Journal of the Korean Society of Mathematical Education Series D:
Research in Mathematical Education
Vol. 15, No. 3, September 2011, 295–310

A Comparative Study of South Korea and Turkey: Attitudes, Beliefs, and Creative Student Oriented Teaching Practices of Middle School Mathematics Teachers[1]

CORLU, M. Sencer*
TLAC - Texas A&M University, College Station, Texas 77843, USA
Email: sencer@neo.tamu.edu

ERDOGAN, Niyazi
TLAC - Texas A&M University, College Station, Texas 77843, USA
Email: niyazierdogan@neo.tamu.edu

SAHIN, Alpaslan
TLAC - Texas A&M University, College Station, Texas 77843, USA
Email: sahin_alpaslan@yahoo.com

(Received April 30, 2011; Revised May 16, 2011; Accepted September 26, 2011)

Teachers' attitudes and beliefs are related to teaching practices and are dependent upon their teaching domain. The present study compares conceptual models of creative student oriented teaching practices of mathematics teachers in two OECD countries, South Korea and Turkey to provide an insight for teacher educators and policy makers. Teaching and Learning International Survey 2008 (TALIS 2008) data are used to test the fit of a path analysis model with a subsample of 1337 middle school mathematics teachers ($N_{Korea} = 562$ vs. $N_{Turkey} = 775$). The study showed that Turkish teachers were younger and less experienced, whereas Korean teachers were better educated. Despite the statistical differences in attitudes, beliefs and practices between countries, it was found that the teaching practices of mathematics teachers in both countries were more complex than to be explained only through attitudes and beliefs.

Keywords: Mathematics teacher education
MESC Classification: B59, R39
MSC2010 Classification: 97B06

[1] A draft version of the article was presented at the 16th Korean International Seminar of Mathematics Education on Creativity Development and Gifted Students at Chungnam Nat'l Univ., Yuseong-gu, Daejeon 305-764, Korea; August 11–13, 2011 (*cf.* Corlu, Erdogan & Sahin, 2011).

* Corresponding author

1. INTRODUCTION

The creation of a knowledge-rich educational system depends heavily on the success of the educational community to adapt itself to the changing conditions of the modern society. One-size-fits-all type of teaching is no longer satisfying the curiosity of the new generations nor making them happy. Students need to be exposed to effective and challenging instruction that they can relate to their lives and culture.

Teachers are one of the most important members of educational community in transforming the traditional models of schooling into constructivist and customized learning systems that are empowered by effective instructional practices (Wang, 2004). Teachers' affective characteristics are indicators of what they think of their subject but also how they teach (Dogan, 2001). A strong content knowledge and a sound pedagogical content knowledge supported by positive affective teacher characteristics, such as attitudes and beliefs, form the three main dimensions of effective teaching. However, the existing body of research on teachers' attitudes and beliefs towards teaching in the general sense doesn't necessarily mean that conclusions automatically apply to the notion of attitudes and beliefs towards teaching mathematics (Bandura, 1997; Esterly, 2003; Tschannen-Moran & McMaster, 2009). Thus, investigating attitudes and beliefs towards mathematics teaching domain is called for, particularly to establish models that would explain how these construct affect teacher's practices in the mathematics classroom.

Today, many countries around the world, including South Korea and Turkey are transforming their educational systems (Li & Yu, 2005; van der Sandt, 2007). Policy makers in both Organisation for Economic Cooperation and Development (OECD) countries in particular, experience similar challenges during their efforts to reform their countries' traditional educational systems which are directed by centralized university admittance examinations (Tansel & Bircan, 2004) and very much perceived in both countries as entrance examination hell or incubus (입시 지옥 – *ipsi jiok* in Korean; *sınav kabusu* in Turkish). Mathematics is traditionally at the core of the curricula, and it is worth investigating if there are similarities or differences between South Korean and Turkish mathematics teachers' attitudes and beliefs towards teaching mathematics.

In terms of student achievement in mathematics, Korean students have consistently outperformed Turkish students at the international level. South Korean students in grade eight were ranked the second among the 48 countries that participated in Trends in International Mathematics and Science Study (TIMSS) in 2007, and fourth among the 65 countries that participated in OECD's Programme for International Student Assessment (PISA). Turkey's rankings were respectively, 30th and 43rd. South Korean high school students also consistently outperformed Turkish high school students in International

Mathematical Olympiads when results of the last 10 years are examined (*i.e.*, South Korean ranking in 2010 was the fourth while Turkish country rank was the eight among 97 participating countries). The comparison of the teacher practices, attitudes and beliefs in two countries is thus, relevant to explain the vast difference between student achievements in international comparison studies.

