



HAL
open science

Turkish prospective middle grades mathematics teachers' teaching efficacy beliefs and sources of these beliefs

Okan Arslan, Aykut Bulut

► **To cite this version:**

Okan Arslan, Aykut Bulut. Turkish prospective middle grades mathematics teachers' teaching efficacy beliefs and sources of these beliefs. CERME 9 - Ninth Congress of the European Society for Research in Mathematics Education, Charles University in Prague, Faculty of Education; ERME, Feb 2015, Prague, Czech Republic. pp.1123-1130. hal-01287332

HAL Id: hal-01287332

<https://hal.science/hal-01287332>

Submitted on 12 Mar 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Turkish prospective middle grades mathematics teachers' teaching efficacy beliefs and sources of these beliefs

Okan Arslan and Aykut Bulut

Middle East Technical University, Faculty of Education, Ankara, Turkey, arokan@metu.edu.tr

In this study, 187 prospective mathematics teachers' teaching efficacy beliefs and sources of their beliefs were investigated through the administration of Teachers' Sense of Efficacy Scale (TSES) and The Sources of Self Efficacy Inventory (SOSI) scales. Furthermore, this study explored how well hypothesized sources (mastery experiences, vicarious experiences, verbal persuasions, physiological and affective states) predict participants' teaching efficacy beliefs. The calculated mean scores (out of 9) for dimensions of TSES were: 6,35 for Efficacy for Student Engagement, 6,57 for Efficacy for Instructional Strategies, 6,35 for Efficacy for Classroom Management. Multiple regression analysis results showed that combination of hypothesized sources significantly predicted overall teaching efficacy beliefs and all dimensions of TSES.

Keywords: Teaching efficacy beliefs and sources, prospective mathematics teachers.

INTRODUCTION

The term of self-efficacy was introduced first in Social Cognitive Theory and defined as one's personal judgments about doing a particular behavior and these beliefs have a great effect on the future behavior (Bandura, 1997). Its effect on the future behavior leads to an interest on this construct and there has been several research related with self-efficacy beliefs in the literature so far. It has also been an important topic in the field of education and much research has been done on the efficacy beliefs of students and teachers. In line with Bandura's definition of self-efficacy, Tschannen-Moran and Woolfolk Hoy (2001) introduced the term teaching efficacy as "...judgment of his or her capabilities to bring about desired outcomes of

student engagement, and learning, even among those students who may be difficult or unmotivated" (p. 783).

Studies have revealed that teaching efficacy beliefs have effects on teachers' teaching related decisions and student learning outcomes (Işıksal & Çakıroğlu, 2006; Poulou, 2007). Teachers with high teaching efficacy beliefs keep their efforts in the classroom even if there are problems in the class (Tschannen-Moran & Woolfolk Hoy, 2001), behave more positively to students who fail in the class (Ashton & Webb, 1986), and have more effective teaching strategies when compared with the teachers who have a low teaching efficacy (Işıksal & Çakıroğlu, 2006). Such research may enable not only to predict prospective teachers' possible teaching behaviors but also to interpret the effectiveness of teacher education programs (Poulou, 2007). Therefore, the focus of the current study is to investigate prospective mathematics teachers' teaching efficacy beliefs.

The significance of teaching efficacy beliefs also lead to an interest on how these beliefs are constructed. Therefore, the sources of teaching efficacy beliefs began to take attention in the literature (Morris, 2010; Usher & Pajares, 2008). When the issue is the sources of teaching efficacy beliefs, the main interest in the literature is the sources of self-efficacy beliefs hypothesized by Bandura (1997) in Social Cognitive Theory. Bandura hypothesized four main sources of self-efficacy beliefs which are *mastery experience, vicarious experience, verbal persuasion, physiological and affective states*. *Mastery experiences* refer to the results of one's personal experiences in the past and based on these experiences, one knows in which conditions s/he would succeed or fail (Bandura, 1997). In other words, one feels more efficacious if s/he succeeded at doing that behavior before and feels less efficacious

