

Understanding Teachers in the Midst of Reform: Teachers' Concerns about Reformed Sixth Grade Mathematics Curriculum in Turkey

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The purpose of this study was to investigate mathematics teachers' concerns about the reformed 6th grade mathematics curriculum in Turkey and to identify the possible relations between teachers' personal characteristics and their concerns about the curriculum. 306 in-service mathematics teachers teaching in Ankara participated in the study. Teachers' concerns about reformed curriculum were identified by administration of Concerns-Based Adoption Model (CBAM). Results showed that teachers' concerns focused mainly on the personal and collaboration stages of the CBAM model. This indicates that the teachers were not resistant to the change, though they had some confusion about the curriculum; they wanted to learn from what others knew and were doing to increase their knowledge and skills about implementation of the reformed curriculum.

Keywords: CBAM, mathematics curriculum reform, teachers' concerns

INTRODUCTION

Educational reform movements around the world generally begin with changes in the curricula followed by changes in educational standards (Department for Education [DFE], 1997; Ministère de l'Éducation Nationale, 1997; National Council of Teachers of Mathematics [NCTM], 2000). It has often been pointed out that the individuals who interpret standards, make changes, and create a new atmosphere in line with the standards are teachers. Confronted with these calls for change, teachers have entered into a reform era that requires them to modify their teaching practices (NCTM, 2000). Research studies suggest that teachers' core beliefs about teaching and learning mathematics

and their concerns about the reform have a significant effect on this change and their implementation of reform curricula (Lloyd & Wilson, 1998; Senger, 1999). Teachers' thoughts and concerns about reformed curricula in many cases can prevent them from undergoing a significant change (Christou, Eliophotou-Menon, & Philippou, 2004; Manouchehri, 2000; Romberg, 1997; Van den Berg, Slegers, Geijsel, & Vandenberghe, 2000). Although it is difficult to change the teachers' core beliefs, resolving their concerns about the reform can facilitate the implementation process of reformed teaching materials (Fullan, 1999; Hord, Rutherford, Huling-Austin, & Hall, 1987).

According to Hord and others (1987), teachers' concerns about the reform indicate the types of support they need in the process of adapting to new practices. In line with these researchers, the works of Beijaard and de Vries (1997) and Chapman (2002) show that meeting the teachers' needs and expectations arising from their concerns about new practices seem to catalyze the change processes that teachers undergo. Given the

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State of the literature

- Teachers' concerns about a reformed curriculum have a significant effect on their implementation of reform curricula.
- The current literature suggests that the role of personal factors in the formation and change of concerns needs to be explored.
- The teachers can have concerns in different stages in the process of change, therefore based on these different concerns they need differentiated support, and guidance.

Contribution of this paper to the literature

- The results reveal that although the teachers are aware of the changes in the curriculum and interested in using it, they have high levels of concern in all stages.
- Teachers' high scores on collaboration and informational stages indicate that teachers want to exchange information and work in cooperation with other teachers about ways of implementation of the curriculum.
- Teachers' level of education and experience in implementing the reformed curriculum are not important factors in explaining the concerns of teachers with the new curriculum. On the other hand, teachers' concerns change across teaching experience and gender, though these differences are not significant.

significance of teachers' concerns about the innovations or reformed curriculum, it is important to understand and explore the teachers' different concerns when they go through a change process. Besides exploring teachers' concerns during the change, there is also a need to extend the research studies in this area by exploring the role of personal factors in the formation and change of concerns (Christou et al., 2004). In these respects, it is crucial to understand the nature of teachers' concerns in Turkey in the midst of curriculum reform. Therefore, the purpose of this study is twofold: The first purpose is to explore the concerns that mathematics teachers expressed about reformed mathematics curriculum in Turkey. The second purpose is to investigate the role of personal characteristics (age, gender, teaching experience, and experience in implementation) on the development of teachers' concerns about the reformed mathematics curriculum.

Assessment of Teachers' Concerns

The concept of concern in the context of teaching and teacher can be defined as teacher's feelings, thoughts and reactions to innovations (Hall & Hord,

2006). The assessment of teachers' concerns about an innovation or change is generally based on Fuller's (1969) concern theory. The fundamental premise of the theory is that concerns develop in stages by following three sequences: self-concerns, task concerns, and impact concerns. In other words, in the beginning of implementing new materials or any innovations, teachers usually have concerns related to their self, yet as the teachers advance in implementing the materials they develop tasks concerns, and at last after gaining sufficient experience in implementing innovation teachers' concerns shift to the impact stage in which they focus more on the effect of change on students (Fuller, 1969). Only after the concerns in the first stage are resolved can the concerns in the next stages become more apparent. On the other hand, if the innovation is not appropriate or if they are managed and facilitated inappropriately then the concerns in the later stages will not emerge or emerge very little (Hall & Hord, 2006).

