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Developing a Teachers' Gender Stereotype Scale toward Mathematics*

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Abstract

Gender has become a focus of mathematics education research. While some research show that there are no differences between boys and girls, numerous research studies have indicated that boys have outperformed girls. It is suggested that gender stereotypes, such as expecting girls to show less achievement in mathematics compared to boys, have an effect on mathematics achievement. According to these gender stereotypes, boys are more successful in mathematics and science and girls are more successful in literature and arts. Gender stereotypes are transmitted by one generation to the next generation via children's books, language, parents and teachers as well. Because of teachers' important role of shaping their students' beliefs and attitudes, determining teachers' gender stereotypes is vital to understanding the differences of mathematical achievement between girls and boys. Therefore, the purpose of this study is to develop a teachers' gender stereotype scale toward mathematics. The scale consists of two subscales: the Boys' Form and the Girls' Form. These two forms are conducted with 595 primary school teachers. Results of the exploratory factor analysis for each form, 17 items and four factors are determined. Based on the literature review, these factors are named as environment, gender appropriateness of careers, competence and attribution of success. For each form, the confirmatory factor analysis is conducted and the four factors of the subscales are confirmed. The findings of the study revealed that the scale is a valid and reliable instrument to measure gender stereotypes in mathematics.

Keywords: Primary school education, mathematics, gender stereotype.

Introduction

Gender issues have become a focus of mathematics education research. Although some research shows that there are no differences between girls and boys (Hyde, Lindberg, Linn, Ellis, & Williams, 2008; Kazu, & Ersözlü, 2008; Dede & Dursun, 2008; Yücel & Koç, 2011), a significant amount of research indicates that boys are more competent than girls in terms of cognitive variables such as problem solving and mathematical thinking abilities (Geary, Saults, Liu, & Hoard, 2000; Gallagher, De Lisi, Holst, McGillicuddy-De Lisi, Morely, M., & Cahalan, 2000; Altunçekiç, Yaman, & Koray, 2005) and affective variables such as mathematics anxiety, mathematical attitudes and self-efficacy (Köğce, Yıldız, Aydın, & Altındağ, 2009; Frenzel, & Pekrun, 2007; Kargar, Tarmizi, & Bayat, 2010; Çakıroğlu & Işıksal, 2009). In addition, some research investigated the mathematical achievement differences of girls and boys. Most of them find that boys are more successful than girls in mathematics (Van de Gaer, Pustjens, Van Damme, & De Munter, 2008; Tate, 1997).

Considering the results of research that attempted to find the relationship between gender and mathematical achievement, it is possible to wonder what kind of reasons could be effective. According to Weissglass (2002), several factors can affect students' mathematical achievement such as ethnicity, socio-economic status, language, sexual orientation, gender, the role of school, and culture as well. Researchers have conducted studies to investigate gender stereotypes in mathematics education as a part of culture (Spencer, Steele, & Quinn, 1999; Schmader, 2002; Brown, & Josephs, 1999; Schmader, Johns, & Barquissau, 2004). These gender stereotypes are the kind of beliefs that boys are more competent than girls in mathematics and science, and girls are more competent than boys in literature and arts (Beilock, Gunderson, Ramirez, & Levine, 2010). Studies find that these gender stereotypes are transmitted from one generation to the next generation via children's books (Taylor, 2003), language (Wigboldus, Sermin, & Spears, 2000), parents (Eccles & Jacob, 1986) and teachers (Esen, 2013; Keller, 2001).

Teachers' beliefs about mathematics have an effect on students' beliefs and even achievements (Beilock et al., 2010). Similarly, teachers' beliefs about mathematics as a male domain influence their students' beliefs and achievement in mathematics (Keller, 2001). Therefore, measuring teachers' gender stereotype beliefs toward mathematics is important to preventing the reproduction of gender stereotypes in mathematics in the classroom and providing a more balanced mathematics education environment for both genders. Even though there are various gender stereotype scale studies developed by

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different researchers in the literature (Leder & Forgasz, 2002; Keller, 2001; Yee & Eccles, 1988; Tiedemann, 2000; Räty, Vänskä, Kasanen, & Kärkkäinen, 2002), these scales about gender stereotypes in mathematics are generally developed toward students and parents. Nevertheless, there are some research focus on measuring teachers' gender stereotypes in mathematics (Tiedemann, 2002; Keller, 2001). However, these studies use biased scales that provide participants with an opportunity to display only the degree of perceived masculinity of mathematics, and do not allow them to rate it as a female domain. For instance, participants who take a low score from a biased scale means that they have a low stereotypical belief about masculinity of mathematics. However, there is no evidence about the stereotypical belief about mathematics as a female domain. In this case, participants could have neutral beliefs in terms of gender in mathematics or even they could regard mathematics as a female domain. The new unbiased scale, included two subscales offering participants to indicate their beliefs about mathematics both as a male and female domain, is thought to be helpful for researchers who want to measure teachers' gender stereotypes in mathematics.