The main research principle guiding this study is to analyze and compare middle school mathematics teachers' attitudes and beliefs in South Korea and Turkey by using teacher-level data obtained from OECD's *Teaching and Learning International Survey* 2008 (TALIS 2008) and develop models that would help educators decide the factors affecting student oriented teacher practices.

2. THEORETICAL FRAMEWORK

Attitudes and Beliefs

Teachers' attitudes and beliefs as a factor in teaching and learning were widely investigated in the literature (Aiken, 1970; Aiken, 1976; Hart, 2002; Lester, Garafalo & Kroll, 1989; Pajares, 1992; Thompson, 1992). Operationally, beliefs were defined as "tacit, often unconsciously held assumptions about students, classrooms, and the academic material to be taught" (Kagan, 1992, p. 65), whereas attitude was perceived by researchers as a derivative of beliefs that "represents a person's general feeling of favorableness or unfavorableness toward some stimulus object" (Fishbein & Ajzen, 1975, p. 216). The attitude and beliefs of mathematics teachers also have been specifically investigated in the literature where many researchers focused on the relationship between the cognitive (*i.e.*, knowledge and thinking) and affective (*i.e.*, attitudes, beliefs and emotions) domains by studying the affect of attitude on mathematics achievement (Ma & Kishor, 1997). It was clear in the literature that teachers' positive attitudes transfer into positive attitude of students (Aiken Jr, 1976; Brown & Baird, 1993). There was also a difference between prospective and in-service teachers in terms of their attitudes. For instance, researchers explained the low attitudes of in-service teachers by their subject-oriented teacher education (Pang & Good, 2000). So it is important to see how in-service teachers' attitudes and beliefs are regarded to their teaching practices.

Teachers in Korea

The Western perception of teaching in Asian countries (*e.g.*, Confucian-heritage country South Korea & Eurasian Turkey) was shaped by the assumption that students' respect and deference levels towards their teachers were high and teachers had higher level of

efficacy than their counterparts in Western countries (Gorrell & Hwang, 1995). This assumption may not be wrong given the research finding that a typical Korean school student would struggle for excellence in order to please their teachers (Kim & Park, 2006). Korean teachers used this tradition-inspired respect to their advantage and did not defer from traditional teacher centered instructional methods for a long time. Research described a typical Korean mathematics classroom as teacher-directed but opens to exploration (Park & Leung, 2006). However, a recent study revealed that the tradition-inspired respect was no longer granted in today's classrooms in Korea and classroom discipline has become one of the concerns of Korean educators (Brown, 2009). Whether teachers were prepared to challenge the changing classroom climate is a question that needs to be answered.

In South Korea, graduate school of education or re-training centers in each province offer professional development series for teachers. However, these programs are not much effective; therefore, small study groups including peer in-service teachers for professional development of teachers were firmly suggested. As an instance, the Korean Society of Mathematical Education offered opportunities for teachers to share their ideas and experiences in small study groups (Park & Shin, 2004).

Teachers in Turkey

Turkish teachers' personal beliefs, attitudes, and knowledge had a profound effect in how teachers perceived teaching and students' learning (Wagner, Lee & Ozgun-Koca, 1999) which were described as being under the influence of absolutism (Baki, 2008). Researchers believed that the central examination system in Turkey was behind this absolutism philosophy (Aksu, Demir & Sümer, 2002).

Absolutism led to the interpretation among Turkish teachers that mathematics was a set of rules to memorize and repetitive practice and drills should have been central to any effective mathematics teaching (Boz, 2008). Researcher claimed that such interpretation of mathematics as a set of rules caused a high level of anxiety towards teaching mathematics among Turkish teachers. However, Turkish teachers who were educated with teaching methods based on problem solving in field teaching classes have overcome anxiety (Ertekin, 2010). In another recent study, it was found that the majority of teacher education curricula used in Turkey were still highly content knowledge focusing (Corlu, Capraro & Capraro, 2011) despite the reform efforts that commenced in late 1990s (Boz; Simsek &Yildirim 2001). The teachers educated in the pedagogical content and integration focusing university curricula had statistically and practically significantly ($p < 0.05$; Cohen's $d = 0.64$) higher attitudes towards mathematics and science integration (Corlu, Capraro & Capraro, 2011).

Previous Comparison Studies

In one of the earlier comparative studies, in which South Korea, Turkey and United States were compared, it was shown that Turkish and Korean pre-service teachers had less self-confidence in teaching mathematics than U.S. pre-service mathematics teachers. Research suggested that the Confucian tradition in South Korea stressing the virtue of humility might have been the reason behind under-estimating their ability (Park, 2004). Among the three, only Turkish teachers described repetitive drills and lecture as highly effective teaching methods in mathematics classrooms due to the large classroom sizes. Both Turkish and Korean teachers believed in neither the educational role of hands-on teaching in mathematics nor the usage of computers and calculators (Wagner, Lee & Ozgun-Koca, 1999).

