TEACHERS' EFFICACY BELIEFS AND PERCEPTIONS REGARDING THE IMPLEMENTATION OF NEW PRIMARY MATHEMATICS CURRICULUM

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Abstract

The purpose of this study was to investigate primary school and mathematics teachers' efficacy beliefs and perceptions in the context of the new primary mathematics curriculum in Turkey and identify differences, if any, in teachers' efficacy beliefs and perceptions based on their area of certification, gender, and experience. The sample consisted of 805 teachers, 696 of whom were primary and 105 of whom were mathematics teachers working in elementary schools located in 5 cities of Turkey. The questionnaire administered to participants was adapted by the researchers throughout the study. The results of the MANOVA analysis indicated that teachers' area of certification and experience had a significant role on the collective dependent variables, gender did not.

Keywords: Teacher Efficacy Beliefs, Teachers' Perceptions about the Curriculum, Mathematics Curriculum Implementation, Teachers' Practices, Primary and Mathematics Teachers

THEORETICAL FRAMEWORK

Mathematics curriculum change for elementary and middle grades was initiated in 2004 in Turkey. After a period of piloting, a new curriculum was started to be implemented in public and private schools throughout Turkey. Parallel with mathematics education reform movements in many countries, the new elementary and middle grades mathematics curriculum requires a significant shift in the teaching and learning of mathematics within the classroom. Compared to its precursor, the new Turkish curriculum includes a larger emphasis on learner-centered instruction, problem solving, open-ended explorations, modeling real-life situations, and the use of technology as a tool to support mathematics learning (MNE, 2005). Teachers are considered to have a critical role for the actualization of the ideas in the new curriculum. Hence, no matter what the curriculum suggests, it is the teacher who makes the ultimate decisions about what is going on in the classroom. Teachers' potential to learn and adapt to innovations can lead to students' learning and acquaintance with the innovations in classrooms. In that sense, teachers are seen as both the means and ends of curriculum reform movements (Cohen & Hill, 2001). Therefore, any curriculum change should pay attention to what teachers know and believe. The purpose of this study was to investigate teachers' efficacy beliefs about the implementation of the new national mathematics curriculum in Turkey. More

specifically, it was aimed to investigate possible differences in teachers' efficacy beliefs based on their area of certification, gender, and experience.

Teacher efficacy has emerged as an important construct in teacher education over the past 25 years. It has been defined as "teachers' beliefs in their ability to actualize the desired outcomes" (Wheatley, 2005, p. 748). Teacher efficacy has been linked to teacher effectiveness and appears to influence students in their achievement, attitude and affective growth. Researchers have shown that teacher efficacy has positive effects on teacher effort and persistence in the face of difficulties (Soodak & Podell, 1993), professional commitment (Coladarci, 1992), student motivation (Midgley, Feldlaufer & Eccles, 1989), and openness to new methods in teaching and positive teacher behavior (Ghaith &Yaghi, 1997). In addition, teachers with a high sense of efficacy are more likely to use student-centered teaching strategies, while low-efficacious teachers tend to use teacher-directed strategies, such as didactic lectures and reading from textbooks (Czerniak, 1990). Thus, the importance of teacher efficacy is well established.

Teachers' sense of efficacy and reforms in curriculum has many common points (Smith, 1996). The changes teachers apply to their practices and adaptation to innovations require that they have a high sense of efficacy. Nevertheless, while both the implementation of reform in mathematics education and teacher efficacy beliefs have been studied in depth over the years, there have been very few research studies completed on the possible connection between the two.

The current study aimed to make a contribution to teacher efficacy research in the context of a major curriculum change initiated in Turkey. Furthermore, teachers' sense of efficacy has been described as "context and situation specific" (Bandura, 1986). Thus, many scales have been developed to serve different purposes, and some of them have been extensively used in different cultures. Therefore, for the specific purpose of the study, a questionnaire was adapted and utilized throughout the study to assess teachers' efficacy beliefs and perceptions regarding the implementation of the new curriculum.

