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Procedia Social and Behavioral Sciences 2 (2010) 5468–5473

Procedia
Social and Behavioral Sciences

WCES 2010

Mathematics teacher educators' beliefs about teacher role

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Received November 11, 2009; revised December 1, 2009; accepted January 22, 2010

Abstract

The aim of this study is to examine the mathematics teacher educators' beliefs about teacher role in teaching mathematics. Case study is preferred as research method. An interview form devised by the researcher, composed of open-ended and scenario type questions was used as the data collecting tool. Interviews taking average 60 minutes were carried out with five academicians from Karadeniz Technical University (KTU) Fatih Faculty of Education in spring term of 2006-2007 academic year. By using Magolda's Epistemological Reflection Model, the data obtained were analyzed. It was found that the participants' beliefs about teacher role fairly comply with the philosophical notion of the new mathematics curriculum in Turkey. We believe that by conducting similar studies with larger samples, it might be possible to get additional perspectives on and contribute to teacher training researches.

Keywords: Teacher role; beliefs; teacher educators; reform effort in education; effective teaching.

1. Introduction

Lots of countries have been trying to raising educational standards, called as 'innovations', by altering instruction methods. Besides there have also been reformation attempts to increase the quality of teachers. Till now in Turkey, in teacher education programmes, teachers were prepared in ways that teachers were assumed to be the possessor of ready made mathematical knowledge to be conveyed to the student. Recently, on the other hand, the assumptions that teacher's conceptualizations can not be given directly to the learner and that mathematical knowledge must be constructed by the learner have increased (Baki, 1997). Effective teaching is defined in terms of the teacher basing instruction on students' thinking and a condition for effective teaching is defined as teachers must know and understand deeply the mathematics they are teaching and be able to draw on that knowledge with flexibility in their teaching tasks. The various statements about teaching documents clearly embrace the importance of teachers emphasizing the processes of doing mathematics and of connecting with students' understanding of mathematics (Wilson, Cooney & Stinson, 2005). So, constructivist educators have attempted to provide teachers with ways to organize learning environments, and manage instruction. But if mathematics teachers' conceptions of mathematics and its teaching formed in the traditional system are to be

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1877-0428 © 2010 Published by Elsevier Ltd.
doi:10.1016/j.sbspro.2010.03.892

changed, there needs to be a break in the cycle of 'as we were taught, so do we teach' (Baki, 1997). Parallel to recent developments in education, contemporary approaches such as constructivism and multiple intelligences become dominant in new teaching programs in Turkey (Birgin & Baki, 2007). Researchers agree that beliefs are major factors affecting teachers' way of teaching and changing their practice of teaching (Thompson, 1984). In the other words, to develop more realistic and healthy changes occur in the classroom we need to change what occurs in the teacher's mind (Baki, 1997; Selçuk, 2004). In understanding teachers' thoughts, practices and changes in practices beliefs have been major concept that researchers have focus on (Thompson, 1984). At the present day, it is accepted that researches into teachers' beliefs can inform educational practice in ways that prevailing research agendas have not and cannot. This view is based on the assumption that beliefs are the best indicators of the decisions individuals make throughout their lives, or more specifically, teachers' beliefs affect their planning, decision-making, and subsequent classroom behaviour (Irez, 2007).

Teachers' beliefs are central to what occurs in classrooms. In the other words, visible teaching practices that occur in the classroom is partly a result of invisible processes that occur in a teacher's mind (Boonyaprakob, 2002). There have been plenty of studies about the beliefs of mathematics teachers and student teachers. These studies mainly concentrate on the relations between teacher beliefs and teaching approaches (Ernest, 1989; Thompson, 1984) and classification of the beliefs and changes in these beliefs (Franke, Fennema & Carpenter, 1997; Hart, 2002; Wilson & Cooney, 2002). Still there have been few studies on classification of mathematics teacher educators' beliefs about learning and teaching or particularly about teachers' role in Turkey. Besides, that the education faculties are charged with mainstream teacher education and training escalades the importance of teacher trainer and academicians' beliefs about learning and teaching. This makes these beliefs be worth studying. On the other hand, with the framework of the rearrangements on the Turkish education system, teacher educators' present beliefs about teacher role should be examined in detail because teacher educators' ideas have not been taken seriously and not been included in the decision making although they are one of the most important keystones of the education process. One another factor hindering application of the rearrangements is that the concepts of 'learning', 'teaching' and 'teacher training' have not been fully understood by teacher trainers and teachers. In Turkey case to implement new curricula efficiently, it is essential to examine mathematics educators' present beliefs which are base for their conventional mathematics teaching approaches thoroughly. We aim to focus on and attract attention at the beliefs of mathematics teachers' educators, one of the most important groups in the mathematics educators, and to contribute to suffice the need in this field. Our major research problem is: "How can be characterized the mathematics teacher educators' beliefs about teacher role?"