Methodology

Participants

The study is conducted with 595 primary school teachers in Turkey. It is considered that the teachers are experienced in teaching. 76% of the participants are female, while 24% of them are male.

Developing the Scale

The Teachers' Gender Stereotype Scale toward Mathematics is a scale applied as a just one scale however it consists of two subscales: Boys' Form and Girls' Form. During the first stage of the development process, literature is reviewed to determine categories of gender stereotypes in mathematics.

Table 1. *Mathematics Gender Stereotypes Indicators and Items*

Categorises	Indicators	Definitions	Sources	Item Examples
Attribution	Effort, ability, chance, support of parents or teachers, easiness of exam	It examines that teachers' attributions about the reasons and sources of students' achievement.	Yee, and Eccles (1988), Tiedemann (2000)	Compared to boys, girls mostly increase their mathematical achievement, because of the support of their teachers. Compared to girls, boys mostly increase their mathematics scores when the examination is too easy.
Competence	Having mathematical, logical thinking, problem solving abilities, motivation and confidence, discovering problems situations, searching patterns, verification of results, making generalisation	It examines that teachers' beliefs about students' mathematical knowledge, ability and attitudes.	Abrantes (2001), Tiedemann (2000), Leder, and Forgasz (2002), Fennema, and Sherman (1976) Milli Eğitim Bakanlığı (MEB) (2015)	Girls use mathematical tools such as rulers, number blocks etc., more effectively than boys do. Boys are more successful than girls in mental computation.
Effort	Contributing classroom activities, studying, seeking help, helping others, completed work in the classroom, making unassigned practice	It examines that teachers beliefs about students' effort in mathematics.	Brookhart (1997)	Boys complete tasks in mathematics classes more than girls do. Girls bring mathematics problems to ask their teachers more than boys do.
Career	Interest of jobs needed mathematical ability, characteristics of planned career, appropriateness of career	It examines that teachers' beliefs about students' career choice.	Correll (2001), Dick, and Rallis (1991), Rallis, and Ahren (1986)	Boys are encouraged more than girls to choose a career in a mathematically-related area.
Environment	Perceptions of peers and parents	It examines that teachers beliefs about how peers and parents perceptions on students in mathematics.	Parsons, Adler, and Kaczala, (1982), Andre, Whigham, Hendrickson, and Chambers (1999), Leder, and Forgasz (2002)	Compared to boys, girls are seen as more competent in mathematics by their parents.

In this regard, categories are written on the basis of scales developed by Leder & Forgasz (2002), Keller (2001), Yee and Eccles (1988), Tiedemann (2000) and Räty et al. (2002). According to these categories, indicators, definitions and items emerge. Table 1 shows these items based on the definitions. A pool with 42 items is written by considering each revised indicator related with gender stereotypes in mathematics. 6 of them take place in the attribution factor, 19 of them are in the competence factor, 6 of them are in the effort factor, 5 of them are in the career factor and lastly 6 of them are in the environment factor. The 42-item form that emerged is

analysed and evaluated by four experts from Primary School Education, six experts from Elementary School Mathematics Education, and one expert from Division of Curriculum and Instruction. Experts are asked to evaluate these items according to appropriateness in terms of ability to measure the gender stereotype beliefs, and intelligibility of items. Also, experts are asked to give suggestions if an item is inappropriate. According to feedback given by experts, intelligibility of some items is improved and 7 items are added for the competence factor. As a result, a 49-item form emerges. Items are written by giving superiority for each gender. For example, 'Boys are more competent than girls in using a calculator' and 'Girls are more competent than boys in using a calculator'. In order to determine participants' gender stereotype beliefs in mathematics, a 5-point Likert-type form is used.

Data Collection

The scale is first applied to 245 primary school teachers for explanatory factor analysis (EFA). After that, for confirmatory factor analysis (CFA), 350 primary school teachers complete the scale. The data collection process takes almost 6 months.