Teacher education curricula in both countries were found to be similar for primary teacher education. Seoul National University's content-focusing teacher education model in secondary mathematics teaching program was similar to the standard teacher education curricula in Turkey. Ewha Womens University's pedagogical content focusing model, however was similar to the secondary teacher education program at Istanbul Bogazici University (Corlu, Capraro & Capraro, 2011; Kwon, 2004).

The desirability of teaching, particularly mathematics teaching was also very high in both countries. Job security and pension schemes seemed to be the major reason behind high popularity of teaching in both South Korea and Turkey. South Korean teachers' income were at the top of the list whereas Turkish teachers' income level was at the OECD average when their salaries were divided by GDP per capita, respectively (OECD, 2009a).

3. METHODS

Instrument & Participants

TALIS 2008 is the first international survey with a focus of providing data and analyses on the conditions for effective teaching and learning in schools. TALIS studied more than 4,000 middle schools (lower secondary education) in both the public and private sectors and examined more than 70,000 teachers' professional development, teacher beliefs, attitudes, and practices in 24 countries. The overall weighted response rates for Korea and Turkey were 79% and 87%, respectively (OECD, 2010a).

The present study employed teachers only from Korea ($N_{Korea} = 562$) and ($N_{Turkey} = 775$) who indicated mathematics as the main subject they teach at their current school ($N_{Total} = 13{,}687$). Teacher attitudes, beliefs and practices in TALIS were

measured by a number of different items and are treated as latent variables. "Because these variables are latent, their metrics (units of measurement) are not determined" (OECD, 2010a, p. 139). They represent factor scores of the combination of these variables with an international mean of zero and standard deviation of one.

As the main data analyzing tool, IEA Data Analyzer software and SPSS 16 with final teacher sampling weights are used in order to have an accurate analysis of the variables by computing population estimates and design based standard errors without failing to address that TALIS is not a single-level data (teachers are indeed nested in schools) and sampling method is beyond simple random design (OCED, 2010b). In the present study, IEA Data merger module is used to merge school and teacher data, and appropriate weight is applied in SPSS. In conclusion, to make correct inferences, researchers should take into account the complex structure of the sampling design in large-scale studies, such as TIMSS or TALIS (Lohr, 1999). Using latent variables with structural equation models without the necessary sample weight adjustment may result in questionable results (see Cho, 2003).

The items used in defining the indices of several teacher related variables are available to interested researchers in TALIS technical report published by OECD (2010). The conceptual model used in this paper is given in Figure 1, where beliefs is measured through self-efficacy beliefs of the teachers, attitude indicate their attitudes towards direct or constructivist type of teaching, and practice specify teachers' structure or student-oriented practices.

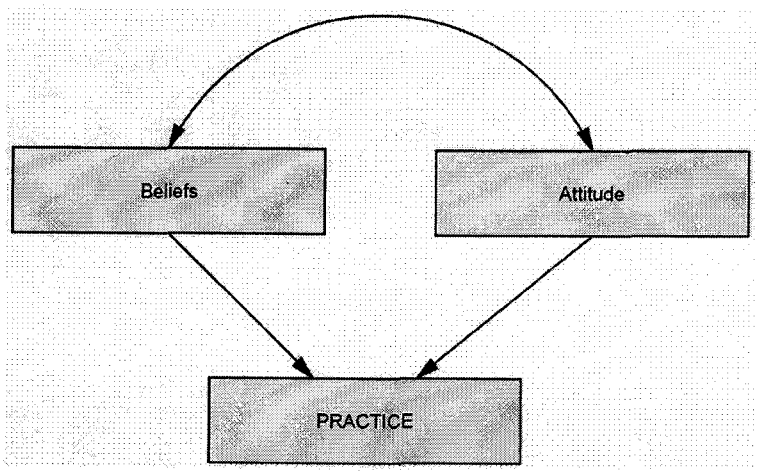

Figure 1. Conceptual model to explain the practices of mathematics teachers in Korea and Turkey

Positive classroom climate, professional development opportunities available to teachers, and several other environment variables are not considered as part of the initial model, however descriptive statistics for the mean of the teachers' responses are presented.

Variables

Three constructs (beliefs, attitudes, and practices) in the conceptual model were m easured through five latent variables, which are further measured through several ite ms. Response categories for belief (*self efficacy*) and attitude (direct teaching and con structivist teaching) constructs were "strongly agree", "agree", "disagree" and "strongl y disagree". Only few teachers used the response category "strongly disagree" , there fore the response categories "disagree" and "strongly disagree" were collapsed. Respo nse categories for practice construct (structure oriented and student oriented) were de signed on a six point ordinal scales which were "never or hardly ever", "in about on e-quarter of lessons", "in about one-half of lessons", "in about three-quarters of lesso ns" and "in almost every lesson".