Based on Fuller's (1969) concern theory, Hall, Wallace and Dosset (1973) developed an evidence-based conceptual framework, called the Concern Based Adoption Model (CBAM). The CBAM provides a construct that helps measure, describe and explain the change process of teachers who are adopting reformed curriculum materials or new instructional practices into their teaching (Anderson, 1997). In this model, the teachers can have concerns in different stages in the process of change, therefore based on these different concerns they need differentiated support, and guidance (Hord et al., 1987).

The CBAM is composed of three dimensions: (a) *Stages of Concerns* dimension shows teachers' perceptions and feelings about educational innovations, (b) *Levels of Use* dimension indicates how teachers implement innovations and (c) *Innovation Configurations* dimension shows the different ways an innovation is implemented. As the focus of this study is on teachers' concerns about reformed curriculum, the Stages of Concern dimension of the CBAM that includes affective aspect of change will be used in this study.

Stages of Concern (SoC)

The Stage of Concern framework includes seven different stages, though not mutually exclusive. These stages are: awareness (Stage 0), informational (Stage 1), personal (Stage 2), management (Stage 3), consequences (Stage 4), collaboration (Stage 5), refocusing (Stage 6). The first three stages of concern are related to teachers' self, the fourth stages of concerns is related to teachers' tasks of teaching, and the final three stages of concerns are associated with the impact of the innovation on students and concerns with improving the practices pertinent to the innovation. Each stage will be discussed briefly, but more detailed information about each stage

of concern can be found in the works of George, Hall, & Stiegelbauer (2006), Hall & Hord (2006), and Hord and others (1987). Teachers, at *Stage 0*, have little or no interest in the innovation (reformed curriculum) and are barely involved in the activities related to the reformed curriculum. Teachers at the *informational stage (Stage 1)* are not certain about demands of reformed curriculum and their role in implementing it. At this stage teachers are interested in learning more about the reformed curriculum, about its general characteristics and what they need to know to implement it. In the *personal stage (Stage 2)*, teachers attend more on how they will be affected by the demands of the new curriculum and their ability to implement it. At this stage, teachers worry about the impacts of new curriculum on them. Teachers' with high personal concerns can even describe the change as "nothing new but something they have always done (Hord et al., 1987). In the *management stage (Stage 3)* teachers' concerns concentrate more on processes and tasks of implementing the new curriculum. At this stage teachers express concerns about effectively managing and organizing information, and overcoming the constraints such as time limitations, lengthy curriculum, lack of resources, and other logistic restraints.

In the *consequence stage (Stage 4)*, teachers are interested more in the impacts of reformed curriculum on students learning and search for the possible ways of improving its effects. At this stage, teachers focus on the evaluation of students' in-class performances, and cognitive and affective development of students. If the teachers see that the implementation of a reformed curriculum improved the learning outcomes of students then they are likely to continue to change their teaching and continue implementing the new curriculum (Guskey, 2002). In the *collaboration stage (Stage 5)*, teachers are interested in working with others regarding use of reformed curriculum. In the final stage, *refocusing (Stage 6)*, teachers begin to evaluate the reformed curriculum, think about and propose modifications in the curriculum. At this stage teachers produce more effective alternatives to ensure that the change works better (Roach, Kratochwill, & Frank, 2009).

Under ideal conditions in which the implementation of reformed curriculum is managed effectively and teachers are guided appropriately, teachers' concerns develop from Stage 0 to Stage 6 as they progress in implementation (Hord et al., 1987). On the other hand, if the change is not managed appropriately then the concerns do not progress sequentially and in many cases stops at Stage 3. According to the CBAM, if teachers' concerns at this stage are not resolved, they revert to self-concerns (Hall & Hord, 2006). Another premise of the CBAM is that the pace of each teacher's progress in these stages is different and the intensity of concerns varies for each teacher in the process of change.

Use of the CBAM in educational innovations

Since the early 1980's, the CBAM and SoC questionnaire have been used widely as a research tool in the context of different educational innovations, such as measuring the concerns of teachers participating in a professional development program (e.g., Tunks & Weller, 2009), assessing teachers' concerns in the process of technology integration (e.g., Roach et al., 2009), and examining teachers' concerns regarding the implementation of new curriculum (e.g., Christou et al., 2004; van den Berg et al., 2000) or school-based assessment scheme (Cheung & Yip, 2004). Among these studies, the works of Christou et al. (2004), Crawford, Chamblee, & Rowlett, (1998), and Van den Berg et al. (2000) pertains directly to the focus of the current study. Using the CBAM and SoC, Christou et al. (2004) investigated 655 primary teachers' concerns about new mathematics curriculum in Cyprus and found that the teachers' concerns focused on task stage, and stages of concern changed according to the teaching experience. Christou et al.'s (2004) study showed that while novice teachers had more personal and task concerns, experienced teachers were concerned more about the impact of the reformed mathematics curriculum for students and had several new ideas to possibly implement the curriculum in a better way. Another important finding of this study was that the researchers could not find any relation between concern stages and years of implementing the new mathematics curriculum. These findings point to the importance of considering teachers' concerns about new curriculum in the process of change and differentiating the in-service training programs based on the teaching experience of teachers.

