can again be explained by the academic focus of the Anatolian high schools. In relation to the high value placed on the university entrance exams for assessment, for 64% of the teachers the 2007 PTP and the university entrance exams were not harmonious. According to these teachers, the suggested assessment task and response formats in schools and those in the university entrance exams are entirely different. For example, a teacher stated:

1. The official curriculum and the assessment, the university entrance exams which
2. defines the future of students are different. As long as these two do not match, this
3. problem will exists. Why not make the exam match the curriculum? But that seems
4. difficult in Turkey. The exam is multiple choice, but when you look at the books you
5. see concept maps, fill in the blanks, true and false questions, and project assignments.
6. So the education given starting from elementary school and the assessment (the
7. university entrance exam) do not match. So this problem will remain (1015).

In this excerpt in lines 1 and 2, the teacher (identified by the number 1015) asserts that the curriculum and assessment, which she singly designates as the university entrance exams, are not aligned. In lines 2 and 3, she says that the problem, teaching to the test, will remain unsolved unless the curriculum and assessment of student learning is matched. Then in lines 3 and 4 she offers a solution, aligning the university entrance exams with the curriculum, which she states her doubt on the

possibility of such alignment. In lines 4 and 5, the teacher articulates the mismatch of the task and response formats between the 2007 PTP and the university entrance exams. She says that university entrance exams are exclusively based on multiple choice; whereas assessment required by the curriculum and included in the official textbooks involve a variety of formats such as concept maps and open ended questions. Finally, in lines 6 and 7, the teacher reiterates the misalignment problem between the curricula starting from elementary school and the university entrance exams, which she appears to consider as the assessment of entire K-12 schooling. She concludes that this lack of alignment is not likely to be resolved.

ALIGNMENT OF TEACHERS VIEWS ABOUT THE 2007 PTP AND ITS IMPLEMENTATION

In this section the results of the data analysis shown in Tables 2 and 3 are reported in order to answer the third research question, which aims to identify sources of misalignment between the 2007 PTP and its implementation.

With respect to the aims in the 2007 PTP and aims in implementation, for the aim of helping students develop a general knowledge base in physics, the ratio of the teachers who identified this aim in the 2007 PTP (38%) is more than twice the ratio of teachers who actually implemented it (15%). This ratio pattern is similar for both the teachers working in Anatolian high schools (28% to 12%) and for those working in general high schools (57% to 21%). Strikingly, for the aim of preparing students for higher education the ratio of the teachers who identified it in the 2007 PTP (62%) is about four times of those who implemented this aim (15%). For this aim, the ratio pattern is similar for Anatolian high school teachers (72% to 16%) and general high school teachers (43% to 14%). Finally, the great majority of the teachers and almost all of the teachers working in Anatolian high schools referred to preparing students for the university examinations as their implemented aims. These results imply that the reasons for the lack of implementation of the aims stated in the 2007 PTP has little to do with the teachers unawareness of these aims; rather the reasons have to do with the teachers adapting an alternative aim as a result of the social, political, and practical realities, namely the crucial role attributed to the university entrance exams.

In relation to the teaching methods, the ratio of the teachers who recognized student research and presentations in the 2007 PTP (38%) is more than twice the ratio of the teachers who actually use this method in their teaching (18%). Especially none of the teachers working in general high schools reported that they used student research and presentations in their classes. More strikingly, although the great majority of the teachers (87%) recognized hands-on activities as a teaching method recommended in the 2007 PTP, only 10% of them actually did use hands-on activities in their teaching. This ratio pattern is similar for both Anatolian high school teachers (92% to 12%) and for the general high school teachers (79% to 7%).

With respect to assessment, the only consistency in the data was observed for the inclusion of various task and response formats, about two fifths of the teachers identified this change in the 2007 PTP (44%) and reported that they actually implemented it (41%). On the other hand, for the decreased emphasis on multiple choice items, the ratio of the teachers who recognized it as an aspect of the 2007 PTP (67%) was more than twice the ratio of the teachers who actually implemented this change (26%). The ratio pattern for the decreased emphasis on multiple choice items was similar across the teachers working in Anatolian high schools and general high schools. Strikingly, the great majority of the teachers and almost all of the Anatolian high school teachers identified the university entrance exams as the real criterion for student attainment. Furthermore, 64% of the teachers purported that the 2007 PTP and the university entrance exams were not aligned.

The data on the implemented aims, teaching methods, and assessment seem to converge on the prominence of university entrance exams. The teachers seem to aim at preparing students for the university entrance exams, teach towards what is included in the exams, include similar questions in their own assessments, and finally evaluate student attainment based on the results of the university entrance exams. Hence, from the perspective of the teachers, it is possible to identify university entrance exams as the major source of misalignment of the 2007 PTP and implementation.