4. RESULTS

Environmental variables, collected from Korean, Turkish, and other participating countries' mathematics teachers, are compared to international averages in TALIS. See Table 1.

Clearly, there are some profile-wise and logistical differences between the mathematics teachers in Korea and Turkey. Turkish teachers are young early-career professionals, and have comparably less experience compared to Korean and international averages of the mathematics teachers in OECD countries. On the other hand, Korean mathematics teachers, like their colleagues in many other OECD countries are mostly female. It is also apparent that mathematics teachers in Korea are older than the average and have more advanced degrees than both the teachers in Turkey and other OECD countries. Korean mathematicians also have the most extensive professional development opportunities. Moreover, Korean middle school mathematics teachers do not look happy about the discipline-wise climate of their classrooms because they indicated that they spent 15% of their classroom time on maintaining order, which is twice as much as the OECD average.

Table 1. Descriptive statistics for the environmental variables

Description / Reported values by teachers	Korea	Turkey	OECD Average*
Percentage of female mathematics teachers	63%	45%	63%
Percentage of mathematics teachers younger than 40	40%	75%	41%
Percentage of mathematics teachers with advanced degrees (M.S./Ph.D)	38%	6%	28%
Percentage of mathematics teachers with 15 or more years of experience	56%	22%	48%
Hours per week on teaching	19 hrs (5)	21 hrs (9)	19 hrs (6)
Hours per week on planning	9 hrs (5)	10 hrs (11)	11 hrs (6)
Hours per week on administrative work	9 hrs (6)	2 hrs (4)	5 hrs (5)
Percentage of class time spent on teaching mathematics	76% (12)	80% (12)	79% (14)
Percentage of class time spent on administrative work	9% (12)	7% (5)	12% (11)
Percentage of class time spent on maintaining discipline in mathematics classroom	15% (11)	12% (10)	8% (7)
Number of professional days in 18 months	29 days (27)	11 days (15)	15 days (21)
Number of students in the mathematics class	34 (8)	31 (12)	24 (8)
*Mathematics classroom disciplinary clima te	-0.20(.84)	0.05 (.98)	0.04 (0.98)

Notes: All values are rounded to the nearest whole, except in index variables indicated with *.
Values in parenthesis indicate the standard deviation.
OECD average doesn't include Iceland (OECD, 2010b, p.72)

Several other indices are created by TALIS, including mathematics attitudes towards constructivist teaching, mathematics classroom disciplinary climate, self efficacy beliefs for teaching mathematics, and student oriented practices in mathematics. The items used in creating these indices are available in TALIS technical report. The comparison of Korean and Turkish teachers' statistics are given in *Table 2*, which also contains the effect sizes as the practical significance between countries, and reliability estimates in overall data.

Attitudes and self-efficacy beliefs are conceptually set to be predictors of the type of teaching practices that mathematics teachers follow in their classrooms in Korea and Turkey. Turkish teachers evaluated their attitudes, beliefs, and practices to be all above the OECD averages, except in their self efficacy beliefs. Interestingly, Korean teachers' self-evaluation of their attitudes, beliefs and teaching practices are below the OECD average in all constructs due to negative values of the mean factor loadings. Still, both Korean and Turkish teachers value constructivist and student-oriented teaching over to direct and structural-oriented teaching practices.

Table 2. Descriptive and inferential statistics for the factor loadings on the latent variables and corresponding effect size estimates between Korea and Turkey

Category	Description / Reported values by teachers	Mean Korea	Mean Turkey	Cohen's d effect size	Average Cronbach's alpha
Attitudes	Attitude towards constructivist teaching	-0.37 (.94)	0.89 (1.24)	0.26	0.61
	Attitude towards direct instruction	-0.77 (0.52)	0.55 (0.91)	1.78	0.47
Beliefs	Self efficacy beliefs for teaching mathematics	-0.82 (.87)	-0.05 (1.10)	0.45	0.76
Practices	Structure oriented practices in mathematics	-0.77 (1.08)	0.23 (1.07)	0.93	0.73
	Student oriented practices in mathematics	-0.12 (1.05)	0.39 (1.18)	1.15	0.70

Notes: $p < 0.01$. The mean factor loadings are estimated according to the international average = 0 and standard deviation =1.
All values are rounded to the nearest hundredths and values in parenthesis indicate the standard deviation.
Reliability is estimated from scores of all participants in TALIS, except Netherlands.