if s/he failed before. Bandura (1997) claimed that *mastery experiences* are the most powerful source of self-efficacy beliefs among the four sources. One not only gains self-efficacy beliefs through personal experiences, s/he also gains efficacy beliefs through observing the experiences of others, and this source is named as *vicarious experience* (Bandura, 1997). One might judge his/her capabilities on a particular behavior based on his/her model's accomplishment on that behavior, which functions as a standard for him/her (Tschannen-Moran & McMaster, 2009). Another source of self-efficacy beliefs is *verbal persuasions* received from others (Bandura, 1997). *Verbal persuasions* refer to judgments about one on his/her capability on doing a particular behavior and these judgments might come from different sources such as colleagues, parents, teachers or administrators (Tschannen-Moran & McMaster, 2009; Usher, 2009). As a last source, Bandura (1997) mentioned one's judgment of personal capabilities is affected from his/her physiological and affective states at that moment. For instance, one might feel less efficacious when s/he is under stress or anxiety (Tschannen-Moran & McMaster, 2009) or when s/he is exhausted (Usher, 2009).

When we consider these hypothesized sources in terms of teaching efficacy, theoretically it is possible to claim that prospective teachers' previous teaching experiences, their observations of peers' and previous teachers' practice, judgments about their own teaching performances, and their feelings such as excitement, tension, fear during teaching have an effect on the development of their teaching efficacy beliefs. However, the effect of these hypothesized sources on teaching efficacy beliefs are not consistent in all

contexts and domains (Morris, 2010; Usher & Pajares, 2008). Therefore, investigating how the hypothesized sources contributed to teaching efficacy beliefs would provide insight on understanding the development of prospective teachers' teaching efficacy beliefs and teacher education programs might benefit from such studies.

In brief, the current study aims to investigate a group of Turkish prospective middle grades mathematics teachers' teaching efficacy beliefs and how well hypothesized sources predicts their teaching efficacy beliefs. In line with these purposes, the following research questions were sought in the current study:

- 1) How efficacious do Turkish prospective middle grades mathematics teachers feel themselves as a teacher? In which dimension(s) do they feel themselves mostly efficacious?
- 2) How well hypothesized sources of self-efficacy beliefs predict prospective middle grades mathematics teachers' teaching efficacy beliefs?

METHOD

Contexts and participants

The participants of the current study were conveniently selected 187 prospective middle grades mathematics teachers from two public universities in Ankara, Turkey. Middle grades Mathematics Education Programs are four-year programs designed to train prospective teachers for teaching middle grades (grades 5 to 8) mathematics in Turkish middle schools. The first two years of the program focus on mathematics courses and the last two years focus

Descriptive Information		Number of Prospective Teachers (N)	Percent (%)
Gender	Male	29	16
	Female	158	84
Methods 1 course	Yes	182	97
	No	5	3
Methods 2 course	Yes	85	46
	No	102	54
School Experience course	Yes	89	48
	No	98	52
Practice Teaching course	Yes	10	5
	No	177	95

Table 1: Information about participants

on pedagogical content knowledge and pedagogical knowledge courses. Two-semester methods (Methods 1 and Methods 2) of teaching mathematics courses are offered in the third year, and School Experience and Practice Teaching courses are offered in the fourth year of the program with very little actual teaching experience opportunities. Descriptive information about participants can be seen in Table 1.

Prospective teachers were also asked about their teaching experience. An important number of them (74%) indicated that they have a teaching experience mostly in the form of private tutoring. These teaching experiences are being a private tutor, being a math teacher in private teaching institutions, being a teacher in voluntary organizations/institutions or being an intern teacher in Practice Teaching course.

Data collection procedure and instruments

Data for the current study was collected in the final week of the fall semester of the 2013–2014 academic year. Prospective teachers were informed about the purpose of the study and only voluntary participants participated in the study. There were two data collection instruments called as “Teachers’ Sense of Efficacy Scale” (TSES) and “The Sources of Self Efficacy Inventory” (SOSI). These two scales were widely used in the teaching efficacy related literature and both of the scales were translated into Turkish before and validated. Therefore, the cultural bias is eliminated.

The first scale was TSES which was developed by Tschanen-Moran and Woolfolk Hoy (2001) and adapted into Turkish by Çapa, Çakıroğlu and Sarıkaya (2005). The scale was in 9 point Likert format and consisted of three dimensions. Sample items for these dimensions are given in Table 2.