Data Analysis

Although some researchers suggest different sample size requirements to perform validity and reliability analysis, it is acceptable to reach 5-10 times the number of items on the scale (Kass, & Tinsley, 1979; Kline, 1994; Pett, Lackey, & Sullivan, 2003; Tavşancıl, 2005). Considering this criterion, 595 teachers are reached to fill out the scale. Before the start of the data analysis, extreme, outlier, and missing values are corrected. At the end of this, validity and reliability analysis are performed as a result of the answers gained from 595 primary school teachers. In this study, data are subsequently collected. In order to reveal the structure of the scale, EFA is performed on the first group (n_1= 245). CFA is performed on the other group (n_2= 350) to test the structure.

Findings

Findings Related to Validity

Before starting to define the structure of the Teachers' Gender Stereotype Scale toward Mathematics by performing EFA, in order to determine the aptitude of data gathered for Boys' Form and Girls' Form of the scale, the KMO and Bartlett's. Test are calculated. According to Kaiser (1974), a KMO value greater than 0.5 can be accepted. Pallant (2001) suggests that the KMO value should be higher than 0.6 to perform EFA. In this study, while the KMO value of Boys' Form is found as .90, the value of Girls' Form is calculated as .91. In this regard, the KMO values of these two forms are both greater than the values to be recommended by researchers. Bartlett's Test needs to have a significant value to determine the factorability of the correlation matrix obtained from the items. Bartlett's Test is found to be significant for both forms of the scale: Boys' Form χ^2= 2193.501; p= 0.00 and Girls' Form χ^2= 1863.416; p= 0.00. Therefore, it is possible to indicate that data from the trial form of the scale are proper for performing a factor analysis.

The total variance values of the items in the Boys' Form and Girls' Form are examined. It is seen in Figure 1a that items of Boys' Form are gathered under 4 factors which are bigger than 1.00 eigenvalues.

As it is clear from the Figure 1b, items of Girls' Form are actually gathered under 3 factors according to criterion of eigenvalue bigger than 1.00. Because of one more factor which is 0.905 eigenvalue has an important contribution to the scale, this factor is included as well. It is claimed that items with a factor loading above 0.4 are included in the output while items with a factor loading less than 0.4 need to be removed. Boys' Form factor loadings and variance values are seen in Table 2a.

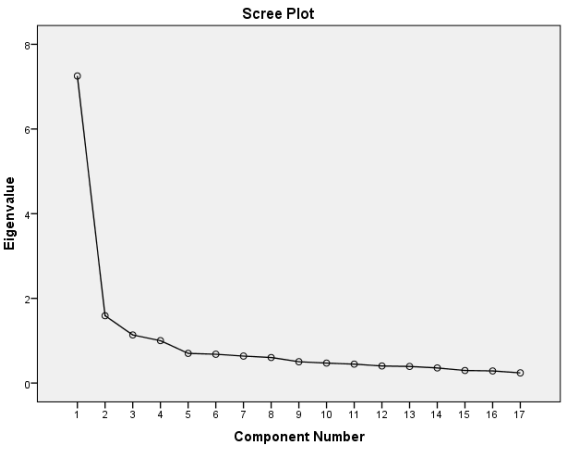

Figure 1a

The first extended factor consisted of 4 items ranging from .50 to .71, the second extended factor consisted of 4 items ranging from .70 to .74, the third extended factor consisted of 6 items ranging from .69 to .75 and the last extended factor consisted of 3 items ranging .64 to .78. Whole factors explain 64.5% of total variance. The first factor explains 26.75% of total variance and is labelled as 'environment'. The second factor explains 15.96% of total variance and is labelled as 'career'. The third factor explains 14.19% of total variance and is labelled as 'competence'. The fourth factor explains 9.67% and is labelled as 'attribution'.

