Factorial Validity and Reliability of Teacher's Self-Efficacy among Omani Teachers: Invariance across Gender

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Abstract

The aim of this study was to examine the factor structure of the Teachers Sense of Self-efficacy Scale. Three factors are assumed to represent the self-efficacy: student engagement, effective strategies and classroom management. Testing the reliability of each construct is another aim of this study. To achieve the aims of the study, a stratified random sample (N = 2446) of Omani teachers was drawn. The Teachers' Sense of Efficacy Scale was administered to teachers in their schools. The scale has 24 items with 8 items for each of the three subscales. Exploratory factor analysis was performed on half of the sample and produced three factors. Confirmatory factor analysis was performed on the other half. The model fit to data was good. Invariance of structure was tested across gender. The parameters of the model were invariant across gender. Consequently, the two genders were compared via multivariate analysis of variance (MANOVA) with gender as independent variable and the three subscales as dependent variables. Female teachers were more efficacious than male teachers in engaging students and teaching strategies; while male teachers were more efficacious than female teachers in classroom management. The study concluded that the scale can be validly used for assessment and research purposes.

Keywords: teacher self-efficacy, Omani teachers, confirmatory factor analysis.

الصدق العاملي لمقياس الفعالية الذاتية لدى المعلمين العمانيين: تشابه البنية العاملية عبر الجنس

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الملخص

هدفت الدراسة الحالية إلى فحص البنية العاملية لمقياس الفعالية الذاتية للمعلمين. وقد تم افتراض ثلاثة عوامل تمثل الفعالية الذاتية وهي: تحفيز الطلبة، واستراتيجيات التدريس وإدارة الصف. كما هدفت الدراسة إلى فحص الثبات لكل عامل من العوامل الثلاثة. ولتحقيق أهداف الدراسة تم اختيار عينة عشوائية طبقية من المعلمين العمانيين في المدارس الحكومية (ن = ٢٤٤٦). وتم تطبيق مقياس الفعالية الذاتية للتدريس على المعلمين في مدارسهم. يتكون المقياس من ٢٤ فقرة ثماني فقرات تقيس كل بعد. أجري التحليل العاملي الاستكشافي على نصف أفراد العينة وأفرز التحليل ثلاثة عوامل. كما أجري التحليل العاملي التوكيدي على النصف الثاني من العينة. وقد ثبت أن النموذج الثلاثي يتمتع بجودة عالية من الملاءمة مع البيانات. اختبرت الدراسة اختلاف البناء لدى كل من المعلمين الذكور والإناث؛ وقد كانت معالم النموذج كلها جوهرية ومؤشرات جودة الملاءمة كلها في المدى المقبول. بناء على ذلك تم توظيف تحليل التباين المتعدد حيث كان الجنس المتغير المستقل والعوامل الثلاثة المتغيرات التابعة. وقد بين التحليل وجود فروق جوهرية لصالح المعلمات في فعالية تحفيز الطلبة واستخدام استراتيجيات تدريس فعالة، في حين كان المعلمون الذكور أكثر فعالية في إدارة الصف. وقد استنتجت الدراسة أن المقياس يمكن أن يستخدم في البيئة العمانية لأغراض البحث والتقويم.

الكلمات المفتاحية: الكفاية الذاتية للمعلمين، المعلمون العمانيون، التحليل العاملي التوكيدي.

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Introdaction

Teacher self-efficacy is an important psychological state by which teachers can handle the stress of teaching. Teachers› self-efficacy can be conceptualized as the beliefs about one's ability to plan, organize, and carry out activities required to attain some educational goals. Also, cumulative research shows that teachers' efficacy beliefs represent an important factor in teachers' ability to teach (Bandura, 1997; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). The findings suggest that the effects of teachers' efficacy beliefs go in two ways: influencing teachers' behavior and impacting students' outcomes.

Bandura's social cognitive theory represents the basis in which teachers' efficacy beliefs research is formed. Bandura (1997) defines efficacy beliefs as the "belief in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). In the context of teaching, Tschannen-Moran et al. (1998) define teachers' efficacy beliefs as teachers' beliefs about his/her ability to produce positive teaching outcomes. While there were several theoretical frameworks used in efficacy research (e.g., Rotter's locus of control, Tschannen-Moran & Woolfolk Hoy, 2001), the majority of studies in this area used Bandura's social cognitive theory as a framework to conceptualize teachers' efficacy belief construct.

