

Secondary Physics, Chemistry, and Biology (PCB) Teachers' Views about In-service Training Related to Curricular Change¹

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Abstract

In Turkey the Physics, Chemistry and Biology (PCB) curricula were renewed in 2008. However, little in-service training for teachers has been conducted to disseminate the ideas in the new curricula. The purpose of this study was to investigate PCB teachers' views on in-service training, which may serve as the base knowledge of educational change in Turkey that can be used in further curricular development. In Istanbul 99 teachers voluntarily participated in this qualitative case study. Data were collected utilizing semi-structured interviews and analyzed by employing constant comparative analysis. The data showed that for 40% of the teachers the in-service training was insufficient: the new curricula were not introduced to them adequately. Only 7% of the teachers expressed positive views towards the in-service training. The teachers were concerned about the incompetence of the trainers and the low quality of the training programs. 20% of the teachers felt that they need to keep up to date with the new curricula and establish ways of cooperation among teachers. The results imply that educational change is more than changing the curriculum, which requires serious planning for implementation requiring a reconceptualization of in-service training as part of a larger professional development framework.

Introduction

Turkey is going through a significant science curriculum reform which began at the primary school level in 2005 and continued at the secondary school level since 2008. The cohort of 2012 who graduated from the secondary schools was taught with the new curricula. The curriculum change was in part justified with the low ranking of Turkish students in international assessments (Gür, 2011), which implied a need for improving scientific literacy. The overall goal for the physics, chemistry, and biology curricula is to help students become scientifically literate citizens (Ministry of National Education [MONE], 2011a, 2011b, 2011c), who have "the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity" (OECD, 2003, p. 133).

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Shifting the purpose of teaching science to help students develop scientific literacy can be regarded as a paradigm shift especially for teachers. Transforming teachers views of teaching science at the secondary level from preparing students for the university entrance exams to helping students become part of “a public that finds science interesting and important, who can apply science to their own lives, and who can take part in the conversations regarding science that take place in society” (Deboer, 2000, p.598) is a difficult task. The official curriculum documents were written to include learning goals and limitations, suggestions for teaching methods, and assessment techniques, which were designed to drive teachers’ views towards scientific literacy. However, although limited in number studies showed that the new curricula were not being implemented the way it was envisioned (Akdeniz & Paniç, 2012; Ayvaci, Ültay, & Mert, 2012; Ercan, 2011).

One reason for the lack of adequate implementation of the new curricula might be the inadequate in-service training provided to the teachers about the new curricula. Only two comprehensive seminars were deployed to introduce the new physics curriculum to teachers chosen from all over Turkey, who were planned to be trained as trainers (Güneş, Eryılmaz, Kanlı, Serin, & Arslan, 2009). In addition, small scale seminars about the new science curricula, the new teaching approaches, and laboratory applications were offered to science teachers in different regions of Turkey, however, the number of these seminars decreased every year since 2008. Gönen and Kocakaya (2006) also highlighted the very limited number of in-service training sessions for physics teachers. Öztürk Akar (2007) showed that the in-service training for biology teachers was even more limited in certain regions of Turkey. Beside the low number of in-service training events, Akçadağ (2012) showed that teachers were concerned about the content and methodology of the training programs emphasizing the need for active participation as well as the expertise of the trainers.

The purpose of this study is to identify and describe PCB teachers’ views on in-service training related to curricular change. Specifically the following questions were explored:

1. How do teachers view the in-service training related to the curricular change?
2. What are the obstacles for in-service training and curricular change?

Method

In this study the qualitative case study approach (Yin, 2003), which allows an interactive process between the researchers and the participants, was adopted and the embedded single case design was selected as the research design. The single case which was explored in this study was the views of the teachers about in-service training related to curricular change. The sub-analysis cases in the study are the science courses (physics, chemistry, and biology) that the teachers teach. Before the study started, the University Ethics Review Board’s and Istanbul National Education Administration’s approval were obtained.

39 physics, 31 chemistry, and 29 biology (total 99) teachers working in state Anatolian high schools (18 schools) and general high schools (9 schools) during the 2010-2011 spring semester voluntarily participated in the study. The sample was selected using

maximum diversity sampling (Seidman, 2006). Table 1 shows the characteristics of the study participants.

The data collection was based on semi-structured interviews conducted with each participant. In semi-structured interviews, the order and exact phrasing of the questions can be altered during the course of the interview (Guba & Lincoln, 1981), which provides flexibility to the researcher to understand how the participants view and interpret the events while maintaining the focus on the topic (Merriam, 1998). The interviews were conducted by the researcher and two research assistants in the schools, took between 10 and 60 minutes, and were audio recorded.

Table 1. Frequency distribution of the characteristics of the study participants.