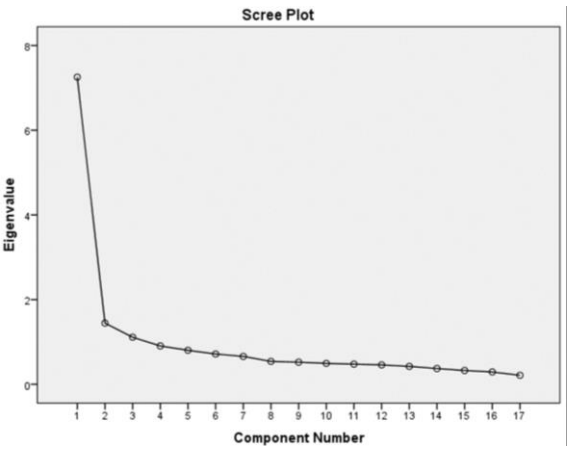

Figure 1b

Table 2a. *Teachers' Gender Stereotype Scale toward Mathematics: Boys' Form Factor Loads and Common Factor Variances*

	Items	Factor 1	Factor 2	Factor 3	Factor 4	Common Factor Variance
Environment	Compare to girls, boys are seen more competent in mathematics by their parents.	.565				.541
	Boys' parents think that mathematics is important more than girls' parents do.	.817				.705
	Compared to girls, boys are more popular because of their mathematical success.	.506				.555
	Boys are expected more than girls to do well in mathematics by their parents.	.714				.692
Career	Boys are more interested in careers which require mathematical ability than girls are.		.732			.731
	Boys are encouraged more than girls to choose a career in a mathematically-related area.		.727			.715
	Boys are more suited than girls to work in engineering branches.		.709			.686
	Boys are more willing than girls to work in mathematically-related areas.		.745			.756
Competence	Boys understand mathematical concepts more easily than girls do.			.692		.525
	Boys are more successful than girls in mental computation.			.701		.662
	Boys are more likely than girls to believe they can be successful in mathematics.			.733		.595
	Boys have higher logical thinking abilities than girls have.			.734		.617
	Boys have higher mathematical thinking abilities than girls have.			.752		.658
	Boys understand mathematical problems more easily than girls do.			.698		.664
Attribution	Compared to girls, boys mostly increase their mathematical achievement, because of the support of their teachers.				.789	.672
	Compared to girls, boys mostly increase their mathematics scores when the examination is too easy.				.604	.585
	Compared to girls, boys mostly increase their mathematics scores because their parents provide them with mathematical support.				.641	.622
	Eigen Value	7.252	1.590	1.136	1.001	
	Explained Variance	24.756	15.962	14.190	9.677	
	Total Explained Variance	64.586				

* Values lower than .40 is not shown in the table.

Table 2b. *Teachers' Gender Stereotype Scale towards Mathematics: Girls' Form Factor Loads and Common Factor Variances*

	Items	Factor 1	Factor 2	Factor 3	Factor 4	Common Factor Variance
Environment	Compared to boys, girls are seen as more competent in mathematics by their parents.	.574				.553
	Girls' parents think that mathematics is important more than boys' parents do.	.781				.677
	Girls are expected more than boys to do well in mathematics by their parents.	.750				.752
Career	Girls are encouraged more than boys to choose a career in a mathematically-related area.		.600			.629
	Girls are more suited than boys to work in engineering branches.		.747			.697
	Girls are more willing than boys to work in mathematically-related areas.		.795			.780
Competence	Girls are more successful than boys in predicting how to solve mathematical problems.			.657		.600
	Girls are more likely than boys to believe they can be successful in mathematics.			.632		.476
	Girls like solving mathematics problems that their classmates are not able to more than boys do.			.660		.527
	Girls are more successful than boys in describing the situation given in mathematical problems with mathematical symbols.			.819		.733
	Girls use mathematical tools such as rulers, number blocks etc., more effectively than boys do.			.801		.695
	Girls are more successful than boys in using a calculator in mathematics classes.			.669		.548
	Girls have higher mathematical thinking abilities than boys have.			.694		.591
	Girls are more successful than boys in modelling mathematical relationships by drawings.			.675		.560
Attribution	Compared to boys, girls mostly increase their mathematical achievement, because of the support of their teachers.				.782	.645
	Compared to boys, girls mostly increase their mathematics scores when the examination is too easy.				.757	.636
	Compared to boys, girls mostly increase their mathematics scores because their parents provide them with mathematical support.				.633	.616
	Eigen Value	7.254	1.445	1.111	0.905	
	Explained Variance	42.668	8.500	6.534	5.323	
	Total Explained Variance	63.026				

* Values lower than .40 is not shown in the table.

In Table 2b, Girls' Form factor loadings and variance values can be seen. According to Table 2b, first extended factor consisted of 3 items ranging from .57 to .78, the second extended factor consisted of 3 items ranging from .60 to .79, the third extended factor consisted of 8 items ranging from .63 to .81 and the last extended factor consisted of 3 items ranging from .63 to .78. Whole factors explain 63% of total variance. The first factor explains 46.66% of total variance and is labelled as 'environment'. The second factor explains 8.50% of total variance and is labelled as 'career'. The third factor explains 6.53% of total variance and is labelled as 'competence'. The fourth factor explains 5.32% and is labelled as 'attribution'.