In another study, Crawford and others (1998) investigated the concerns of 376 teachers who participated in an in-service training program about a new algebra curriculum. They measured teachers' concerns at the beginning of training and a year after the implementation of new curriculum. Their results showed that while the teachers had high informational and personal concerns at the beginning of training, informational concerns lowered significantly after a year and teachers' concerns shifted to personal and management stage. In other words, although the teachers in their study were unclear about the content and structure of new algebra curriculum at the beginning, the training met these informational concerns of teachers, and at the end of training teachers had concerns about their personal adequacy to meet the demands of new curriculum and how to effectively manage implementation of it. Although these results indicated the success of the one-year project, being unable to move the teachers' concerns to consequence and collaboration stages pointed out the need for close support while teachers implement the new curriculum

(Crawford et al., 1998). In a study investigating teachers' concerns about adaptive teaching, Van den Berg et al. (2000) also found similar results with 129 primary school teachers participating in a two-year support program. Their results showed that while teachers' concerns focused on self in the beginning of implementing the adaptive teaching, their concerns shifted significantly from self to impact at the end of the program. Similar shift sequence was also evident in concerns of 4th grade teachers who participated in a professional development program offered by Tunks & Weller (2009).

The studies reviewed above suggest investigating the relation between concerns about innovation and certain personal characteristics of teachers. Only a few research studies have begun to investigate mathematics teachers' concerns about innovations in relation to their personal characteristics (Ghaith & Shaaban, 1999; McKinney, Sexton & Meyerson, 1999; Pigge & Marso, 1987). Although there is not always an agreement among the findings of studies in the literature regarding relationship between personal characteristics and concerns, findings of aforementioned studies suggested that teaching experience (Christou et al., 2004), gender (Erbas & Ulubay, 2008; Pigge & Marso, 1987), years of implementing innovations (Fuller, 1969), teaching efficacy (Ghaith & Shaaban, 1999) influence teachers' concerns about new curriculum or innovations.

Mathematics curriculum reform process and the nature of the reformed curriculum in Turkey

The Turkish Ministry of National Education (MNE) began implementing a new elementary mathematics curriculum in 2005 (MNE, 2005); although the reform process was first initiated in 2003. The implementation first started in 1st through 5th grades; then, the new curriculum for grades 6th through 8th was implemented gradually starting from 2006 (Ubuz, Erbas, Cetinkaya, & Ozgeldi, 2010). The mathematics curriculum reform was part of a larger scale curriculum reform, including elementary and high school mathematics, science, social sciences, life science and Turkish language courses. The reform of school curriculum initiated another chain of reform in teacher education curricula (Isiksal, Koc, Bulut & Atay-Turhan, 2007). The elementary school curricula reform was based on four fundamentals; social, individual, economical, and historical and cultural fundamentals (Koc, Isiksal & Bulut, 2007). This indicates that the reform targets several areas of student development which will help improve the quality of schooling (Huang, 2004). The Turkish mathematics initiative was highly influenced by the reform efforts

around the world and recent research findings and theories of mathematics learning. Overall, it was aimed to design and implement a 'revolutionary' mathematics curriculum (Bulut & Koc, 2006).

The elementary school mathematics curriculum introduces various elements that radically influence teaching and learning of mathematics in Turkish mathematics classrooms. First of all, the curriculum initiative declares that all students can learn mathematics. Additionally, learning mathematics with understanding lies at the center of the change with a focus on both conceptual and procedural knowledge. Considering mathematical understanding, the curriculum sets four main process skills that should be fostered in mathematics classrooms; problem solving, communication, reasoning and making connections. As a result of these goals, the curriculum assumes new teacher and student roles. While the teacher is acknowledged as the facilitator of student learning via designing learning environments to foster mathematical understanding, the students are envisioned in the role of active participants in their learning. It should be noted that new textbooks were written and various instructional materials were introduced to mathematics classrooms (MNE, 2005).

METHOD

Population and sample

917 mathematics teachers teaching 6th through 8th grade mathematics in 574 different public and private elementary schools in Ankara constitute the population of the study. In order to generalize the research findings, the teachers who participated in the study were selected via stratified sampling method from public and private elementary schools (Creswell, 2005). In the first stage, the city of Ankara was divided into 7 districts. In order to represent each district proportionally, one third of all mathematics teachers in each district were selected for the sample. The schools from each district were selected via simple random sampling method (Fraenkel & Wallen, 1996). After consultations with the teachers and administrators in those schools, only the teachers who have used the reformed 6th grade mathematics curriculum were selected for the study. Based on this criterion, 306 mathematics teachers from 202 elementary schools were selected as the participants. Demographics of the participants collected using a structured demographics information form summarized in Table 1.