In order to get validity evidence for the obtained data through TSES, confirmatory factor analysis was applied. According to analysis results, Root Mean Square Error of Approximation (RMSEA) value was

calculated as 0.080, Normed Fit Index (NFI) was found as 0.94, and Comparative Fit Index (CFI) was found as 0.97. Finding RMSEA value lower than 0.10, and CFI and NFI values close to 1 could be accepted as an indicator of good fit (Kelloway, 1998). Cronbach Alpha values were also calculated in order to interpret the reliability of the obtained data. For each TSES dimension and whole scale, it ranged from 0.74 to 0.93, which indicated satisfactory internal consistency (Pallant, 2007).

SOSI, which was developed in line with the sources of the self-efficacy in Social Cognitive Theory by Kieffer and Henson (2000), was used as the second data collection instrument. Therefore, these four hypothesized sources constituted the four dimensions of SOSI. This scale was adapted into Turkish by Çapa-Aydın, Uzuntiryaki-Kondakçı, Temli and Tarkın (2013). The scale is in 7 point Likert format and consisted of 27 items in four dimensions which are explained above. In order to have a better understanding of the scale, looking at the sample items from each dimension in Table 3 might be beneficial.

Confirmatory factor analysis was conducted in order to present a validity evidence for the data obtained through SOSI. Calculating RMSEA value lower than 0.10 (RMSEA = 0.085), NFI (0.86) and CFI (0.91) fit indices close to 1 was interpreted as satisfactory for the data fit (Kelloway, 1998). Furthermore, calculated Cronbach Alpha values for each SOSI dimension and whole scale ranged from 0.77 to 0.86, which indicated satisfactory reliability evidence (Pallant, 2007).

Data analysis procedure

In order to answer the first research question, data obtained through the administration of TSES were analyzed with descriptive statistics techniques and ANOVA. To investigate second research question, multiple regression analysis was conducted. Independent variables of the analysis were each dimension of SOSI. Dependent variable in multiple regression analysis

Dimension	Sample Item
Efficacy for Instructional Strategies	To what extent can you provide an alternative explanation or example when students are confused?
Efficacy for Classroom Management	How much can you do to control disruptive behavior in the classroom?
Efficacy for Student Engagement	How much can you do to get students to believe they can do well in school work?

Table 2: Sample of items of TSES

Dimension	Sample Item
Mastery Experiences	I became successful when trying to teach something to students.
Vicarious Experiences	I had chances to observe other teachers in class environment.
Verbal Persuasion	I often get feedback from experienced people about my teaching skills.
Physiological and Affective States	I get worried when I teach something wrong.

Table 3: Sample of items of SOSI

was all dimensions of TSES and overall teaching efficacy belief which was the total mean score obtained from TSES.

FINDINGS

Teaching efficacy beliefs

Descriptive analysis was conducted to explore the prospective mathematics teachers' teaching efficacy beliefs. Table 4 indicates mean values and standard deviations for participants' teaching efficacy beliefs scores for each dimension.

In TSES instrument, a rating of 7 out of 9 refers to the quite a bit efficiency on the given item, and 5 out of 9 refers to the some efficiency on the given item. Table 3 shows that mean values in the dimensions of teaching efficacy beliefs ranged from 6.3 to 6.6 out of 9. It might be inferred that participants felt efficacious themselves as a teacher. In order to understand whether there was a significant difference among dimensions of TSES, ANOVA was conducted. Before starting the analysis, all of the assumptions were checked and confirmed.

Findings of ANOVA indicated that there was a statistically significant difference among TSES dimensions (Wilks' Lambda = .88, $F(2, 185) = 13.24, p < .05$). As a

follow up test, paired sample t tests were conducted and results were evaluated using Holm's Sequential Bonferroni Procedure.

According to Bonferroni Procedure, "Efficacy for Instructional Strategies" ($M = 6.57, SD = .071$) was significantly different from "Efficacy for Student Engagement" ($M = 6.35, SD = .073$) and "Efficacy for Classroom Management" ($M = 6.35, SD = .074$). The magnitude of the mean differences among dimensions were respectively .10 and .09, which indicated moderate effect size. It means that prospective mathematics teachers felt mostly efficacious in "Efficacy for Instructional Strategies" dimension.

Prediction of teaching efficacy beliefs by hypothesized sources

In order to explore the how well hypothesized sources of self-efficacy beliefs predict participants' teaching efficacy beliefs, multiple regression analysis was conducted. Before starting the analysis, eleven assumptions addressed by Tabachnick and Fidell (2007) had been checked, and one outlier was eliminated from the data since it highly exceeds the critical value of Mahalanobis Distance. After assuring the assumptions, the analysis was conducted with .05 alpha level and pairwise deletion method.