Correlation matrices for all five variables in Korean and Turkish mathematics teacher samples are presented in Table 3 and Table 4.

Table 3. Correlation matrix for Korean mathematics teachers

	Attitude towards constructivist teaching	Attitude towards direct instruction	Self efficacy beliefs for teaching mathematics	Structure oriented practices in mathematics	Student oriented practices in mathematics
Attitude towards constructivist teaching	1	0.688**	0.116**	0.052**	-0.077**
Attitude towards direct instruction		1	0.153**	0.024**	0.002
Self efficacy beliefs for teaching mathematics			1	0.223**	0.234**
Structure oriented practices in mathematics				1	0.611**
Student oriented practices in mathematics					1

Note: Statistically significant two-tailed Pearson correlation coefficients are denoted by $**p < 0.01$.

Table 4. Correlation matrix for Turkish mathematics teachers

	Attitude towards constructiv-ist teaching	Attitude towards direct instruction	Self efficacy beliefs for teaching mathematics	Structure oriented practices in mathematics	Student oriented practices in mathematics
Attitude towards constructivist teaching	1	0.863**	0.226**	0.085**	0.031**
Attitude towards direct instruction		1	0.253**	0.081**	0.056**
Self efficacy beliefs for teaching mathematics			1	0.166**	0.253**
Structure oriented practices in mathematics				1	0.746**
Student oriented practices in mathematics					1

Note: Statistically significant two-tailed Pearson correlation coefficients are denoted by ** $p < 0.01$.

The high correlation values in both Korean and Turkish mathematics teacher samples between attitudes towards constructivist and direct teaching ($r_{Korea} = 0.688$ vs. $r_{Turkey} = 0.863$) clearly show that mathematics teachers in both countries do not sympathize one-type of teaching and believe in the usefulness of both approaches. Their attitudes reflect well on their practices, indeed there is also a high correlation between student and structure oriented practices ($r_{Korea} = 0.611$ vs. $r_{Turkey} = 0.746$) in both countries. Self efficacy alone is also correlated with both practices and attitudes of Korean and Turkish teachers.

The models constructed to explain each type of mathematics teacher practices, either structure oriented or student oriented, explained less than 7% of the variance accounted for Korea and Turkey, despite a better model fit for Korean mathematics teachers than their Turkish counterparts. The corresponding standardized weights for each model and adjusted R^2 values are indicated in Figure 2 and Figure 3, which are all statistically significant for $p < 0.01$.

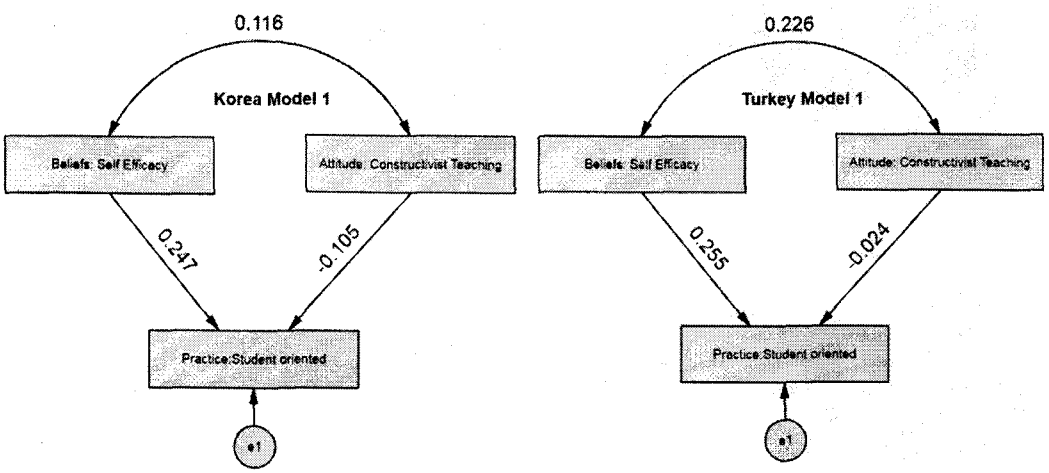

Figure 2. Path models to predict student oriented practice.
$p < 0.01$, $adjR^2_{Korea} = 0.066$, $adjR^2_{Turkey} = 0.063$.