Table 1. Demographics of the participants

	<i>f</i>	<i>%</i>		<i>f</i>	<i>%</i>
Gender			School type		
Male	118	38.6	Public	292	95.4
Female	188	61.4	Private	14	4.6
Age			Weekly teaching load (hours)		
20-29	70	22.9	0-15	14	4.5
30-39	100	32.7	16-20	73	23.9
40-49	76	24.8	21-25	161	52.6
50-59	60	19.6	26 and above	58	19
Experience in using the new mathematics curriculum (years)			Highest degree received		
One	150	49	Associate	62	20.3
Two and above	148	48.3	BS	217	70.9
Unidentified	8	2.7	MS and/or PhD	27	8.8
Department graduated			Experience in teaching (year)		
Vocational teacher training college	60	19.6	0-2	16	5.3
Mathematics education	80	26.1	3-5	37	12.1
Other teacher training departments	8	2.7	6-9	61	19.9
Mathematics	132	43.1	10-19	98	32
Other departments	5	1.6	20 and above	94	30.7
Unidentified	21	6.9			

Table 2. Sample items from the Turkish version of SOCQ and reliability estimates of each stage

Dimension	Stage	Cronbach's α	Sample Items
UNAWARE	0: Awareness	0.60	I spend little time thinking about the new mathematics curriculum
PERSONAL	1: Informational	0.75	I would like to discuss the possibility of using the new mathematics curriculum
TASK	2: Management	0.70	I am concerned about not having enough time to organize myself each day
IMPACT	3: Impact	0.68	I would like to use feedback from students to change the new mathematics curriculum
	4: Collaboration	0.78	I would like to know what other teachers are doing in implementing new mathematics curriculum

Stages of Concern Questionnaire

The teachers' concerns about the new mathematics program were measured using translated (into Turkish) and validated version of the Stages of Concern Questionnaire (SoCQ) (Hall et al., 1977). The original questionnaire contained 35 items and each item is rated on a 7-point Likert-type scale including following choices: 0 (not applicable to me), 1-2 (not correct), 3-5 (partly correct) and 6-7 (correct). In the present study, the original English version and the Turkish version of the questionnaire were checked by a bilingual individual and an experienced mathematics educator. Necessary changes were done by these two individuals. During this stage, Turkish translation of the SoCQ (Gokcek & Baki, 2007) was very useful. Then, the revised version of the questionnaire was reviewed by two mathematics educators for validity and reliability purposes. Next, the revised questionnaire was given to 30 elementary school

teachers who examined the test for the clarity of language. After these steps, the questionnaire took its final form. Psychometric properties of the Turkish adaptation of the SoCQ were explored with the participation of 1316 in-service elementary school teachers and middle school mathematics teachers. After explanatory and confirmatory factor analyses, 11 items with low item total correlations were removed from the questionnaire and the seven stages were decreased to five. So, finally the Turkish version of the questionnaire contained 24 items in 5 stages. The stages and their reliabilities, and sample items for each scale are given in Table 2. The new grouping of the items in five stages is consistent with Bailey and Palsha's (1992) 5-stage revised version of the SoCQ.

Brief descriptions of seven concern stages (awareness, informational, personal, management, consequences, collaboration, and refocusing) are given before. The interpretations of new stages in the adapted version of the SoCQ are as follows. The informational

stage in the adapted version indicates the concerns of teachers about the characteristics of the new mathematics program, requirements of its implementation and how the implementation will impact their life. The impact stage in the adapted version shows the concerns of teachers on the impacts of the new curriculum on student learning and on devising alternatives that will help implement the new curriculum and improve students' learning outcomes.

Data collection procedures

In the middle of the spring semester, 10-15 minute meetings were held with the administrators and teachers in each school participating in the study. In the meetings, the purpose of the study was explained and the data collection instrument was introduced. The meetings were effective for increasing the reliability of the data and high degree of return rate from the teachers. While some of the teachers completed the questionnaires just after the meeting, others mailed the completed forms to the researcher.

Data analysis

In order to analyze the participants' level of concern about the new mathematics program, the handbook of stages of concern developed by George et al. (2006) was used. Firstly, missing data analysis was performed. Participants' omitting items for each stage range from %3.2 to %7.3. Since the listwise deletion method would drop a considerable amount of the participants and the number of omitted items was relatively low, the omitted items were handled via the missing data analysis approach recommended by George et al. (2006). In this approach, the omitted items in each stage were replaced

by the mean scores of the stage.