	Mean	SD	Skewness	Kurtosis
Efficacy for Student Engagement	6.35	.073	-.49	.61
Efficacy for Instructional Strategies	6.57	.071	-.23	-.04
Efficacy for Classroom Management	6.35	.074	-.47	.86

Table 4: Descriptive analysis for teaching efficacy beliefs dimensions

Pairs	t	df	Sig.
Student engagement – Instructional strategies	- 4.55	186	.00
Classroom management – Instructional strategies	- 4.40	186	.00
Student engagement – Classroom management	.05	186	.96

Table 5: Paired sample t-tests

	R	R Square	Std. Error of the Estimate	Durbin-Watson	F	Sig.
Student Eng.	.63	.395	.79	1.87	29.59	.00
Instructional Str.	.63	.392	.76	1.81	29.21	.00
Class. Management	.56	.318	.84	1.92	21.10	.00
Total TSES	.66	.433	.70	1.84	34.58	.00

Table 6: Regression analysis

The examination of multiple regression analysis values from Table 6 indicated that the combination of hypothesized sources of teaching efficacy beliefs significantly predicted all dimensions of TSES and overall teaching efficacy beliefs. Moreover, explained variance in dependent variables ranged from 31.8% to 43.3%.

As shown in Table 7, *mastery experiences* and *physiological and affective states* significantly predicted all dimensions of TSES and overall teaching efficacy beliefs. To consider the Beta scores, *mastery experiences* made the strongest contribution to explaining the overall teaching efficacy and TSES dimensions. In addition, *physiological and affective states* made more contribution than *verbal persuasion* and *vicarious experiences* to explaining them. On the other hand, *verbal persuasion* and *vicarious experiences* did not significantly predict teaching efficacy beliefs.

DISCUSSION

The present study aimed to examine one group of Turkish prospective middle grades mathematics

teachers' teaching efficacy beliefs and how the hypothesized sources predict these teaching efficacy beliefs. The descriptive statistics results for TSES indicated that participants feel themselves efficacious in mathematics teaching. Relevant studies in the national context supported this finding. For instance, İşıksal and Çakıroğlu (2006) mentioned that prospective middle grade mathematics teachers' teaching efficacy level could be interpreted as high. In another study, Koç (2011) reported that prospective middle grades mathematics teachers had significantly higher teaching efficacy beliefs than prospective secondary mathematics teachers.

The current study also indicated that prospective mathematics teachers' teaching efficacy beliefs for instructional strategies were significantly higher than teaching efficacy for classroom management and student engagement. This might address that prospective mathematics teachers felt more competent and sophisticated in employing instructional strategies. Participants might have benefited from courses in teacher education program, especially from methods

		Student Eng.	Inst. Str.	Class. Management	Total TSES
Mastery Experiences (M = 5.09, SD = .78)	Beta	.60	.55	.47	.59
	T	6.53	6.04	4.80	6.62
	Sig.	.00	.00	.00	.00
Vicarious Experiences (M = 5.25, SD = .84)	Beta	.08	.08	.08	.09
	T	.77	.80	.79	.91
	Sig.	.44	.42	.43	.37
Verbal Persuasion (M = 5.39, SD = .94)	Beta	-.06	-.01	.03	-.02
	T	-.74	-.13	.31	-.21
	Sig.	.46	.89	.76	.84
Physiological and Affective States (M = 4.66, SD = 1.05)	Beta	-.14	-.18	-.16	-.17
	T	-2.42	-3.02	-2.54	-3.04
	Sig.	.02	.00	.01	.00

Table 7: Coefficients

of teaching mathematics courses, in which they learnt using different instructional strategies for teaching mathematics. On the other hand, mean scores of efficacy for classroom management and student engagement dimensions were relatively lower than efficacy for instructional strategies. It might be the case that the lack of participants' experience in real classroom environment resulted in relatively lower scores in these dimensions. Although a considerable part of participants (74%) had a teaching experience, most of these experiences were private tutoring in a one-to-one context, not in a classroom. Offering teaching experience courses not only in the last year, but also in the previous years might be beneficial for prospective teachers to improve their teaching efficacy for classroom management and student engagement.