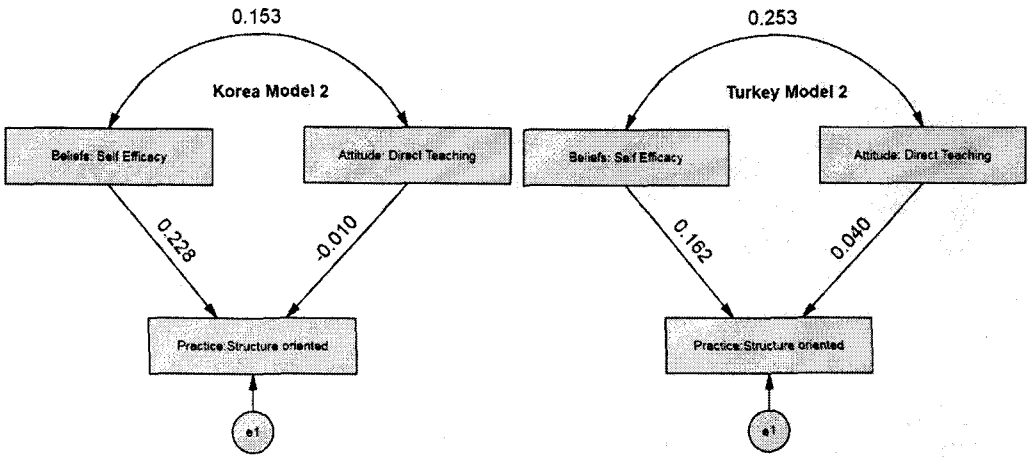

Figure 3. Path models to predict structure oriented practices.
$p < 0.001$, $adjR^2_{Korea} = 0.051$, $adjR^2_{Turkey} = 0.031$

The models indicate self efficacy as the best predictor in both countries for structure and student oriented practices. The attitudes towards student oriented practices for both countries and towards structure oriented practices in Korea only are predicting negatively although the weights are relatively small.

5. DISCUSSION

The purpose of this study was to investigate differences and similarities between Korean and Turkish middle school mathematics teachers in terms of environmental variables and the effect of their attitudes and beliefs on their practices.

The results showed that the important differences between the mathematics teachers in two countries are in the experience, level of education, and professional development variables. Having advanced degrees may provide teachers broader perspectives in integrating effective instructional methods into their teaching and result in a better learning environment. Moreover, having access to more professional development opportunities may also create a difference in the instructional effectiveness. The greater experience, higher level of education combined with more in-service training can be the reasons of the superiority of Korean students in international mathematics tests compared to the students in Turkish schools. However, further causal research is needed to have evidence towards this argument.

In terms of attitudes, beliefs and practices, Turkish mathematics teachers have statistically higher averages than their Korean colleagues in all five inspected variables. Turkish mathematics teachers responded positively to almost all variables that were used to measure attitudes, beliefs, and practices whereas Korean mathematics teachers responded negatively to all variables. This shows a distinct difference between mathematics teachers in both countries, and that Korean teachers do not believe in using one type of teaching method in their classrooms. Thus, Korean mathematics teachers prefer a combination of approaches as the most effective way of teaching mathematics. This hypothesis is partly confirmed with the high correlation between two types of attitudes and practices measured in the study and is related to Park & Leung (2006) study, in which a typical Korean classroom is described as teacher-directed but also open to exploration. The study also confirmed the study that indicated Korean teachers were becoming more and more concerned with the order and discipline in their classrooms (Brown, 2009).

The models proposed in the present study are inefficient to explain the teacher practices in terms of their attitudes and beliefs alone. More advanced models should be developed, and are suggested as a further research area.

REFERENCES

Aiken, L. R. Jr, (1970). Attitudes toward mathematics. *Review of Educational Research* **40(4)**, 551–596. Retrieved from: http://www.jstor.org

_____ (1976). Update on attitudes and other affective variables in learning mathematics. *Review of Educational Research* **46(2)**, 293–311. ERIC EJ142051 Retrieved from: http://www.jstor.org

Aksu, M.; Demir, C. & Sümer, Z. (2002). Students' beliefs about mathematics: A descriptive study. *Egitim ve Bilim* **27(123)**, 72–77.

Baki, A. (2008). *Kuramdan uygulamaya matematik eğitimi* (in Turkish: Mathematics education from theory into practice). Ankara, Turkey: Harf Eğitim Yayıncılığı.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W.H. Freeman & Company.

Boz, N. (2008). Turkish pre-service mathematics teachers' beliefs about mathematics teaching. *Australian Journal of Teacher Education* **33(5)**, 66–80.

Brown, B. (2009). Perceptions of student misconduct, perceived respect for teachers, and support for corporal punishment among school teachers in South Korea: An exploratory case study. *Educational Research for Policy and Practice* **8(1)**, 3–22. ERIC EJ830541

Brown, C. A. & Baird, J. (1993). Inside the teacher: Knowledge, beliefs, and attitudes. In: P. S. Wilson (Ed.), *Research ideas in the classroom: High school mathematics* (pp. 245–259). New York: Macmillan.