Characteristics	Physics			Chemistry			Biology			Total		
	AL ^a	GL ^b	T ^c	AL	GL	T	AL	GL	T.	AL	GL	T
Years of experience	n	n	n	n	n	n	n	n	n	n	n	n
5-10 years	3	0	3	4	0	4	3	2	5	10	2	12
11-15 years	8	4	12	5	3	8	3	5	8	16	12	28
16-20 years	8	4	12	7	2	9	8	3	11	23	9	32
21-25 years	5	2	7	5	5	10	3	0	3	13	7	20
> 25 years	1	4	5	0	0	0	1	1	2	2	5	7
Total	25	14	39	21	10	31	18	11	29	64	35	99
Gender												
Male	18	12	30	7	4	11	2	1	3	27	17	44
Female	7	2	9	14	6	20	16	10	26	37	18	55
Total	25	14	39	21	10	31	18	11	29	64	35	99

^a Anatolian High school; ^b General High school; ^c Total.

The data analyses involved cyclic processes of data reduction, data display, and conclusion drawing/verification, which are characteristics of qualitative analysis (Miles and Huberman, 1994). 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 in which the bulk of the dataset was condensed into analyzable units by creating categories from the data (Coffey & Atkinson, 1996) utilizing constant comparative method (Glasser and Strauss, 1967). The data were coded following open coding, axial coding, and selective coding strategies suggested by Strauss and Corbin (1990).

In order to ensure validity and reliability of the study several strategies were deployed. In order to increase the internal validity, member checks were deployed (Lincoln & Guba, 1985). In order to increase the external validity and external reliability the research process was explained in detail including the research design, the participants, the data collection procedures, and the data analysis and interpretation. In order to establish internal reliability, the analysis was based on convergence, agreement, and coverage among the

researchers (Gee & Green, 1998). Moreover, all of the quotations were presented without any interpretation.

Results

As the results of the analysis the opinions shown in Table 2 emerged.

Table 2. Frequency distribution of the PCB teachers' opinions about in-service training related to curricular change.

Opinion	Physics			Chemistry			Biology			Total		
	AL ^a	GL ^b	T ^c	AL	GL	T	A L	GL	T	AL	GL	T
	%	%	%	%	%	%	%	%	%	%	%	%
The curricula were not introduced to teachers sufficiently	64	71	67	38	20	32	11	18	14	41	40	40
I did not participate in any in-service training	16	14	15	19	10	16	6	9	7	14	11	13
The in-service training was insufficient	44	50	46	38	20	32	33	45	38	39	40	39
The in-service training was sufficient	8	7	8	10	20	13	0	0	0	6	9	7
The teachers have to renew themselves	28	0	18	19	30	23	28	9	21	25	11	20
The teachers should be trained	32	21	28	19	20	19	6	9	7	20	17	19
There has to be cooperation among science teachers	12	7	10	14	20	16	17	0	10	14	9	12

^a Anatolian High school; ^b General High school; ^c Total.

The first theme that encompassed most of the teachers' statements, with 40%, was the lack of sufficiently introducing the new curricula to the PCB teachers. Especially physics teachers pointed out that the introduction of the new curriculum was inadequate. For example, a physics teacher stated:

The new curriculum was not communicated to the teachers adequately. Either the information was insufficient or the ones who were responsible for dissipating the information did not know what they were talking about. I did not participate in any of the seminars they conducted but I know people who went to those seminars. It did not matter; those who went did not learn what the new curriculum was about. They said it was just for the show: They did the seminar just for the sake of having done it (Physics, AL, 1017).

The ratio of the teachers who explicitly stated that they did not participate in any in-service training was only 13%. The indication is that most of the teachers have received some sort of in-service training. However, about two fifths of the teachers said the in-service training was insufficient, and less than 10% of the teachers stated that it was sufficient. About half of the teachers did not state anything to evaluate the effectiveness of in-service training. One reason for the lack of teachers evaluation of the in-service training related to curricular change might be their indifference. Perhaps, the teachers did not care about in-service training. However, the teachers who pointed the problems with in-service training offered their reasons for thinking that the in-service training was insufficient. One of these reasons is that in-service training was perceived as equivalent of one or two hour seminars, in which teachers learned very little about curricular change and the new curricula. For instance, a teacher said:

I do not find the in-service trainings very effective. I do not encounter any valuable information in those seminars. I want to say that "I learned something valuable today" when I attend an in-service training. Yet most of the time I do not think that I learned something at all, I return home frustrated. The trainer should be qualified; at least she should know what she is talking about. But the trainers say that you can read the information from the document we gave you to get rid of the burden. If I can read, send the CD to me, why do I have to come (2004, Biology, AL)

According to these teachers, the trainers in the in-service training seminars were not knowledgeable. Some teachers stated that in some cases the trainers knew less than the trainees about the new curriculum. One explanation for the inadequacy of the trainers was that the trainers were teachers who participated in an in-service training seminar and were expected to replicate that seminar. Although aware of their incompetence, these teachers had to conduct these seminars. For example, a teacher stated:

I gave a seminar on mathematics education methods. How am I expected to know anything about that? I do not have the necessary background. You look up various resources, learn the teaching methods in some way and you blend it with your experience then you give an hour long speech. You share ideas with the trainees. There is nothing you can do beside these. You have not got any formal education at all about the specifics. This is something that has to be done by professionals. (1024, Chemistry, GL)

In teachers' opinions the issues with implementation of the new curricula were not only about the inadequacy of in-service training; the teachers had some degree of negative attitudes towards other teachers. One of the recurring themes in the interviews was that the teachers often stressed the need for teachers to keep themselves up to date, which implies that they believed teachers are not up to date. For example, a teacher stated:

Our teachers do not like to work hard. There are new topics added to the chemistry curriculum, and I know most teachers did not teach or even learn them. As a teacher the new curriculum asks you to become a student and study. Moreover you have to learn new ways of presenting the lesson. It is not only chalk and talk anymore; the students must do presentations and such. But we did not learn this way and we did

not teach this way. Learning this is a lot of work, and most teachers just do not want to do it (2018, Chemistry, AL).