METHODOLOGY

In this study, a survey research design was employed. In the sampling method, schools rather than individuals were randomly selected. 57 schools selected for the study were public schools. The participants of this study included 696 primary teachers and 109 mathematics teachers who are teaching at upper primary level. Overall, there were 503 female and 302 male participants.

The data in this study were collected through a survey instrument, one part of which was adapted from another instrument called "Teachers Assessment Efficacy Scale (TAES)" (Wolfe, Viger, Jarvinen, & Linksman, 2007) and the other part constituted of " Teacher' Sense of Efficacy Scale (TTSES)" (Capa, Cakiroglu, & Sarikaya, 2005) which was originally developed in English by Tschannen-Moran and Hoy (2001).

INSTRUMENTATION

Within the adaptation process, the TAES was translated in respect to the Turkish school culture. A conceptual translation method was employed. This method "uses terms or phrases in the target language that capture the implied associations, or connotative meaning, of the text used in the source language instrument" (Braverman & Slater, 1996, p. 94). Moreover, there were no negatively worded items in the original scale. However, Gable and Wolf (1993) suggest that both positive and negative items should be included in an instrument in order to control the response style. Therefore, some of the items were reworded to include a negative stem by maintaining the corresponded sub-dimension of the item. In addition, the confidence items were rephrased with "can" as Bandura (2006) suggested using "can" to refer to capability while developing efficacy scales because self-efficacy is a perceived capability. After the adaptation process of the instrument, various expert opinions were obtained for the content validation.

The final draft of the instrument consisted of four parts. The first part included 11 items measuring teachers' demographic characteristics such as gender, experience, educational level and area of certification. The second part included 22 items on a 5-point Likert type agreement scale (1-strongly disagree, 3-undecided, 5-strongly agree) related to the sub-dimensions of (1) efficacy beliefs in terms of the implementation of the new curriculum (e.g. I can prepare assessment tasks in accordance with the new curriculum) (2) beliefs about the impact of the new curriculum on classroom instruction (e.g. When based on the new curriculum, mathematics classes motivate the students to learn), and (3) perceptions about the utility or practicability of the new curriculum (e.g. The new curriculum can help me to identify the knowledge a students must master). The third part included 24 items on a 5 point Likert type frequency scale (1-never, 3-sometimes, and 5-always) about teachers' perceived utilization of the new curriculum (e.g. I use the new curriculum to plan problem-solving tasks for my students). Twelve items were added to the original sub-scale in order to assess teachers' utilization of special techniques such as cooperative group work and their use of manipulatives during instruction (e.g. I organize cooperative group work activities for my students). The fourth and the last part included the short form of Turkish teachers' sense of efficacy scale (TTSES) which consisted of 12 9-point scale items (1- inadequate, 5-moderately adequate to 9-extremely adequate) (e.g. How much can you do to control disruptive behavior in the classroom?).

In this study, common factor analysis was employed in order to discriminate the unique variance of each variable from common variance (Costello & Osborne, 2005). Factor analysis was conducted in two stages: factor extraction and factor rotation. Maximum Likelihood analysis with Direct Oblimin was used for each part of the questionnaire. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) produced values higher than .9 for all parts of the questionnaire which means the sample size is appropriate for factor analysis (Field, 2005). Moreover, Bartlett's Test

of Sphericity was significant evaluating the correlation matrix is not an identity matrix (Tabachnick & Fidell, 2007).

Results of exploratory factor analysis suggested six dimensions: Utility and Impact of the Curriculum, Impact of the Curriculum regarding Efficacy Beliefs, Efficacy Beliefs regarding the New Curriculum, Utilization of Curriculum, Utilization of Special Techniques, and Teachers' Sense of Efficacy. The reliability coefficients of the sub-scales produced high levels of reliability coefficients except the Efficacy beliefs regarding the new curriculum subscale.