2. Method

Case study method was applied in this study. Case study is particularly suitable for individually implemented studies and enables an in-depth inquiry of one aspect of the problem, and can be completed in a shorter time frame (Çepni, 2007). In qualitative and quantitative researches, there are five important question words: "Who, what, where, how and why". Among these the most suitable ones for case study are "what", "how" and "why" (Yin, 1994). Regarding the importance of these features, case study is preferred as the best research design.

2.1. Participants

The study was conducted with five academicians in spring term of 2006-2007 academic year in KTU Fatih Faculty of Education. These five were volunteer and willing to share their ideas about teachers' role. Some information regarding the participants are given in Table 1.

Table 1. Some personal information regarding the participants

Participants	Title	Gender	Professional Experience (Year)	Level of Education	Science Field
1	Res. Asst.	Male	4	Ph.D. Student	Mathematics Education
2	Res. Asst.	Male	5	Ph.D. Student	Mathematics Education
3	Res. Asst.	Male	7	Ph.D. Student	Mathematics Education

4	Res. Asst.	Male	8	Ph.D. Student	Mathematics Education
5	Res. Asst.	Male	10	Ph.D. Student	Mathematics Education

2.2. Data collection tools

An interview form devised by the researcher, composed of open-ended and scenario type questions was used as the data collecting tool. Each of the informants completed the one hour interview designed to elicit responses relating to their beliefs about teachers' role.

2.3. Data analysis

The interviews were first recorded with a digital sound recorder and then they were transcribed. By using Baxter Magolda's (1992) Epistemological Reflection Model, the data obtained were analyzed descriptively in a qualitative manner. From simple to higher levels, the perceptions in this model were ranked as; Absolute Knowing, Transitional Knowing, Independent Knowing and Contextual Knowing. The model was used as a theoretical framework to label and to present the results more clearly.

By concerning the model, participants perceiving teacher role as communicating knowledge appropriately by using interesting methods and ensuring if students acquire the knowledge or not were classified at absolute level. Participants who appreciate teacher role as: **a)** Using methods aimed at understanding versus memorization, **b)** Employing methods that help student apply knowledge, **c)** Creates rapport with student and allow student involvement and self-expression, discussion, **d)** Challenge students to think on the subject and understand it were classified at transitional level. Participants perceiving teacher role as: Promoting independent thinking (that is, allowing student to define their own learning goals, promoting exchange of or sharing of opinions, encouraging student discovery and group work under the direction of teacher) were classified at independent level. Finally, participants perceiving teacher role as: **a)** Encouraging student to produce knowledge by using his/her present information with group works or projects etc and application of the knowledge in context, **b)** Promoting evaluative discussion of perspectives and **c)** Pushing student to critique his/her peers and teachers were classified at contextual level.

3. Results

At this section, the data obtained will be presented and interpreted in the context of the research problem. 1st participant's opinions relating to the teacher role are below:

"I do not adopt a perspective with passive students and the teacher always talks. Individuals construct their own knowledge. Knowledge should be discovered with students, based upon their pre-knowledge. Association is important. Experimental activities facilitate students' constructing their own knowledge. A teacher should not be a fully confirmer or a complete error finder, which blunts students' constructing their own knowledge. Hollow formulas and rules are stereotype knowledge. Students should know how to think logically and why they are learning a certain piece of knowledge. Teachers should push students think and activities should be brain training. I do not favor a mathematics instruction all students solve problems with the same method as the teacher do. I do not favor a mathematics instruction that do not support research, examining and mathematical thinking. I am in favor of smaller classrooms and classroom setting in which students are activated with group works and classroom debates."

The participant is considered as at conceptual level in terms of teacher's role. He was observed as appreciating the significance of the individually constructed knowledge and seeing teacher as a facilitator providing learning environment that student think, discuss, discover and learn with group works, comprehend topics. The participant emphasized three fundamental perceptions of the conceptual level related to teacher's role presented above.

2nd participant's opinions relating to the teacher role are as follows:

"A teacher should associate mathematics with daily life. To make students construct their own mathematics, a teacher should urge students to think, he should keep their minds busy with problem solving continuously. He/she should prepare activities improving problem solving skills and mathematics literacy and can be applied in real life settings. He/she should arrange group activities and relaxed discussion medium. He/she should be in a continuous contact with students and pick their ideas. But never let them completely free. Otherwise students get lazy and get accustomed to easy things. He/she should challenge them, direct thinking, organize group works and facilitate them exchange knowledge. In any case the aim of group

work is: Some students are shy, they have problems about talking to teachers. They communicate better and more intimate with their friends. So they can discuss in group environment and correct their mistakes without needing to teachers. We are mediators. We are guidance teachers who contribute students learning with feedbacks. Students should construct their own knowledge. Students don't have to solve as the teacher do. If we push them to do this, we restrict their mathematical thinking skill development because students can accept their own solution as wrong, even when it is actually right. A teacher should not be an absolute authority, should be guide. But still he/she should force students."