One mechanism that these teachers offered for pushing all teachers to develop themselves professionally was mandating in-service training.

The new curriculum is fine, but since we are used to the old one, we have not been able to implement it fully. We are used to dealing with numerical operations, we are having problems adapting. Changing old habits is really hard, we have a teaching method we are accustomed to, and that is what we keep on using. What I want for teachers is to receive in-service training first, all of them. (1018, Physics, AL)

Another mechanism was to redefining in-service training as continuous professional development, not as one or two hour seminars. For instance, a teacher said:

Short seminars in crowded rooms are not in-service training. I need to see what these new teaching methods look like. I need to first experience these new activities before I can bring these to my students. This cannot happen in a few sessions. We need continuous training. (2019, Physics, AL)

According to these teachers continuous in-service training might help spread the educational reform by convincing teachers to the arguments made for the reform in the first place. For example:

The teachers could not internalize the new curricula since they were not convinced of the validity of the new curricula. At first, teachers should be convinced. What I mean is they have to show me why this is important. Why we need such a radical and rapid change? They have to tell me first; when I say me of course I mean they should inform every teacher. The necessity of such a change should be explained to the teachers first. I have to learn what kinds of changes are going through and believe that the change is something we need. Let's investigate it in the training (1061, Physics, AL).

The final theme in teachers' opinions about in-service training related to curricular change was the need for cooperation among science teachers. 12% of the teachers stressed cooperation and solidarity among colleagues. For example, a chemistry teacher said:

We need to cooperate with other science teachers, both within and outside our field. I have to follow what other chemistry teachers are doing in my school as well as in neighboring schools. Otherwise, everyone might be just following their own curriculum, not the common one we are supposed to. I also can learn content and methods they are using. Similarly, especially for the new topics related to the atom, I need a physics teacher to explain me quantum mechanics. Because I am supposed to be teaching that, but I do not remember what quantum mechanics was about. So if science teachers can come together and study together, we all will learn (1047, Chemistry, GL).

Discussion

The purpose of this study was to investigate PCB teachers' opinions about in-service training related to curricular change. The teachers mostly expressed that they have participated in in-service training seminars but the in-service training they received was inadequate. According to the teachers the inadequacy was due to incompetent trainers, the lack of adequate professional collaboration among teachers, and the lack of breadth and depth in perceived meaning of in-service training.

The finding that trainers were perceived as incompetent by the teachers may imply that in-service training was not planned and conducted rigorously. The makers of the curriculum did conduct several large scale in-service training activities (Güneş, Eryılmaz, 2010), which were aimed at training the participant teachers to become trainers. However, it appears that teachers as in-service trainers plan failed. The incompetence of trainers appears to hurt the efforts for implementing curricular change; trainer and participant teachers' motivations for in-service training diminishes. As a way to disseminate information about curricular change, training teachers to conduct in-service training may be an effective way. However, it seems that training teachers as trainers require a more robust approach. Rather than having the teachers participate in seminars which they are expected to conduct themselves, a long term and continuous plan for training trainer teachers may prove fruitful.

The data showed that the teachers are concerned about the lack of adequate cooperation among teachers. Apparently, teachers require support from other teachers both within and outside of their field of specialization. In the current state of affairs, in Turkey the teachers have formal meetings at schools in which they discuss the courses and the students. However, these meetings are not executed or intended to be a part of professional development. A fruitful approach to foster professional collaboration might be supporting formation of professional learning communities. By voluntary participation teachers can learn from each other and from external sources, form a shared vision, and assume ownership for educational change (Fullan, 2007). Helping teachers become members of professional learning communities, may help increase the capacity of teachers and schools.

Perhaps the most important implication of this study is the need for redefining in-service training. For the teachers in-service training meant one or two hour seminars, which were conducted once or twice a year. Some of the teachers stated that working with this definition fails to achieve its purpose, namely preparing the teachers for effectively meeting the demands of the new curricula. Teachers appear to be aware of the key role they have in enacting curricular change. They stress the need for continuing professional development as a way to help teachers change. Hence, a broader concept of continuing professional development may provide an overarching framework which would also encompasses in-service training. Continuing means that teachers will be provided support throughout their careers, helping them form professional learning communities.



Dr. Mercan is interested in how teachers, students, and society reconstructs the official curriculum documents in their enactment of educational reform policies in classrooms. He is also exploring how big data from international student assessments can be used to inform theory, practice and policy.

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