Cho, G. (2003). Using structural equation modeling to fit a model of student background, teacher background, home environment, and a school characteristic to mathematics achievement on the TIMSS. *J. Korea Soc. Math. Educ. Ser. D* **7(2)**, 247–270. ME **2004e.**03919

Corlu, M. S.; Capraro, R. M. & Capraro, M. M. (2011). *Turkish student teachers' attitudes towards mathematics and science integration.* Paper presented at National Council of Teachers of Mathematics (NCTM) Research Pre-session, Indianapolis, IN.

Corlu, M. S.; Erdogan, N. & Sahin, A. (2011). A Comparative Study of South Korea and Turkey: Attitudes, Beliefs, and Creative Student Oriented Teaching Practices of Middle School Mathematics Teachers In: In: C. Cho, S. Lee & Y. Choe (Eds.), *Proceedings of the 16th Korean International Seminar of Mathematics Education on Creativity Development and Gifted Students at Chungnam Nat'l Univ., Yuseong-gu, Daejeon 305-764, Korea; August 11–13, 2011* (pp. 287–302). Seoul: Korean Society of Mathematics Education.

Dogan, M. (2001). Eğitim fakülterinde okuyan aday öğretmenlerin matematiğe karşı tutumları (in Turkish: Attitudes of teacher candidates' in education faculties towards mathematics). In: *Proceedings of the IV.Fen Bilimleri Eğitimi Kongresi* [IV. Science Education Congress], Ankara, Turkey.

Ertekin, E. (2010). Correlations between the mathematics teaching anxieties of pre-service primary education mathematics teachers and their beliefs about mathematics. *Educational Research and Reviews* **5(8)**, 446–454. ERIC EJ911834

_____ (2003). A multimethod exploration of the mathematics teaching efficacy and epistemological beliefs of preservice and novice elementary teachers. Unpublished doctoral dissertation. Columbus, OH: Ohio State University. Retrieved from: http://etd.ohiolink.edu

Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison–Wesley.

Gorrell, J. & Hwang, Y. S. (1995). A study of efficacy beliefs among preservice teachers in Korea. *Journal of Research and Development in Education* **28(2)**, 101–105. ERIC EJ500452

Hart, L. C. (2002). Preservice teachers' beliefs and practice after participating in an integrated content/methods course. *Sch. Sci. Math.* **102(1)**, 4–14. ME **2002b.**00966 ERIC EJ643892

Kagan, D. M. (1992). Implication of research on teachers' beliefs. *Educational Psychologist* **27(1)** 65–90.

Kim, U. & Park, Y. S. (2006). Indigenous psychological analysis of academic achievement in Korea: The influence of self-efficacy, parents, and culture. *International Journal of Psychology*, **41(4)**, 287–292.

Kwon, O. N. (2004). Mathematics teacher education in Korea. In: H. Lew et al. (Eds.), *The Report on mathematics education in Korea. The Korean national presentation at the 10th International Conference of Mathematics Education (ICME-10), Copenhagen, Denmark* (Chap. 9). Retrieved from: http://matrix.skku.ac.kr/For-ICME-11/ICME/Chap9(Kwon).htm

Lester, F. K.; Garafalo, F. & Kroll, D. L. (1989). Self-confidence, interest, beliefs and metacognition: Key influences in problem solving behavior. In: D. McLeod & V. Adams (Eds.), *Affect and mathematical problem solving* (pp. 75–88). New York: Springer. ME **1991e.**00343

Li, M. & Yu, P. (2005). The main problems of internal professional structure of mathematics teachers in middle schools. *J. Korea Soc. Math. Educ. Ser. D* **9(2)**, 97–113. ME **2006a.**00268

Lohr, S. L. (1999). Sampling: Design and Analysis. Pacific Grove, CA: Duxbury Press.

Ma, X. & Kishor, N. (1997). Assessing the relationship between attitude toward mathematics and achievement in mathematics: A meta-analysis. *J. Res. Math. Educ.* **28(1)**, 26–47. Retrieved from http://www.jstor.org ME **1997f.**03693 ERIC EJ536673

Organisation for Economic Co-operation and Development (2009a). *Education at a Glance 2009: OECD Indicators.* Retrieved from OECD Publications: http://www.oecd.org ERIC ED506349

_____ (2009b). *Creating effective teaching and learning environments (First Results from TALIS).* Retrieved from OECD Publications: http://www.oecd.org

_____ (2010a). *TALIS 2008[Technical Report].* Retrieved from OECD Publications: http://www.oecd.org

_____ (2010b). *TALIS user guide for the international database [User Guide].* Retrieved from OECD Publications: http://www.oecd.org

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research* **62(3)**, 307–332. ERIC EJ453784

Pang, J. & Good, R. (2000). A review of the integration of science and mathematics: Implications for further research. *Sch. Sci. Math.* **100(2)**, 73–82. ME **2000f.**04670 ERIC EJ602437

Park, K. (2004). Factors contributing to Korean students' high achievement in mathematics. In: H.