One of the ways of determining the stages of concern profile is to look at each individual member's average scores at each stage (George et al., 2006). After analyzing the teachers' responses to the Turkish version of the Stages of Concern Questionnaire, each teacher's average score at each stage was computed using spreadsheet. The average score at each stage ranges between 0 and 7. By comparing a teacher's averages in each stage, it was possible to determine at which stage the teacher's concern was more dominant. Factorial Multivariate Analysis of Variance Analyses (Factorial MANOVA) was conducted to see whether the teachers' stages of concern about the 6th grade mathematics program changed according to their overall teaching experience, experience in implementing the reformed curriculum, education level and gender.

RESULTS

Level of Teachers' Concerns about 6th Grade Mathematics Curriculum

Figure 1 shows levels of concerns of all teachers participated in the study about 6th grade mathematics curriculum calculated as the mean of all points in each stage. The mean responses to each scale starting from Stage 0 to Stage 4 are 2.59, 4.90, 4.05, 4.22, and 5.51.

The results showed that teachers' level of concerns regarding the 6th grade mathematics curriculum and its implementation was high. The two most intense concern stages were the collaboration ($M = 5.51$) and informational ($M = 4.90$). The relatively higher scores on these two stages indicated that the teachers were more willing to make collaborations and work with their colleagues and other educators to exchange information

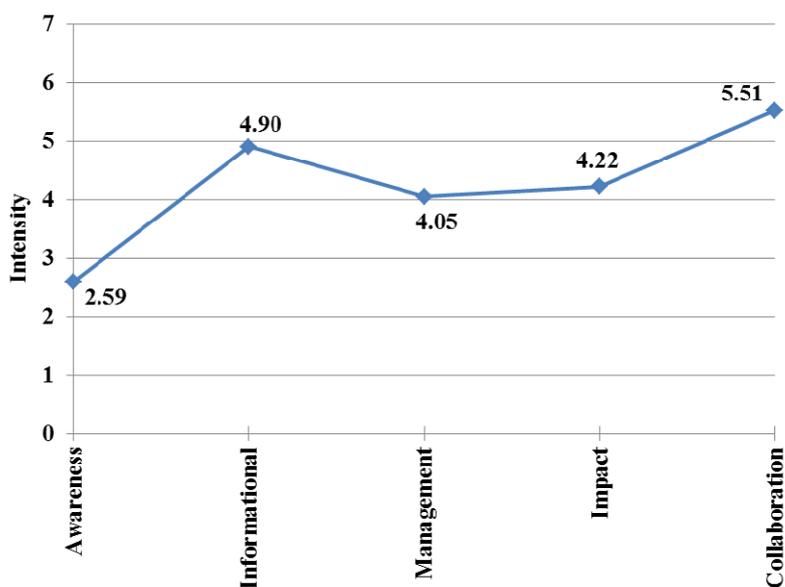


Figure 1. General concern profiles of teachers (n=306) participated in the study calculated as the mean of all points for each stage

and ideas about the implementation of the program (George et al., 2006). Furthermore, the high mean on the informational stage indicated that the teachers were aware of the reformed 6th grade mathematics curriculum; however they felt uncertainty about their roles in implementing the curriculum and needed to get more information about it. In this stage, teachers desired fundamental information (without the overwhelming details) about the structure and ways of implementing the new curriculum and possible impacts/consequences of it for their immediate spheres of influences. On the other hand, the teachers' concerns were the least in the awareness stage ($M = 2.59$). The fact that teachers' concern scores were high in informational and collaboration stages and low in awareness might be an indicator that the teachers were interested in the new curricula and open to change (George et al., 2006).

Table 3 shows the descriptive statistics regarding teachers' concerns about the reformed 6th grade mathematics curricula at awareness, informational, management, impact and collaboration stages with respect to age, gender, years of experience in teaching, experience (number of academic year) in implementing the new elementary school (6-8 grades) mathematics curricula and level of education (highest degree received). It was observed that female teachers were more focused on the informational and collaboration while the male teachers were more concerned about impact and awareness stages. It is also observed that the

older the teachers the lower was the teachers' concerns at awareness, informational and collaboration stages. Furthermore, regardless of the age, teachers' concerns were more intense at the collaboration and then the informational stages.

In terms of awareness, concerns of teachers with relatively less experience (0-5 years) were higher than those with higher experience. Moreover, at all stages except for the impact, more experienced teachers (20 or more years) expressed less concern compared to those with less experience. Furthermore, regardless of their ages, all teachers expressed almost the same level of concern regarding the impact of the reformed mathematics curriculum.

It was found that the teachers' concerns about the reformed 6th grade mathematics curriculum slightly differed depending on the experience (number of academic year) they had in implementing the reformed curriculum. The most important difference was that the teachers who had been implementing the new curriculum for only a year had more concerns at awareness stage and less concerns at informational stage than those who had been implementing it for 2 to 3 years.