The defined teacher profile is encouraging students to think, discuss, discover, and construct their own mathematics, comprehend topics and apply it in real life. The participant thinks group work offers students warmer and more intimate environment and provides opportunity to share, understand and discover the knowledge. These perceptions of the participant are basic perceptions belonging to contextual level. The participant assumed "guide" role for teacher as: "*To encourage students mature their own ideas and share them with others*". The participant mentioned about the conceptual level perceptions in terms of teacher role like: "*To help students apply their knowledge in a context, support them to improve their skills and encourage them to discuss ideas critically."*

3rd participant's opinions relating to the teacher role are below:

"To teach students what they want to learn is not so good thing. I mean I don't like and adopt educational perspective of those extreme constructivists. A teacher should be environment former and supervisor who give feedback to the student. I don't quite agree with the idea of, students can learn themselves. There should be a composer and supervisor leading. Students can not learn themselves. You put them into learning environment, you render them active, face them with the topic, attract their attention. Then you expect them to develop cognitive activities, to communicate with each other. They can't learn themselves. You should direct them as teacher. Think about the mouse in labyrinth. If you leave them entirely free, they may get lost. Teachers should encourage students to communicate and to share knowledge. By this way students may learn more from each other than they learn from you."

The ideas put forward by the participant shows that *he is at the transitional knowing level because* he, on one hand talked about student autonomy but he, on the other hand, emphasize on teacher's role as unique authority. In addition, by stating "*To teach students what they want to learn is not so good thing. I mean I don't like and adopt educational perspective of those extreme constructivists"* shows that participant do not accept to allow student define their own learning goals which is a perception of independent level and he also confused about the constructivism.

4th participant's opinions relating to the teacher role are as follows:

"A teacher should act as a student. A teacher writes on the board and students take them onto notebooks. In this environment there is no active participation. But a discussion environment can be set and by this way students can reach solution by discussing. Activities helping students to think should be prepared instead of ones provide literal transmission. The teacher is a guide for students-a supporter, rather than an authority. A teacher should concern about the context (pre-conditions and solution set of the problem) while solving a problem. For example," the square of a reel number can not be negative" he/she should say. If he explains in this way, students will not surprise when they see a number with negative square in complex numbers unit."

The participant is believed to be at the independent knowing level. He appreciated with teacher guidance, not as an authority, helping student to think and preparing learning environment for discovery. However, it is seen that he could not explain the teacher's role as a supporter of student autonomy in detail.

5th participant's opinions relating to the teacher role are below:

"A teacher should care about developmental level and needs of students. He/she should both exert his/her authority and sometimes leave students free. He/she should pick a discussion between students. I remember learning more by studying and discussing with my friends than I learnt from teacher. However, classical instruction also has some goods... A classroom environment mixing all approaches would be great: Cooperative learning, computer aided learning, discussing. Computers should exist: A separate technology classroom or something like a laboratory which enable student make presentations or exhibit their products. Students should learn by personally doing and experiencing in the classroom. Learning environments should be set according to the unit and the needs. For example, in a school building, there should be several computer classrooms, debate classrooms, conference rooms and lab-type classrooms. Sitting in U shape can contribute interaction."

It is observed that the participant defined a teacher profile that render students active in the classroom, encourage them to think about the topic by discussions. The ideas of the participant, who sounded as having a teacher centered view, are mostly about the perceptions of the transition level. However his mentioning about studying years and understanding better by studying with friends is a perception which belongs to independent knowing level, accepting that the teacher is not the unique knowledge source. But the participant did not mention about fundamental perceptions of the independent knowing level: *"Encouraging students to develop and share*

individual ideas" or "contributing to set their own learning goals." So the participant assumed to be at the beginning of independent knowing level for the teacher role.

4. Conclusion and Recommendation

The goal of this study is to determine the mathematics teacher educators' beliefs about teacher role in teaching mathematics. When the information collected related to teacher's role are considered, it was found that the roles as facilitator, guide, autonomy supporter, authoritarian and encourager were dominant. Similar roles were reported in the works of Birgin and Tutak (2006) and Köğce, Yıldız and Aydın (2008). Moreover, the views of the participants are in line with the qualities defined by Brooks and Brooks (1993) and Ersoy (2002) for effective teacher. All of these dominant roles except "authoritarian" may be argued to conform to constructivist approach. For this reason, it can be said that the participants' beliefs about teacher role fairly comply with the philosophical notion of the Turkish brand new mathematics curriculum. Knowing that education faculties are mainly charged with teacher training and finding participants' beliefs about teacher's role at high level (independent and contextual) is hopeful, because preparing learning-teaching environments providing student teachers with the opportunity of organizing and improving their beliefs on mathematics education is mainly under trainers' responsibility and it is anticipated that teachers having beliefs at high level (conceptual level and independent level) are competent to form such environments effectively. However, we believe that by conducting similar studies with larger samples and by using multiple intellectual development models, such as Belenky, Chincy, Goldberger and Tarule (1986) and Perry (1970) or social groups defined by Ernest (1991), in analyzing data it might be possible to get additional perspectives on and contribute to teacher training researches.

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