DISCUSSION

The purpose of this study was to explore teachers' views about the 2007 PTP and its implementation, as well as to identify possible sources of misalignment of the 2007 PTP and its implementation. The results demonstrate that physics teachers are aware of the aims in the 2007 PTP including helping students form a general knowledge base about physics and preparing them for higher education. This results strengthens previous research findings that physics teacher understand the aims of the 2007 PTP (Baybars and Kocakülah, 2009; Karal, 2010; Şafak, 2010). On the other hand, the physics teachers identified pragmatic reasons for teaching physics, but not other types of reasons such as helping students become citizens who can make informed decisions in a democratic society. Hence, it may be appropriate to inform teachers about the democratic implications of teaching physics.

The teachers in this study recognized the teaching

methods suggested in the 2007 PTP as student centered methods entailing student research and presentations and hands-on activities, which is a result consistent with previous findings (Akdeniz and Paniç, 2012; Baybars and Kocakülah, 2009; Sadi and Yıldız, 2012). On the other hand, the teachers did not refer to technology design at all, which implies that they may lack the knowledge on how to incorporate technology design in to their teaching (Ayvacı et al., 2012). Professional development programs geared towards teaching methods in the 2007 PTP may help expand teachers' pedagogical knowledge base.

Regarding assessment in the 2007 PTP, many teachers seem to have recognized the proliferation of task and response formats and the decreased focus on multiple choice questions. On the other hand, the teachers did not talk about diagnostic and formative purposes of assessment. This result may indicate that teachers do not have an adequate understanding of the assessment approach in the 2007 PTP (Akdeniz and Paniç, 2012; Baybars and Kocakülah, 2009). In line with suggestions of Ergin (2013), teachers seem to need professional development related to assessment methods as well.

The results of this study show that there are alignment issues between the 2007 PTP and its implementation. The teachers in this study stated that the aims in the 2007 PTP and the aims actual instruction are not the same. Instead of helping students become scientifically literate or preparing them for higher education, most of the teachers aimed at preparing them for the university entrance exams. Consequently, instruction is primarily directed towards the university entrance exams. The majority of the teachers seem to interpret the content and teaching methods prescribed in the 2007 PTP from the perspective of preparing students to the university entrance exams, which is consistent with findings of Kapucu (2010) and Tortop (2012). Therefore, the teachers seem to teach through traditional lectures and solving questions resembling those in the university entrance exams. In accordance with the results of previous studies (Ayvacı et al., 2012; Baybars and Kocakülah, 2009; Kapucu, 2010; Sadi and Yıldız, 2012), the results of this study show that the teaching methods suggested in the 2007 PTP are not enacted by the teachers. The reasons that the teachers offered did not include their lack of knowledge about the new teaching methods as suggested by Taşçı (2010) and Yolbaşı (2010). However, the reasons for not using the prescribed teaching methods are not new either. The teachers listed inadequacy of class hours (Akdeniz and Paniç, 2012), mismatch between the teaching methods and the university entrance exam questions (Kapucu, 2010; Marulcu, 2010; Sadi and Yıldız, 2012; Söğüt et al., 2010), and the lack of equipment (Engin and Bülbül, 2009; Karal, 2010; Şafak, 2010) among the reasons for not enacting the prescribed teaching methods. It is possible to interpret these results in a similar way to Demir and Demir (2012) that these reasons may be offered as excuses instead of genuine explanations for not following the prescribed teaching methods.

Consistent with previous research the results of this study support the conclusion that in Turkey physics teachers' implementation of the 2007 PTP is limited.

Because this study is constrained by self-reports of the teachers, accomplishing a comprehensive understanding of what teachers actually do in physics classes require further research which involve classroom observations over a long period. Additionally, in order to be able to get a broader view of physics teachers' implementation, further research with more teachers across geographical regions and different types of schools is called for. Finally, in line with the recommendations of Kurnaz and Çepni (2012), longitudinal studies of the implementation of the PTP may help improve further curriculum development.An important conclusion is that the teachers seem to work backwards from assessment to instruction.

The university entrance exams seem to be the major source of misalignment between the 2007 PTP and its implementation. It appears that implementing the aims and teaching methods suggested by the 2007 PTP rest on achieving an alignment between the official curriculum and assessment of the attained curriculum. The teachers seem to consider the university entrance exams as the assessment tool for the attained curriculum; hence, it is necessary to align the content and format of these exams with those suggested in the 2007 PTP. It may be difficult to change teaching practices in physics classrooms in the absence of such an alignment.

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APPENDIX

The Interview Protocol
Demographic information:
Gender: Male Female
Age:
Years of teaching:
Type of school that you are working: Anatolian High school General High school
Undergraduate Degree and Department:

INTERVIEW QUESTIONS

1. What do you think about the aims, teaching methods, and assessment approaches of the 2007 PTP?
2. What are your own aims, teaching methods, and assessment approaches?
3. What has changed for you with the 2007 PTP?
4. In your opinion, what are the strengths and weaknesses of the 2007 PTP?