COMPARISON OF PRESERVICE PHYSICS TEACHERS' BELIEFS AND PRACTICES

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Related literature and the aim of the study

Preservice teachers' beliefs have been the focus of attention in teacher education research (Kagan, 1990; Thompson, 1992; Block and Hazelip, 1995; Woolley and Woolley, 1999; Staub and Stern, 2002; and Benjamin, 2003). There is ample research on the relationship between teachers' beliefs and practices (Kagan, 1992; Rodriguez, 1998; Gales and Yan, 2001; Kane, Sandretto, Heath, 2002).

At this stage, it is beneficial to give the definition of teaching belief. There are various definitions synthesizing well what teaching belief is and the factors influencing the belief. Kagan (1990: 423), for example, defined teachers' belief as "the highly personal ways in which a teacher understands classrooms, students, the nature of learning, the teacher's role in the classroom and the goals of education". Block and Hazelip (1995: 27) claimed that "teacher beliefs and belief systems are grounded in their personal experiences and, hence, are highly resistant to change". Thompson (1992: 149) noted that "thoughtful analysis of the nature of the relationship between beliefs and practice suggest that belief systems are dynamic, permeable mental structures, susceptible to change in light of experience. As understood from the definitions that teaching belief is emerged from personal experiences and it can be changed by having the related experiences.

The aims of this study are to determine preservice physics teachers' teaching beliefs and to examine the relationship between their beliefs and practices. Teaching beliefs are categorised mainly as traditional, transitional and constructivist. Traditional belief is "based on a theory of learning that suggest that students will learn facts, concepts, and understandings by absorving the content of their teacher's explanations or by reading an explanation from a text and answering related questions" (Ravitz, Becker and Wong, 2000: 1). Constructivist belief , on the other hand, is "based on a theory of learning that suggests that understanding arises only through prolonged engagement of the learner in relating new ideas and explanations to the learner's prior beliefs" (Ravitz, Becker and Wong, 2000: 1). In addition to these two categories we developed a category called, transitional belief, to refer to teaching beliefs in which neither of the two categories are dominant and cases where teachers can have different beliefs in different contexts.

Methodology

Qualitative and quantitative research methods were designed for this study. Survey, semi-structured interviews, observations, preservice teachers' written documents such as lesson plans and school practice portfolios were used to collect the data.

At this stage, it might be useful to give some information about physics teacher education program in Turkey. The content of the program was designed based on the constructivist philosophy. In order to enter one and a half-year graduate teacher education program, participants must complete 3.5 years in physics department. During the program, preservice teachers take courses related with pedagogy, education and educational psychology, and do some practices in schools. "Instructional Methods in Physics-I" is one of the main courses of the physics teacher education program. In this course, preservice teachers have opportunities

to build theories of physics teaching and learning, do microteaching activities, examine their own teaching, observe and examine peer teaching, and experience different teaching and learning approaches. In "School Practice I, II, III" courses, preservice teachers have school placements where they have opportunities of teaching in the real school settings. Participants of the study were all 42 preservice physics teachers attending a teacher education program. The age of the participants ranged from 20 to 25 and 43% of them were female.

In order to achieve the aims of the study, we conducted a survey which is adopted from TLC Survey (Teaching, Learning, and Computing Survey: 1998). The adaptation was done in three stages. First, TLC Survey which was originally conducted to teachers was adopted to preservice teachers. Second, the survey was accommodated to Turkish educational system. Last, the original survey was translated to Turkish by the authors separately and validated by comparing two translations.

On the basis of the results of the survey, two participants from each category were selected to be interviewed. The interviews were semi-structured and have two purposes. The first purpose was to validate the results of the survey. Second purpose was to compare preservice teachers' teaching beliefs to their teaching practices.

In order to determine their teaching practices, six participants were observed in Method I course and school placements as they did micro-teaching. This data is triangulated with lesson plans and interviews.