Beside this research that focused on teachers' characteristics in relation to their efficacy beliefs, other studies examined the connections between

teachers' efficacy beliefs and students' outcomes. For example, Midgley, Feldlaufer, and Eccles (1989) found that students' math expectancies, perceived performance, perceptions of task difficulty were influenced by their transition from high to low-efficacy math teachers. Using preschool teachers' self-efficacy, Guo, Piasta, Justice and Kaderavek (2010) found that teachers' self-efficacy predicted children's academic gains and that children's higher in vocabulary gains were those who study in classes of high efficacious teachers and high levels of emotional support.

Furthermore, research has looked at possible factors influencing teachers' levels of efficacy beliefs. Bandura (1997) hypothesized four sources of efficacy beliefs that include enactive mastery experience, social persuasion, affective status, and vicarious experiences. Empirically, O'Neill and Stephenson (2012) examined these sources and found that for pre-service teachers, enactive mastery experiences and verbal persuasion got the highest mean score of influence among the four sources. These two sources of efficacy beliefs loaded on one component with the other two sources loaded on separate factorial components.

Bursal (2009) found that pre-service teachers' science/math efficacy beliefs were predicted by high school scores in math and science for a Turkish sample. Providing contexts that help teachers in acquiring difficult tasks is more likely to enhance their self-efficacy (Mackay & Parkinson, 2010). Using qualitative design, Wyatt (2010) concluded that providing teachers with more hands-on practice in conducting teaching tasks is more likely to enhance teachers' efficacy beliefs; micro-teaching modules can be a good context for these hands-on practices. Similarly, Guven and Cakir (2012) found that primary school English teachers' self-efficacy beliefs were influenced by their educational background. Teachers who had taken courses related to teaching English to children and those who graduated from English teaching department had higher levels of efficacy beliefs than those who did not take courses related to teaching English or those who graduated from department other than English teaching. In contrast, lack of coursework preparation in specific teaching tasks resulted in low levels of pre-service teachers' efficacy beliefs (O'Neill & Stephenson, 2012).

In contrast, Tuchman and Isaacs (2011) and Main and Hammond (2008)

(both as cited in O'Neill and Stephenson, 2012) found no significant connection between teachers' efficacy beliefs and prior experiences. Similarly, Tran et al. (2012) found no relation between self-efficacy and teaching experience. Teachers' efficacy for classroom management was predicted by a group of variables including teachers' motivation, enactive mastery experiences, personality characteristics, social persuasion and affective state (Oh, 2011). Tran et al. (2012) argued that teachers feel a sense of efficacy as they see they students are learning. In Oman, girls are better learners than boys. Girls outperformed boys in almost every school subject. For example, girls scored higher than boys in international exam such as TIMSS and PISA. Consequently, we argue here that female teachers would be more efficacious than male teachers.

A prerequisite to investigating relations of self-efficacy with other variables is to have a valid and reliable instrument that can measure self-efficacy. In Oman as well as in many Arab countries, such instrument is not available. It is important that an instrument that measures teacher's self-efficacy is made available. The aim of this paper was to test the validity and reliability of the Teachers' Sense of Efficacy Scale among Omani public school teachers. Since self-efficacy is a latent construct that cannot be directly observed, rigorous scrutiny is required for its validity to be established. Specifically, the structure of self-efficacy will be tested. Also, the similarity of structure across gender will be tested. The reliability of the sense of efficacy scale and sub-scales will be estimated via Cronbch's alpha.

METHOD
Sample
A representative stratified (gender by directorate) sample of Omani teachers (N= 2446; male = 997, female = 1449) was randomly drawn from the eleven school directorates in the Sultanate of Oman. The population from which the sample was drawn was about 17000 teachers. The average experience at present school was 6.16 (SD = 4.28) years; and the average workload was 15.66 (SD = 4.28) classes per week.

Instrument

The Teachers' Sense of Efficacy Scale (Tschannen-Moran, & Woolfolk Hoy, 2001) was administered to Omani teachers as part of a large scale study. The Teachers' Sense of Efficacy Scale is composed of 24 items that measure three factors: efficacy in student engagement (8 items, œ = .84), efficacy in instructional practices and strategies (8 items, œ = .85), and efficacy in classroom management (8 items, œ = .84). The items that measure each subscale are as follows (see Table 1):

Efficacy in Student Engagement: Items 1, 2, 4, 6, 9, 12, 14, 22.
Efficacy in Instructional Strategies: Items 7, 10, 11, 17, 18, 20, 23, 24.
Efficacy in Classroom Management: Items 3, 5, 8, 13, 15, 16, 19, 21.