Reliability of the subscales were satisfactory (Field, 2005) which were given in table 1.

Table 1. Reliability Statistics of the Sub-scales

Sub-scale	**Cronbach's Alpha (α)**	**Number of Items**
Utility and Impact of the curriculum	.873	9
Impact of the curriculum regarding Efficacy beliefs	.821	8
Efficacy beliefs regarding the new curriculum	.670	5
Utilization of Curriculum	.910	11
Utilization of Special Techniques	.864	13
Teachers' Sense of Efficacy	.912	12

DATA ANALYSIS

For the inferential results, MANOVA was employed because of its advantage of controlling the risk of Type I error. Furthermore, MANOVA also provides univariate ANOVAs in the output to observe the separate effects of independent variables on each dependent variable (Field, 2005); however the significance of the follow-up tests should be evaluated by using Bonferroni method by dividing the alpha by the number of dependent variables in the analysis. In this study, three independent variables were chosen for investigations which were: teachers' area of certification, gender, and experience. Therefore, the alpha level was adjusted first dividing by three (0.05÷6) and then by the number of dependent variables (0.02÷6). The assumption the homogeneity of population covariance matrix for dependent variables of MANOVA was checked by inspecting Box's M Test of Equality of Covariance Matrices and Levene's test.

RESULTS

The results of the MANOVA indicated that teachers' area of certification and experience had a significant role on the collective dependent variables, while gender did not (Table 2).

Table 2. MANOVA Results for Area of Certification, Gender and Experience

Effect	Wilks' Lambda	*F*	Hypothesis df	Error df	*P*	Partial η^2	Observed Power
Area of certification	.976	2.800	6.000	697.000	.011	.024	.884
Gender	.966	4.124	6.000	697.000	.000	.034	.977
Experience	.929	4.124	24.000	2401.335	.001	.018	.993

Further follow up analyses revealed that primary teachers (*M* = 3.76, *SD* = .538) had significantly stronger efficacy beliefs about the new curriculum than mathematics teachers (*M* = 3.57, *SD*=.545).

Moreover, teachers with 11 to 15 years and 21 and more years of experience were significantly found to perceive a higher utilization of special techniques than teachers with 10 years or less experience. In a similar sense, teachers with 16-20 years of experience were found to have a significant higher perceived utilization of special techniques than teachers with 5 years or less experience.

Table 3. Utilization of Special Techniques according to Teaching Experience

Teaching Experience	M	SD
5 years or less	3.61[a]	.485
6-10	3.68[a]	.484
11-15	3.90[a]	.473
16-20	3.86[a]	.458
21 or more years	3.88[a]	.521

[a] The possible highest score is 5; the possible lowest score is 1.

DISCUSSIONS

Results indicated that primary teachers had significantly stronger efficacy beliefs about the new curriculum than mathematics teachers. This result is interesting in the sense that primary teachers who teach all subjects possessed higher efficacy beliefs in the implementation of the curriculum than mathematics subject-matter teachers. One of the reasons may be that primary teachers teach younger students

than mathematics teachers. For example, Ross (1994) noted that declines occur in teacher efficacy when the grade levels taught are increased. Also, Capa (2005) found that elementary school teachers were more efficacious about student engagement than secondary school teachers in their first-year of teaching. Another possible reason for the lower sense of efficacy in the mathematics teachers may be because the new mathematics curriculum has been implemented since 2005 and it was first conducted in primary grades (1-5), then in the upper primary grades (6-8). Therefore, primary school teachers have been implementing the new curriculum for a longer time than mathematics teachers; thus, primary school teachers may be more acquainted with the new curriculum. Furthermore, primary teachers may have more congruent practices with the new curriculum such as developing and using hands-on activities with their students in the primary levels. Therefore, they may have felt more efficacious than mathematics teachers in the implementation of the new curriculum. A study was conducted by Wilson and Cooney (2002) including mathematics and primary teachers. The results showed that while the mathematics teachers focused on content knowledge; elementary teachers focused on different views of instructional strategies that claimed to have more "constructivist-oriented" views (p.143). Another claim for this result may be, in the grades between 6 through 8, middle grades, there are national examinations held at the end of each year for the purpose of placement of students to high schools after the 8th grade. Therefore, mathematics teachers may focus more on the scope of these examinations during their instructions rather than the requirements of the new curriculum, so that they may feel less efficacious about the new curriculum than primary teachers.