For each form of the scale, correlations between factors are tested. Correlation coefficients between factors of Boys' Form are shown in Table 3a, of Girls' Form are shown in 3b.

Table 3a. *Correlation Coefficients between Factors of Boys' Form*

Factors	Environment	Career	Competence	Attribution
Environment	1.00	.599	.624	-.495
Career		1.00	.631	-.463
Competence			1.00	-.375
Attribution				1.00

**p<0.01

Table 3b. *Correlation Coefficients between Factors of Girls' Form*

Factors	Environment	Career	Competence	Attribution
Environment	1.00	.563	.538	-.480
Career		1.00	.585	-.434
Competence			1.00	-.447
Attribution				1.00

**p<0.01

As seen in Table 3a, correlation coefficients between factors of Boys' Form are ranging from -.37 to .62 and they are significant at .01 level.

As seen in Table 3b, correlation coefficients between factors of Girls' Form are ranging from -.43 to .58 and they are significant at .01 level.

CFA is performed to confirm the structure of the model revealed after EFA. χ^2/df chi-square/degree of freedom, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI) and Comparative Fit Index (CFI) are taken into consideration as model fit indices. The four-factor model fit indices are determined as: Boys' Form: $\chi 2/df = 3.34$ ($p= .000$); RMSEA= .081; GFI= .90; AGFI= .84; CFI= .91; NFI= .88; SRMR= .06. Boys' Form is presented in Fig. 2a and 3a.

According to model fit indices, χ^2/df value for Boys' Form is 3.34, for Girls' Form it is 2.03. Kline (2005) states that there is a perfect match in models if the value is less than 2.5 for small samples. However, there is no consensus regarding for χ^2/df value. As Wheaton, Muthen, Alwin, & Summers (1977) indicate that less than 5.0 is acceptable ratio for this statistics. Therefore, these values in both Boys' and Girls' Forms are acceptable. The RMSEA value is found to be .08 for Boys' Form and .05 for Girls' Form. According to the literature, these values indicate a good cohesiveness (Brown, 2006). Additionally, GFI and AGFI values above .90 mean the model has perfect fit, and AGFI value above .80 is considered adequate (Jöreskog & Söbom, 1993). In this regard, GFI values are perfect and AGFI values are acceptable for both forms of the scale. As Sümer (2001) states that there is a good model fitting if CFI and NFI values are above .90. However, according to some researchers above .80 is acceptable, as well (Hair, Black, Babin & Anderson, 2009). Therefore, these values for the both forms of the scale are acceptable.

Cronbach's alpha is used as an estimate of the reliability of the scale. Cronbach's alpha values of Boys' Form are presented in Table 4a. Cronbach's alpha values of Girls' Form are presented in Table 4b.

Table 4a. *Cronbach's alpha values of Teachers' Gender Stereotype Scale towards Mathematics: Boys' Form*

Factors	Cronbach's Alpha Values
Environment	.771
Careers	.768
Competences	.915
Attribution	.580
General	**.884**

Table 4b. *Cronbach's alpha values of Teachers' Gender Stereotype Scale towards Mathematics: Girls' Form*

Factors	**Cronbach's Alpha Values**
Environment	.673
Careers	.593
Competences	.863
Attribution	.729
General	**.910**

According to Nunally (1978) alpha values higher than .70 are considered adequate. Cronbach's alpha value of Boys' Form is calculated as .884, and of Girls' Form is calculated as .910. In this regard, it is possible to indicate that both forms of the scale have adequate reliability.