Results form the survey

42 pyhsics teachers' beliefs determined by the survey were presented in Table 1. below:

	Traditional	Close to traditional	Transitional	Close to constructivist	Constructivist
Type of class discussion s/he is more comfortable	28,6	42,9	7,1	19	2,4
A quiet classroom is generally needed for effective learning	14,3	23,8	50	9,5	2,4
Students will take more initiative to learn when they feel free to move around the room during class	0	14,3	47,6	33,3	4,8
Teachers know a lot more than students; they should explain the answers directly	0	2,4	38,1	40,5	19
It is better when the teacher -not the students-decides what activities are to be done	9,5	19	42,9	28,6	0
I see my role: as a facilitator – as an explainer	19	35,7	19	21,4	4,8
The most important part of instruction is: to encourage "sense-making" - the content of the curriculum	26,2	47,6	7,1	19	0
It is useful for students to: to master a few complex ideas and skills well – become familiar with many different ideas and skills	14,3	21,4	31	28,6	4,8
Interest and effort are more important – motivation should not drive what students study	26,2	47,6	21,4	2,4	2,4
Do hands-on/laboratory activities	0	9,5	42,9	47,6	0

Work on projects that take a week or more	2,4	66,7	23,8	2,4	4,8
Write in a journal	0	19	42,9	23,8	14,3
Suggest or help plan classroom activities or topics	0	40,5	35,7	21,4	2,4
Work in small groups to come up with a joint solution or approach to a problem or task	0	31	45,2	19	4,8
Work on problems for which there is no obvious method of solution	7,1	45,2	23,8	14,3	7,1
Write an essay in which they are expected to explain their thinking or reasoning at some length	4,8	38,1	42,9	9,5	4,8

Table 1. Results from the survey

Results from the interviews

The first aim of the interview was to validate the results from the survey. In that respect, interviews revealed similar responses to survey results. The second aim was to compare preservice teachers' teaching beliefs to their teaching practices. To achieve this aim we adopted a new theoretical framework which is developed from Haney and McArthur (2002). Haney and McArthur (2002) categorises beliefs as behaviourist and constructivist. They categorises constructivist beliefs as core beliefs referring to the beliefs which are enacted in the practice and peripheral beliefs which are stated but not enacted in the practice due to external factors such as lack of resources in the schools. They present a further categorisation of core beliefs as constuructivist, conflict and emerging core beliefs. Constructivist core beliefs are the constructivist beliefs which are put into practice. On the other hand, conflict constructivist beliefs are those beliefs that are enacted in the practice, but are in opposition to constructivist theory. Emerging core beliefs are the ones that are both stated and put into practice but are not directly related to the constructivist practice (e.g. believing that good teachers are caring). Haney and McArthur's (2002) framework is summarised in Diagram 1 below:

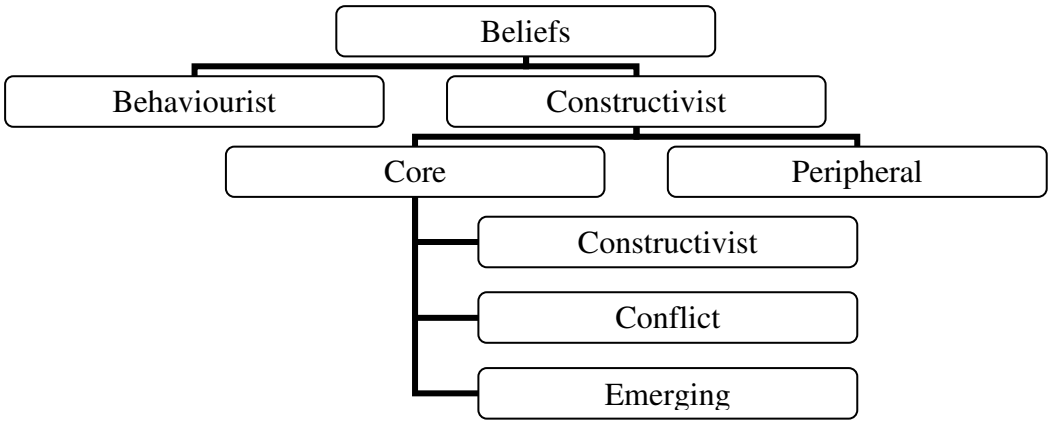

Diagram 1. Haney and McArthur's (2002) categorisation of beliefs

The analysis of interview data revealed that further categorisation is needed to explore the relationship between teaching beliefs and practices. As discussed in the first section above, teaching beliefs are categorised as traditional, transitional and constructivist. We adopted Haney and McArthur's (2002) subcategories of constructivist beliefs to these three categories. Our theoretical framework is summarised in the Diagram 2 below:

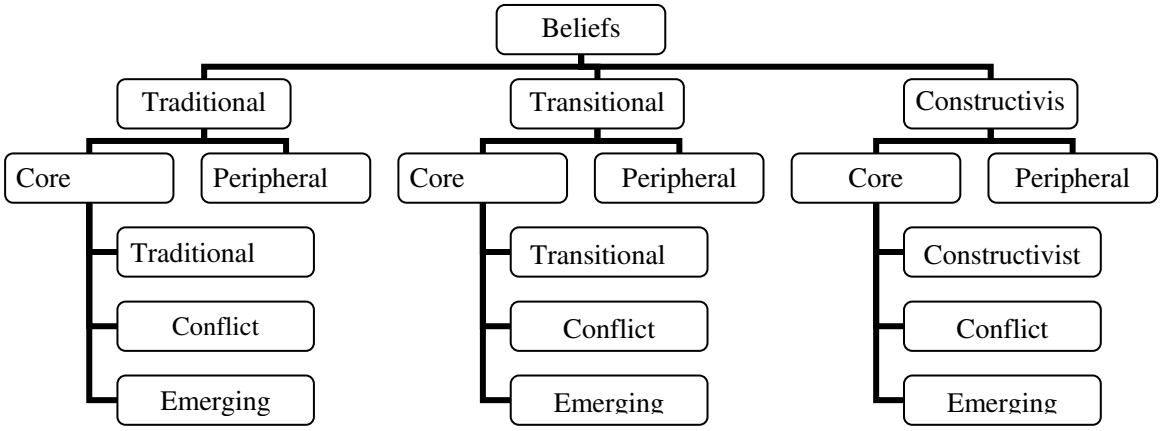

Diagram 2. The categorisation of the beliefs

Analysis of the interviews with six preservice physics teachers is presented in the table below. The table also gives preservice teachers' beliefs which were determined from the survey and information on their teaching practices in method course and school practices. Letters are used to refer to participants who were selected from each category considering the results of the survey. **A** refers to participants which held constructivist beliefs, **B** refers to transitional beliefs and **C** refers to traditional beliefs.

	Survey	**Interview**	**Method course**	**School practice**
A1	Constructivist	Constructivist	Constructivist-core belief	Constructivist peripheral belief
A2	Constructivist	Constructivist	Constructivist-core belief	Constructivist-core belief
B1	Transitional	Constructivist	Constructivist-core belief	Constructivist-peripheral belief
B2	Transitional	Transitional	Traditional-core belief	Traditional-core belief
C1	Traditional	Constructivist	Constructivist-emerging core belief	Constructivist-emerging core belief
C2	Traditional	Transitional	Transitional-core belief	Transitional-core belief

Table 2. Comparison of participants' teaching beliefs and practices

The columns named as method course and school practices are determined by compairing participants' beliefs to their practices in the method and school practice courses which were observed by the authors.

Conclusions and Implications

The results indicated that preservice physics teachers do not hold the same belief for every item in the survey. In terms of the relationship between teaching beliefs and teaching practices, it can be concluded that some of the participants' constructivist beliefs can not be put into practice, therefore, they are peripheral beliefs in the school settings, although they are constructivist core beliefs in the methods courses. These are due to the external factors (such as limitted resources, control of the teacher over preservice teachers' lesson planing, time pressure, students' attitudes) keeping those beliefs to be enacted as mentioned by the participants in the interviews.

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