Results indicated that teachers with 11 to 15 years and 21 and more years of experience had significantly higher perceived utilization of special techniques than teachers possessing 10 or less years of experience. Moreover, teachers with 16-20 years of experience possessed significantly higher perceived utilization of special techniques than teachers with 5 or less years of experience. The first five years of teaching profession is a period where teachers are in the beginning of experiencing the learning to teach and developing ideas about themselves as a teacher. This may be a reason of why less experienced teachers perceive themselves to utilize the specific techniques suggested in the new curriculum less frequently. Ghaith and Shaaban (1999), founding their measurement on Veenman's (1984) list of teaching problems pointed out that teachers' concerns about teaching decrease after 15 years of experience. Therefore, more experienced teachers were expected to integrate special techniques more frequently than their beginning or less experienced counterparts since they may have less concerns about other issues such as maintaining classroom management and discipline. Veenman (1984) also called the first-year experience of teachers as a "reality shock" because of the gap between the theory they learned and the practice they are engaged in.

The study also revealed that, although found to be insignificant, teachers' efficacy beliefs about the new curriculum increased when teaching experience increased (Table 4).

Table 4. Efficacy Beliefs regarding the New Curriculum according to Teaching Experience

Teaching Experience	M	SD
5 years or less	3.64[a]	.521
6-10	3.70[a]	.523
11-15	3.77[a]	.510
16-20	3.71[a]	.512
21 or more years	3.75[a]	.581

[a] The possible highest score is 5; the possible lowest score is 1.

The findings of other studies in this issue is somewhat varying. Wenner (2001), for instance, indicated in his study with pre-service and in-service teachers that experience leads to greater perceived efficacy of teachers. De Mesquita and Drake (1994), on the other hand, investigated primary school teachers' attitudes and efficacy beliefs towards a nongraded state mandated educational reform and found that teachers possessed a lower-sense of efficacy when their experience increased. However, in the current study teachers' sense of efficacy beliefs, was found to increase when teaching experience increased although this increase was not statistically significant.

Moreover, gender did not reveal a significant difference in this study. However, descriptive results revealed that the sense of efficacy beliefs of male teachers was higher than females; despite not being statistically significant. On the contrary, Evans and Tribble (1986) found that females had higher teaching efficacy than males and Cheung (2006) found that female teachers had significantly higher general efficacy beliefs than male teachers by employing TSES. However, there have been some studies which indicate no relationship between gender and teacher efficacy (Hoy & Woolfolk, 1993; Ghaith & Shaaban, 1999).

It should be noted that change is a process rather than an event. Therefore, the teachers' adaptation process should not be underestimated. In-service trainings may aim to develop new sources for teachers' efficacy beliefs compatible with the reform efforts especially for mathematics teachers. For the design of the in-service training sessions, collaboration between schools and universities may provide educational opportunity for teachers. Furthermore, the in-service training should be parallel to the approach of what is expected from teachers as conductors of the curriculum, so that the teachers may gain mastery experiences which may provide them more efficacious about the new approaches of the innovation. In order to achieve the intended changes through implementation of the new curriculum, teachers' practices and beliefs in the adaptation process should continue to be analyzed well. Moreover, qualitative studies may be conducted to support teachers' self-report measures such as classroom

observations and interviews in order to gain in-depth data about teachers' efficacy beliefs regarding the new curriculum and their adaptation processes to the new curriculum.

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