Multiple regression analysis indicated that combination of hypothesized sources significantly predicted overall teaching efficacy belief and all dimensions of TSES. Therefore, it could be stated that the analysis results were in line with the theory. However, apart from the hypothesized sources, there might be other sources for teaching efficacy beliefs. To give an example, content knowledge (Can, 2015), invitations send and received by the individuals (Usher & Pajares, 2008), and personal characteristics and motivation for teaching (Poulou, 2007) might be additional sources which are mentioned in some of the related studies. Hypothesized sources might be supported with such additional sources in the further studies.

When the individual contribution of hypothesized sources are investigated, it was seen that mastery experiences and physiological and affective states significantly predicted teaching efficacy beliefs in all dimensions of TSES and in overall teaching efficacy beliefs. As hypothesized by Bandura (1997), mastery experiences are the most influential source for self-efficacy beliefs. Studies in the literature also consistently show that mastery experiences are the best predictor of teaching efficacy beliefs (Morris, 2010). Therefore, the results of the current study could be interpreted as in consistency with the theory and practical studies in the literature and highlights the importance of mastery experience for teaching efficacy beliefs. In line with this finding, it is possible to claim that there is a need to create environments which provide mastery experiences for prospective teachers during their training. The teaching experience courses can be enhanced for prospective teachers to include more actu-

al teaching experience, and new courses in which they will have opportunities to improve their teaching experiences can be designed. However, when designing these courses, it should be beneficial to bear in mind that prospective teachers should be in a supportive environment during these experiences (Knoblauch & Woolfolk Hoy, 2008). When they do not have support from their mentors and instructors from the university, and when they do not have enough resources to improve their practices, mastery experiences do not become an improving source for prospective teachers' teaching efficacy beliefs as seen in Knoblauch and Woolfolk Hoy's study (2008).

Although mastery experiences consistently predict teaching efficacy beliefs in the related literature, there is not a consistent result for the other three hypothesized sources (Usher & Pajares, 2008). In the current study, it was seen that physiological and affective states significantly predicted teaching efficacy beliefs of prospective teachers unlike some findings in the related literature. For instance, in their study Mulholland and Wallace (2001) stated that physiological and affective states contributed to a novice teachers' efficacy beliefs less than the other three hypothesized sources. Similarly, Poulou (2007) mentioned that physiological and affective states are the least influential source among other sources. Such findings cause to neglect the possible contribution of physiological and affective states on teaching efficacy beliefs. However, such results might derive from the difficulty of measuring physiological and affective states source and some measurement errors rather than the nonsexist contribution of this source on teaching efficacy beliefs (Usher & Pajares, 2008). The findings of current study and the study of Morris (2010) support this claim and show that physiological and affective source should be taken into consideration while investigating teaching efficacy beliefs.

While investigating physiological and affective state source, feelings of anxiety and/or stress are generally interpreted as negative for the development of teaching efficacy beliefs. However, Bandura (1997) stated that some degree of such feelings might positively contribute to teaching efficacy beliefs. The study of Morris and Usher (2011) also supported this claim and showed that even award winning professors feel some anxiety and stress before their lessons, but they are able to overcome this feelings during lessons which in turn enhance their teaching efficacy beliefs. In this

study, the calculated mean score for the physiological and affective state source indicates that participants occasionally feel anxiety, stress and tension while teaching. However, whether these feelings affected their teaching efficacy beliefs in a positive way or in a negative way remained unclear. Therefore, qualitative follow up studies might be beneficial while investigating how physiological and affective states affected teaching efficacy beliefs (Usher & Pajares, 2008).

According to multiple regression analysis results, vicarious experience and verbal persuasions did not significantly predict teaching efficacy beliefs of prospective teachers. However, Bandura (1997) stated that hypothesized sources are highly related with each other. In such situations, independent contribution of verbal persuasion and vicarious experiences in multiple regression might be over shaded by mastery experience (Usher & Pajares, 2008), which might be the case in the current study. Therefore, there is a need for the further study in order to clarify how the vicarious experiences and verbal persuasions are internalized by prospective teachers in terms of teaching efficacy.