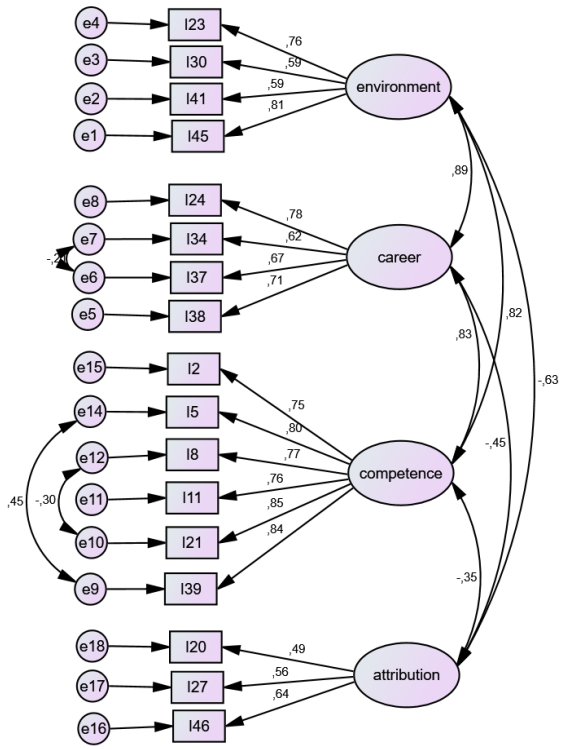

Figure 2a

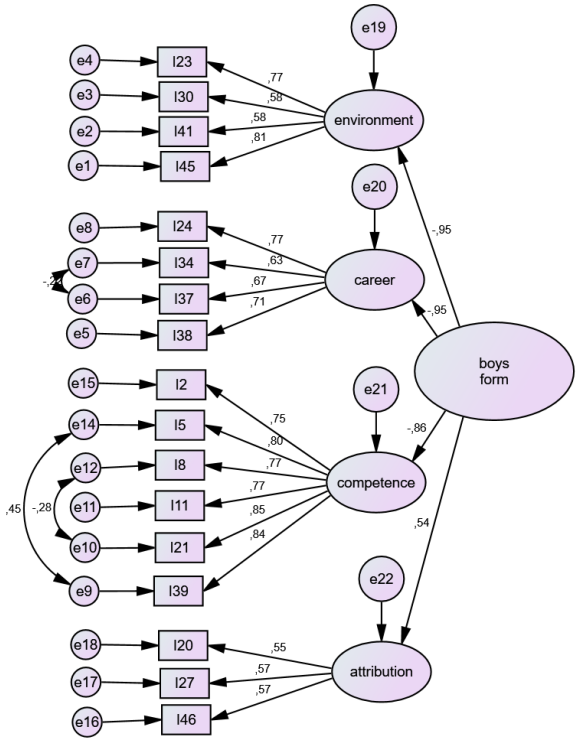

Figure 3a

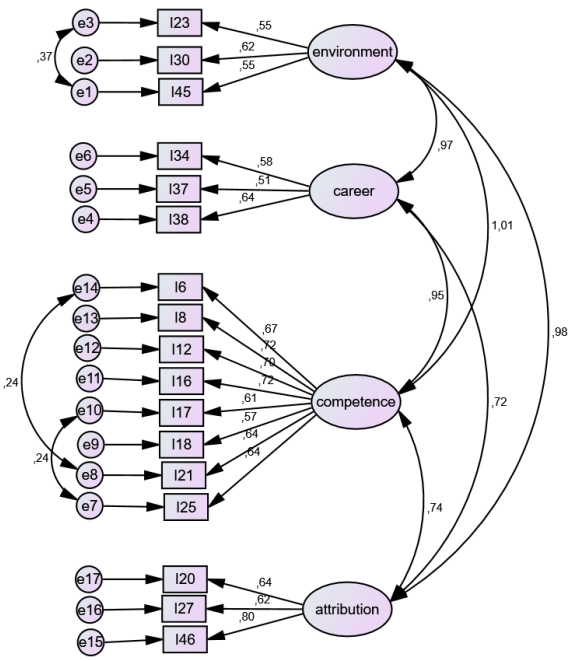

Figure 2b

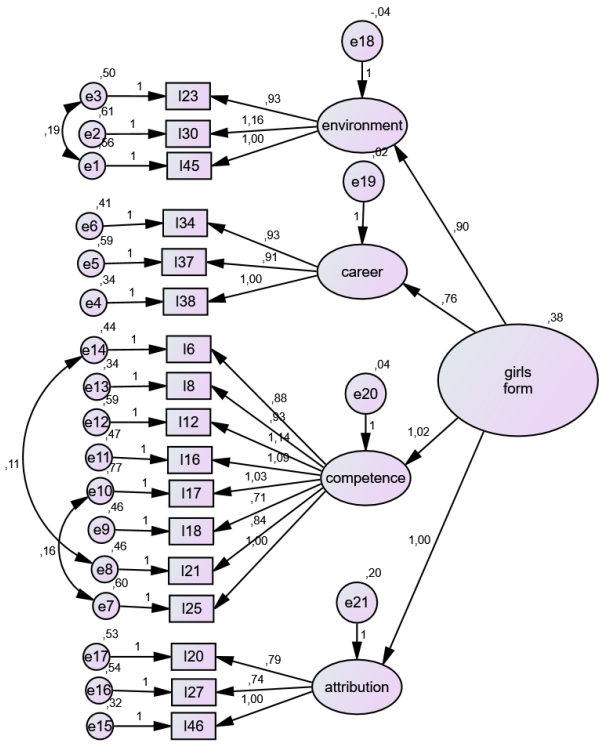

Figure 3b

Girls' Form: χ2/df= 2.03 (p= .000); RMSEA= .05; GFI= .93; AGFI= .90; CFI= .94; NFI= .90; SRMR= .04., Girls' Form is presented in Figure 2b and 3b.

Results

In this study, a new scale is developed to measure teachers' gender stereotype beliefs toward mathematics by considering mathematics gender stereotype indicators prepared by many researchers generally from western culture (Leder, and Forgasz, 2002; Keller, 2001; Yee, and Eccles, 1988; Tiedemann, 2000; Räty, et al. 2002). The scale has two subscales: Boys' Form and Girls' Form. Also it consists of four factors environment, career, attribution, and competence. However, it is possible to say that the literature has not offered a consistent structure about gender stereotypes about mathematics. Also, these studies are generally conducted to investigate parents' or children's beliefs about mathematics gender stereotypes. Nevertheless, there is a small amount of research investigating gender stereotype beliefs about mathematics particularly in teachers (Tiedemann, 2000, 2002) and these studies have limited sub-dimensions compared the other scales. This study focuses on teachers' beliefs and uses four scale factors existing in other research studies. Therefore, it is possible to say that, the research has an important role to investigate teachers' gender stereotype beliefs in mathematics field more comprehensively. According to the results, the scale is reliable and valid. In future, studies aimed to investigate teachers' mathematics gender stereotypes can use this scale.

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Appendix

1.Items in Turkish Language