On the other hand, it was observed that while the level of education increased from Associate of Arts/Science to Master of Science, teachers presented more concerns about the reformed mathematics curriculum. In other words, teachers with higher academic degrees had more concerns compared to those

Table 3. Descriptive statistics regarding stages of teachers' concerns with respect to some demographic variables

	Stages of Concerns									
	Awareness		Informational		Management		Consequence		Collaboration	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender										
Female (n = 188)	2.42	1.15	5.06	1.15	4.05	1.31	4.14	1.17	5.76	1.09
Male (n = 118)	2.86	1.31	4.65	1.34	4.03	1.28	4.34	1.13	5.11	1.33
Age										
20-29 (n = 70)	2.64	1.27	5.43	0.87	4.23	1.30	4.38	1.05	5.81	0.92
30-39 (n = 100)	2.63	1.13	4.87	1.28	3.95	1.29	4.05	1.11	5.57	1.28
40-49 (n = 76)	2.58	1.23	4.89	1.22	4.10	1.23	4.27	1.32	5.45	1.16
50-59 (n = 60)	2.49	1.36	4.35	1.34	3.93	1.39	4.26	1.12	5.12	1.44
Years of experience in teaching mathematics										
0-5 (n = 53)	2.63	1.30	5.56	0.82	4.12	1.29	4.45	1.03	5.93	0.91
6-9 (n = 61)	2.80	1.11	4.94	1.24	4.18	1.32	4.10	1.21	5.51	1.30
10-19 (n = 98)	2.56	1.18	4.90	1.20	4.06	1.31	4.14	1.10	5.57	1.09
20 and over (n = 94)	2.47	1.30	4.51	1.33	3.91	1.27	4.24	1.24	5.21	1.39
Experience in implementing the reformed mathematics curriculum*										
1 academic year (n = 153)	2.63	1.27	4.82	1.26	4.02	1.36	4.22	1.17	5.50	1.22
2 or 3 academic years (n = 150)	2.55	1.18	4.93	1.22	4.08	1.21	4.20	1.13	5.49	1.25
Level of Education										
Associate of Arts/Science (n = 62)	2.48	1.33	4.57	1.24	3.99	1.13	4.37	1.14	5.32	1.29
Bachelor of Science (n = 217)	2.57	1.18	4.95	1.21	4.05	1.33	4.16	1.13	5.55	1.21
Master of Science (n = 27)	3.03	1.33	5.30	1.36	4.13	1.38	4.35	1.35	5.61	1.25

*Data for 3 of the participants were missing.

Table 4. Summary of factorial MANOVA for teachers' level of concerns with respect to years of experience in teaching, experience in implementing the reformed elementary school (6-8 grades) mathematics curricula, level of education and gender

	Dependent Variable	Sum of Squares	df	\bar{X}^2	F	p	Partial η^2
Years of experience in teaching mathematics (A)	Awareness	7.838	3	2.613	1.837	0.141	0.020
	Informational	11.686	3	3.895	2.660	0.049	0.029
	Management	5.378	3	1.793	1.041	0.375	0.012
	Impact	0.317	3	0.106	0.081	0.970	0.001
	Collaboration	9.473	3	3.158	2.259	0.082	0.025
Experience in implementing the reformed curricula (B)	Awareness	0.722	1	0.722	0.508	0.477	0.002
	Informational	0.250	1	0.250	0.171	0.680	0.001
	Management	0.096	1	0.096	0.056	0.814	0.000
	Impact	0.049	1	0.049	0.038	0.846	0.000
	Collaboration	1.001	1	1.001	0.716	0.398	0.003
Level of Education (C)	Awareness	1.478	2	0.739	0.520	0.595	0.004
	Informational	0.983	2	0.491	0.335	0.715	0.003
	Management	0.368	2	0.184	0.107	0.899	0.001
	Impact	0.086	2	0.043	0.033	0.968	0.000
	Collaboration	0.571	2	0.286	0.204	0.815	0.002
Gender (D)	Awareness	8.179	1	8.179	5.752	0.017	0.021
	Informational	0.705	1	0.705	0.481	0.488	0.002
	Management	2.902	1	2.902	1.685	0.195	0.006
	Impact	3.681	1	3.681	2.814	0.095	0.010
	Collaboration	4.244	1	4.244	3.036	0.083	0.011

with lower academic degrees. This was true except for the impact stage at which teachers holding a bachelor's degree had less concerns than those with Associate of Arts/Science and Master of Science degrees.