Limited number of participants and non-random sampling method limits the generalizability of the observed results in the present study. Therefore, it is suggested to replicate the study with different samples in order to improve the generalizability. Furthermore, when the issue is how the hypothesized sources contributed to teaching efficacy beliefs, supporting quantitative analyses with qualitative analyses would be beneficial to undermine the limitations of quantitative measurement on hypothesized sources (Usher & Pajares, 2008). Therefore, mixed method studies are suggested as a further study. Future research studies may also focus on possible teacher education program experiences in which prospective teachers' teaching efficacy beliefs are likely to improve and how these beliefs and their sources change during the teacher education program.

REFERENCES

- Ashton, P. T., & Webb, R. B. (1986). *Making a difference: Teachers' sense of efficacy and student achievement*. New York: Longman.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

- Can, H. (2015). Sources of teaching efficacy beliefs in pre-service science teachers. *Elementary Education Online*, 14(1), 358–373. doi: 10.17051/ieo.2015.84390
- Çapa, Y., Çakıroğlu, J., & Sarıkaya, H. (2005). The development and validation of Turkish version of teachers' sense of efficacy scale. *Education and Science*, 30(137), 74–81. Retrieved from <http://egitimvebilim.ted.org.tr>
- Çapa-Aydın, Y., Uzuntiryaki-Kondakçı, E., Temli, Y., & Tarkin, A. (2013). Özyeterlik kaynakları ölçeğinin Türkçe'ye uyarlanması. *İlköğretim Online*, 12(3), 749–758. Retrieved from <http://ilkogretim-online.org.tr>
- İşıksal, M., & Çakıroğlu, E. (2006). İlköğretim matematik öğretmen adaylarının matematiğe ve matematik öğretimine yönelik yeterlik algıları. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 31, 74–84. Retrieved from <http://www.efdergi.hacettepe.edu.tr>
- Kelloway, K. E. (1998). *Using Lisrel for structural equation modeling: A researcher's guide*. London: Sage.
- Kieffer, K. M., & Henson, R. K. (2000, April). *Development and validation of the sources of self-efficacy inventory (SOSI): Exploring a new measure of teacher efficacy*. Paper presented at the annual meeting of the National Council on Measurement in Education, New Orleans, LA.
- Knoblauch, D., & Woolfolk Hoy, A. (2008). "Maybe I can teach those kids." The influence of contextual factors on student teachers' efficacy beliefs. *Teaching and Teacher Education*, 24(1), 166–179. Retrieved from <http://www.journals.elsevier.com/teaching-and-teacher-education>
- Koç, Y. (2011). An investigation of the effect of department and years spent in the program on prospective teachers' mathematics teaching efficacy beliefs. *Education and Science*, 36(160), 213–223. Retrieved from <http://egitimvebilim.ted.org.tr>
- Morris, D. B. (2010). *Sources of teaching self-efficacy: A scale validation*. (Unpublished doctoral dissertation). Emory University, Atlanta, Georgia.
- Morris, D. B., & Usher, E. L. (2011). Developing teaching self-efficacy in research institutions: A study of award-winning professors. *Contemporary Educational Psychology*, 36(3), 232–245. Retrieved from <http://www.journals.elsevier.com/contemporary-educational-psychology>
- Mulholland, J., & Wallace, J. (2001). Teacher induction and elementary science teaching: enhancing self-efficacy. *Teaching and Teacher Education*, 17(2), 243–261. Retrieved from <http://www.journals.elsevier.com/teaching-and-teacher-education>
- Pallant, J. (2007). *SPSS survival manual: A step by step guide to data analysis using SPSS for windows* (3rd edition). Berkshire, England: Open University Press.

- Poulou, M. (2007). Personal teaching efficacy and its sources: Student teachers' perceptions. *Educational Psychology, 27*(2), 191–218. doi:10.1080/01443410601066693
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston: Allyn & Bacon.
- 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 Middle Grades School Journal, 110*(2), 228–245. doi: 10.1086/605771
- Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: capturing an elusive construct. *Teaching and Teacher Education, 17*(7), 783–805. Retrieved from <http://www.journals.elsevier.com/teaching-and-teacher-education>
- Usher, E. L. (2009). Sources of middle school students' self-efficacy in mathematics: A qualitative investigation. *American Educational Research Journal, 46*(1), 275–314. doi: 10.3102/0002831208324517
- Usher, E. L., & Pajares, F. (2008). Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research, 78*, 751–796. doi: 10.3102/0034654308321456