	Hiç Katılmıyorum	Katılmıyorum	Biraz Katılıyorum	Katılıyorum	Tamamen Katılıyorum
1. Kızlar erkeklere göre velileri tarafından matematikte daha yeterli görülürler.					
2. Erkekler kızlara göre matematik dersinde iyi oldukları için arkadaşları arasında daha popülerdirler.					
3. Kızlar erkeklere göre velilerinde daha yüksek matematiksel başarı beklentisi oluştururlar.					
4. Erkekler kızlara göre aileleri tarafından matematik ile alakalı bir iş koluna yönelmeleri konusunda daha çok desteklenirler.					
5. Kızlar erkeklere göre çeşitli mühendislik alanlarında çalışmaya daha uygundurlar.					
6. Erkekler kızlara göre velileri tarafından matematikte daha yeterli görülürler.					
7. Erkekler kızlara göre matematik başarılarını daha çok, sınav kolay olduğunda arttırabilirler.					
8. Kızlar erkeklere göre matematik dersinde sınıf arkadaşlarının çözemediği soruları yanıtlamaktan daha çok hoşlanırlar.					
9. Kızlar erkeklere göre problem sonuçlarını tahmin etmede daha başarılıdırlar.					
10. Kızlar erkeklere göre matematik dersinde araç ve gereçleri (cetvel, onluk sayı blokları vb.) daha etkili bir şekilde kullanırlar.					
11. Erkekler kızlara göre matematik başarılarını daha çok, velileri matematiksel destek sağladığı için arttırırlar.					
12. Kızlar erkeklere göre daha üst düzey matematiksel düşünme becerilerine sahiptirler.					
13. Kızlar erkeklere göre matematik başarılarını daha çok, sınav kolay olduğunda arttırabilirler.					
14. Erkekler kızlara göre matematikle alakalı bir iş kolunda çalışmayı daha çok isterler.					
15. Erkekler kızlara göre daha üst düzey matematiksel düşünme becerilerine sahiptirler.					
16. Erkekler kızlara göre velilerinde daha yüksek matematiksel başarı beklentisi oluştururlar.					
17. Kızlar erkeklere göre aileleri tarafından matematik ile alakalı bir iş koluna yönelmeleri konusunda daha çok desteklenirler.					