Lew et al. (Eds.), *The Report on mathematics education in Korea. The Korean national presentation at the 10th International Conference of Mathematics Education (ICME-10), Copenhagen, Denmark* (Chap. 5). Retrieved from: http://matrix.skku.ac.kr/For-ICME-11/ICME/Chap5(kPark).htm

Park, H. S. & Shin, H. (2004). Education and professional development mathematics teachers in Korea. *J. Korea Soc. Math. Educ. Ser. D* **8(2)**, 69–80. ME **2004e.**03834

Park, K. & Leung, F. K. S. (2006). Mathematics lessons in Korea: Teaching with systematic variation. In: D. Clarke, C. Keitel & Y. Shimuzu (Eds.), *Mathematics classrooms in twelve countries: The insider's perspective* (pp. 263–274). Rotterdam, Netherlands: Sense Publishers.

Simsek, H. & A. Yildirim (2001). The reform of pre-service teacher education in Turkey. In: R.G. Sultana (Eds.), *Challenge and change in the Euro-Mediterranean region*. New York: Peter Lang.

Tansel, A. & Bircan, F. (2006). Demand for education in Turkey: A tobit analysis of private tutoring expenditures. *Economics of Education Review* **25(3)**, 303–313. ERIC EJ739019

Thompson, A. G. (1992). Teachers' beliefs and conceptions: A synthesis of the research. In: D. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 127–146). New York: Macmillian.

Tschannen-Moran, M. & McMaster, P. (2009). Sources of self efficacy: Four professional development formats and their relationship to self efficacy and implementation of a new teaching strategy. *The Elementary School Journal* **110(2)**, 228–245. ERIC EJ863503

van der Sandt, S. (2007). Research framework on mathematics teacher behaviour: Koehler and Grouws' framework revisited. E*urasia Journal of Mathematics, Science & Technology Education* **3(4)**, 343–350. ME **2009e.**00107

Wagner, S.; Lee, H, & Ozgun-Koca, S. A. (1999). *A comparative study of the United States, Turkey, and Korea: Attitudes and beliefs of pre-service mathematics teachers toward mathematics, teaching mathematics, and their teacher preparation programs*. Paper presented at the annual meeting of the Association of Mathematics Teacher Educators, Chicago, IL. ERIC ED445907

Wang, L. (2004). Mathematics teacher's needs in their professional development. *J. Korea Soc. Math. Educ. Ser. D* **8(2)**, 59–67. ME **2004e.**03849

APPENDIX
VARIABLE AND ITEM DESCRIPTIONS

Construct	Latent Variable	TALIS Code	Item description
Beliefs	*Self Efficacy Beliefs*		How strongly do you agree or disagree with the fol lowing statements about yourself as a teacher in thi s school?
		BTG31B	I feel that I am making a significant educational dif ference in the lives of my students
		BTG31C	If I try really hard, I can make progress with even the most difficult and unmotivated students.
		BTG31D	I am successful with the students in my class.
		BTG31E	I usually know how to get through to students.
Attitudes	*Direct Teaching*	BTG29A	Effective/good teachers demonstrate the correct way to solve a problem.
		BTG29G	Instruction should be built around problems with cle ar, correct answers, and around ideas that most stud ents can grasp quickly.
		BTG29H	How much students learn depends on how much ba ckground knowledge they have – that is why teachi ngfacts is so necessary.
		BTG29K	A quiet classroom is generally needed for effective learning.
	Constructivist Teaching	BTG29D	My role as a teacher is to facilitate students' own i nquiry.
		BTG29F	Students learn best by finding solutions to problems on their own
		BTG29I	Students should be allowed to think of solutions to practical problems themselves before the teacher sho ws them how they are solved.
		BTG29L	Thinking and reasoning processes are more importan t than specific curriculum content.
Practices	*Structure Oriented*	BTG42B	I explicitly state learning goals.
		BTG30C	I review with the students the homework they have prepared.
		BTG42H	I ask my students to remember every step in a pro cedure.
		B TG42I	At the beginning of the lesson I present a short su mmary of the previous lesson.
		BTG42M	Students evaluate and reflect upon their own work.
	Student Oriented	BTG42D	Students work in small groups to come up with a j oint solution to a problem or task.
		BTG42E	I give different work to the students that have diffi culties learning and/or to those who can advance fa ster.
		BTG42F	I ask my students to suggest or to help plan classr oom activities or topics.
		BTG42N	Students work in groups based upon their abilities.