The relation between the stages of teachers' concerns and personal characteristics

Before conducting a factorial MANOVA to determine whether teachers' level of concerns at awareness, informational, management, impact and collaboration stages differs with respect to some background variables (i.e., the years of experience in teaching, experience in implementing the reformed elementary school mathematics curricula, level of education and gender), the data were checked against the assumptions of MANOVA. Bartlett's test of sphericity ($\chi^2 = 245.96$, $df = 14$, $p < .001$) indicated that MANOVA was warranted. Also, the Levene's test suggested heterogeneity of variances for each of the concern levels ($F(31) = 0.91$, $p = 0.608$; $F(31) = 1.514$, $p = 0.045$; $F(31) = 1.232$, $p = 0.192$; $F(31) = 1.156$, $p = 0.268$; $F(31) = 1.313$, $p = 0.131$ for awareness, informational, management, impact and collaboration respectively). Thus, a one-way between-subject multivariate analysis of variance (MANOVA) was conducted on five dependent variables: awareness, informational, management, impact and collaboration. The independent variables were the gender, years of experience in teaching mathematics (0-5, 6-9, 10-19 and

20 and above years), highest degree obtained (i.e., Associate of Art/Science, Bachelor of Science, Master of Science), years of experience in teaching the new curriculum (i.e., one academic year, two-to-three academic years). A statistically non-significant Box's M test (Box's M = 360.59, $p = 0.312$) suggested equal variance-covariance matrices of the dependent variables across levels of experience in the dependent variables.

The results of the MANOVA (see Table 4) suggested that the combined DVs were significantly affected only by teacher's gender; Pillai's trace = .05, $F(5, 262) = 2.769$, $p = 0.019$. Years of experience in teaching mathematics (Pillai's trace = .073, $F(15, 792) = 1.309$, $p = 0.19$), highest degree obtained (Pillai's trace = 0.009, $F(10, 526) = 0.234$, $p = 0.993$), years of experience in teaching the new curriculum (Pillai's trace = 0.005, $F(5, 262) = 0.29$, $p = 0.918$) were not significant. Furthermore, no interaction between the independent variables was statistically significant. When the results for the dependent variables were considered separately, the only difference to reach statistical significance, using a Bonferroni adjusted alpha level of 0.0125, was the awareness stage: $F(1, 266) = 9.113$, $p = 0.003$. An inspection of mean scores suggested that male teachers reported higher levels of awareness ($M = 2.42$, $SD = 1.15$) than females ($M = 2.86$, $SD = 1.31$).

DISCUSSION and CONCLUSION

The reformed mathematics curriculum and the concerns of teachers

In this study, Concern-Based Adoption Model and Stages of Concern Questionnaire (Hord et al, 1987) were used to explain teachers' concerns about the reformed 6th grade mathematics curriculum and its implementation. Findings of this study showed that teachers were aware of the changes in the curriculum and interested in using it. However, except the first stage, teachers seemed to have high levels of concern in all stages and their concerns reach highest level at informational stage. These findings indicated that teachers were generally confused about the reformed curriculum, and seem to not understand the philosophy, contents, and ways of implementation, and changes that came with the new curriculum (Baki & Gokcek, 2007; Erbas & Ulubay, 2008). Even though the reformed curriculum was in effect for some time, the teachers did not seem to have opportunities or resources to get comprehensive information about the content and application of the reformed curriculum.

Further, analysis of the data showed that concerns of teachers mostly concentrated on collaboration and informational stages. The high score in informational concern stage showed that the teachers needed more information about the mathematics curriculum. In this stage, the teachers wanted more information about the structure and implementation of the reformed curriculum without being drowned in details and they wanted to know how the curriculum would affect them as well. High scores in collaboration and informational stages also indicated that teachers wanted to exchange information and work in cooperation with other teachers about ways of implementation of the curriculum (George et al., 2006). The fact that teachers wanted to work in cooperation with others showed a desire to reduce the concerns in other stages and the lack of a resistance toward implementation of the reformed program.

On the other hand, according to the developmental structure of the CBAM, collaboration concerns should not be higher than management and impact concerns. The relatively high concern at the collaboration stage in this study can be explained by teachers' perceived needs for cooperation in order to learn about the reformed curriculum. This was true even when they had concerns about personal issues of implementation. For example, when teachers had doubts about their self-confidence to implement the reformed curriculum, or when they lacked understanding of their own role, or the time issue or the use of textbooks, it is understandable that they still wanted to consult with their colleagues and share their experience with the curriculum and see how other

teachers think to improve the effects of the curriculum on students. This finding shows that the sequence of concerns may be less universal than claimed in the CBAM framework (Andersen, 1997; Ghaith & Shaaban, 1999), and the sequential structure of the model should be assessed in different cultures and contexts.

The fact that scores in informational and collaboration stages were high, and awareness stage was low showed that teachers indeed cared about the curriculum, and they were open to new ideas (George et al., 2006; Hall & Hord, 2006). In addition to this, high score in informational stage was expected because the program was recently implemented at national scale at the time. According to Van den Berg and Ros (1999), it might take from 3 to 5 years for teachers to move from self-concerns to higher stages of concern. However, it is still quite alarming that teachers have lack of knowledge about the fundamental components of the curriculum such as leading student-centered classroom activities, and about the roles of teachers and students in teaching and learning.