	Hiç Katılmıyorum	Katılmıyorum	Biraz Katılıyorum	Katılıyorum	Tamamen Katılıyorum
18. Kızlar erkeklere göre matematik başarılarını daha çok, velileri matematiksel destek sağladığı için arttırırlar.					
19. Kızlar erkeklere göre daha çok, matematiğin en önemli ders olduğunu düşünen velilere sahiptirler.					
20. Erkekler kızlara göre matematik kavramlarını daha kolay anlarlar.					
21. Kızlar erkeklere göre matematik problemlerinde verilen bir durumu matematiksel sembollerle göstermede daha başarılıdırlar.					
22. Erkekler kızlara göre daha çok, matematiğin en önemli ders olduğunu düşünen velilere sahiptirler.					
23. Kızlar erkeklere göre matematikle alakalı bir iş kolunda çalışmayı daha çok isterler.					
24. Erkekler kızlara göre çeşitli mühendislik alanlarında çalışmaya daha uygundurlar.					
25. Kızlar erkeklere göre matematik başarılarını daha çok, öğretmen onlar ile ilgilendirdiği için arttırırlar.					
26. Erkekler kızlara göre matematik problemlerini daha kolay anlarlar.					
27. Erkekler kızlara göre zihinden işlem yapmada daha başarılıdırlar.					
28. Kızlar erkeklere göre matematikte başarılı olabileceklerine daha çok inanırlar.					
29. Erkekler kızlara göre matematik başarılarını daha çok, öğretmen onlar ile ilgilendiği için arttırırlar.					
30. Erkekler kızlara göre daha üst düzey mantıksal düşünme becerilerine sahiptirler.					
31. Kızlar erkeklere göre matematik dersinde hesap makinesi kullanmakta daha başarılıdırlar.					
32. Erkekler kızlara göre matematikte başarılı olabileceklerine daha çok inanırlar.					
33. Erkekler kızlara göre üst düzey matematiksel beceri gerektiren meslek kollarına daha çok ilgi duyarlar.					
34. Kızlar erkeklere göre matematiksel ilişkileri resimler yoluyla modellemede daha başarılıdırlar.					

2. Items in English Language

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Compared to boys, girls are seen as more competent in mathematics by their parents.					
2. Compared to girls, boys are more popular because of their mathematical success.					
3. Girls are expected more than boys to do well in mathematics by their parents.					
4. Boys are encouraged more than girls to choose a career in a mathematically-related area.					
5. Girls are more suited than boys to work in engineering branches.					
6. Compare to girls, boys are seen more competent in mathematics by their parents.					
7. Compared to girls, boys mostly increase their mathematics scores when the examination is too easy.					
8. Girls like solving mathematics problems that their classmates are not able to more than boys do.					
9. Girls are more successful than boys in predicting how to solve mathematical problems.					
10. Girls use mathematical tools such as rulers, number blocks etc., more effectively than boys do.					
11. Compared to girls, boys mostly increase their mathematics scores because their parents provide them with mathematical support.					
12. Girls have higher mathematical thinking abilities than boys have.					
13. Compared to boys, girls mostly increase their mathematics scores when the examination is too easy.					
14. Boys are more willing than girls to work in mathematically-related areas.					
15. Boys have higher mathematical thinking abilities than girls have.					
16. Boys are expected more than girls to do well in mathematics by their parents.					

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
17. Girls are encouraged more than boys to choose a career in a mathematically-related area.					
18. Compared to boys, girls mostly increase their mathematics scores because their parents provide them with mathematical support.					
19. Girls' parents think that mathematics is important more than boys' parents do.					
20. Boys understand mathematical concepts more easily than girls do.					
21. Girls are more successful than boys in describing the situation given in mathematical problems with mathematical symbols.					
22. Boys' parents think that mathematics is important more than girls' parents do.					
23. Girls are more willing than boys to work in mathematically-related areas.					
24. Boys are more suited than girls to work in engineering branches.					
25. Compared to boys, girls mostly increase their mathematical achievement, because of the support of their teachers.					
26. Boys understand mathematical problems more easily than girls do.					
27. Boys are more successful than girls in mental computation.					
28. Girls are more likely than boys to believe they can be successful in mathematics.					
29. Compared to girls, boys mostly increase their mathematical achievement, because of the support of their teachers.					
30. Boys have higher logical thinking abilities than girls have.					
31. Girls are more successful than boys in using a calculator in mathematics classes.					
32. Boys are more likely than girls to believe they can be successful in mathematics.					
33. Boys are more interested in careers which require mathematical ability than girls are.					