Teachers had relatively lower levels of concern in the management stage and higher concern in informational stage. This showed that teachers tried to implement the new program, but their success was uneven. Because the CBAM foresees a developmental adoption process (Hall & Hord, 2006), we can predict that teachers' concern about management and implementation of the new program will increase only after they reduce their self-concerns and have a chance to implement the program at some level. At the same time, according to CBAM, it is only possible to bring innovations into life and implement them at some sustained level when most of the teachers resolve their concerns at initial stages (self and task concerns) (Hall & Hord, 2006). With this in mind, the findings of this study showed that the implementation of the new mathematics program was not settled in schools yet, and to move teachers' to tasks and impact concerns they need a well-planned, on-going and close support (Erbas & Ulubay, 2008; Fullan, 1999; Guskey, 2002; Tunks & Weller, 2009). Roach and others (2009) also suggest "teacher support groups" for teachers having high concerns at informational and personal stages.

The role of personal characteristics in teachers' concerns

The second purpose of this study was to look into whether success of the use of the reformed program differed based on the personal characteristics of teachers (gender, teaching experience, experience in implementing the reformed curriculum, and level of education). The findings showed that teachers' level of education and experience in implementing the reformed curriculum did not make a difference in explaining the

concerns of teachers with the new curriculum. These results support those found by Christou et al. (2004) that experience with the new program (with teachers from one to six years of experience) was not related with their level of concern with the new program.

Furthermore, even though experienced teachers' level of concern is lower than the concern levels of less experienced teachers in general, the difference was not significant. This is not in line with Christou et al.'s (2004) findings. Christou et al. (2004) found in their study that as teachers' level of experience increased, their level of concern moved from informational stage to consequence stage. In fact, research on the relationship between teachers' experience and the level of concern does not paint a clear picture. For example, even though Ghaith and Shaaban's (1999) study showed a decrease of concern by the level of teachers' experience at some intervals, they found that teachers over 15 years of experience had lower levels of concern at all stages. Similarly, Pigge and Marso (1987) and Reeves and Kazelskis (1985) did not find a developmental pattern in teachers' concerns in their studies. This can be explained in two ways. First, teachers with less experience were more likely to have received a training based on the new vision of the program in their pre-service education. Consequently, they would have gathered less concern in especially the implementation stage. Another explanation could be that teachers' concern might be context specific and vary according to specific situations as Ghaith and Shaaban (1999) and Guillaume and Rudney (1993) hinted.

Studies addressing the relationship between gender and stages of concern yielded varying results. For example, Ghaith and Shaaban (1999) found no relationship between gender and teacher concern, on the other hand, Pigge and Marso (1987) reported a higher level of impact concerns among female teachers. In this study, we found an interesting pattern of relationship between gender and stages of concern. Female teachers reported a higher level of concern in collaboration stage about the reformed curriculum; conversely, male teachers reported a higher level of concern in awareness stage compared to female teachers. This could be interpreted that female teachers were more willing to cooperate and share their experiences with others for the implementation of the reformed curriculum whereas male teachers had a different set of interests and concerns about teaching and learning that are more primary than the mere implementation of the curriculum compared to female teachers.

To sum up, the findings of this study draw attention to teachers' concerns about the reformed curriculum in the process of change and to the relations between some personal characteristics and these concerns.

Meeting the concerns of teachers, especially the informational and collaboration stages, documented in this study is crucial for an effective implementation of the curriculum in Turkey.

Although the present study makes a solid contribution to the theory and practice; it still has a few limitations that should be considered when interpreting the findings. First, the Stages of Concern Questionnaire measured the participants' level of concern; so, the findings are limited to this particular questionnaire. If a different questionnaire was used, the findings could be at least slightly different. Second, the data was collected in Ankara, a large metropolitan area with so many opportunities and resources. Teachers teaching in rural or less urbanized regions could have some different concerns regarding the new curriculum as their needs would be different. Last, the data was collected in the third year of curriculum implementation process; collecting data after the teachers acquired at least five years of implementation experience, concerns levels would have been different due to the time factor; so, the reader should be cautious about this limitation.

Future studies can use the findings of this study as a baseline to examine the current state of teachers' concerns about the reformed curriculum. Thus, the new studies can portray how the concerns of teachers have changed and if the teachers have received necessary support to move to the higher stages of concerns. Future studies could also explore the relationships among teachers' concerns and personal, cultural and contextual factors such as, gender differences, mathematics teaching efficacy, existence of established support systems for teachers, and curriculum change history of the country. Finally, it is recommended that sources of teachers' concerns about the curriculum reform could be investigated via some qualitative approaches to understand how deep the teachers' concerns and how teachers deal with the stress and expectations coming with the introduction of the new curriculum.

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