Data Analysis

Preliminary exploratory factor analysis (EFA) was initially performed with half of the sample (N = 1119, the difference is due to missing data). Confirmatory factor analysis (CFA) was then conducted to test the a priori 3-factor model as a structure of the TSES. The other half of the sample was used for this analysis. Multisample CFA was then conducted as gender was the grouping variable. Comparison of results across different populations requires strong assumptions about the invariance of the factor structure. If the underlying factors differ fundamentally in different groups, then there is no basis for interpreting observed differences. For example, in cross-population (e.g., gender) studies, interpretation of even relations among different constructs presupposes that the factors are the same across populations. In the present investigation, we considered invariance across gender. Measurement invariance is an important component of construct validation and a pre-requisite to any variance-covariance and mean-level comparisons across subpopulations (i.e. gender). Hence, we leave as open research question whether there is support for the invariance of factor loadings (weak invariance), item intercepts (strong invariance), factor correlations, in relation to gender, and whether the relative support for invariance differs across gender.

The maximum likelihood method was used to analyze the data. Because the œ 2 statistic is widely known to be sensitive to sample size, we also

evaluated model fit using the comparative fit index (CFI), and the root mean square error of approximation (RMSEA) that have been recognized to be least affected by sample size (Dimitrov, 2010). According to Hu and Bentler (1999), an acceptable and good model fit are indicated by CFI values above .90 and .95, respectively; and when the RMSEA value is ideally below .06. The most commonly used goodness-of-fit index for invariance tests has been difference in chi square (Δx^2). However, Cheung and Rensvold (2002) and Dimitrov (2010) found that chi-square is highly sensitive to large sample size. They proposed that ΔCFI or ΔTLI are robust statistics for testing between-group invariance models when the sample size is large. They suggested that a value of smaller than or equal to .01 shows that the null hypothesis of invariance should not be rejected.

Results

Factor structure of Teacher's Sense of Efficacy Scale: Three factors were specified and then extracted using EFA. The three factors explained about 49.61% of the total variance. Table 1 shows the pattern matrix of factor loadings. Loadings in bold indicate the assumed loadings and light loadings indicate loadings on non-respective factors. All loadings on the respective factors were significant except items 5 and 8.

Table 1
EFA Pattern Matrix for the Items of Teachers' Sense of Efficacy Scale

	Subscales		
	Student Engagement	**Classroom Management**	**Instructional Strategies**
1. How much can you do to get through to the most difficult students?	0.654		
2. How much can you do to help your students think critically?	0.502		
3. How much can you do to control disruptive behavior in the classroom?		0.778	
4. How much can you do to motivate students who show low interest in school work?	0.631		
5. To what extent can you make your expectations clear about student behavior?	0.315		

Table 1

	Subscales		
	Student Engagement	Classroom Management	Instructional Strategies
6. How much can you do to get students to believe they can do well in school work?	0.555		
7. How well can you respond to difficult questions from your students?			-0.663
8. How well can you establish routines to keep activities running smoothly?			-0.377
9. How much can you do to help your students value learning?	0.560		
10. How much can you gauge student comprehension of what you have taught?			-0.482
11. To what extent can you craft good questions for your students?			-0.705
12. How much can you do to foster student creativity?	0.600		-0.336
13. How much can you do to get children to follow classroom rules?		0.727	
14. How much can you do to improve the understanding of a student who is failing?	0.723		
15. How much can you do to calm a student who is disruptive or noisy?		0.772	
16. How well can you establish a classroom management system with each group of students?		0.516	
17. How much can you do to adjust your lessons to the proper level for individual students?	0.347		-0.506
18. How much can you use a variety of assessment strategies?			-0.559
19. How well can you keep a few problem students form ruining an entire lesson?		0.660	
20. To what extent can you provide an alternative explanation for example when students are confused?			-0.647
21. How well can you respond to defiant students?		0.484	

Table 1

	Subscales		
	Student Engagement	**Classroom Management**	**Instructional Strategies**
22. How much can you assist families in helping their children do well in school?	0.638		
23. How well can you implement alternative strategies in your classroom?			-0.610
24. How well can you provide appropriate challenges for very capable students?			-0.638

Note. Loadings less than .30 are omitted for clarity.

Confirmatory factor analysis (CFA). Fit indices were adequate but two of the items that measure classroom management had low loadings (items 5 and 8). After removing items 5 and 8 the fit indices were: x^2 (206, n = 1193) = 828.186, CFI = 0.930, RMSEA = 0.050.

Invariance across gender: The three-factor model was then fitted to data after omitting the two items and the fit indices improved markedly with the multisampling analysis. The fit indices are shown in Table 1: for M1, the unconstrained model, x^2 (412) = 1066.921, p < 0.000, CFI = 0.926, RMSEA = 0.037. With factor loadings constrained to be equal across gender (M2), x^2 (431) = 1091.343, p < 0.000, CFI = 0.926, RMSEA = 0.036 (ΔCFI = .000) indicating that factor loadings were invariant across gender and constrained model (M2) was as good as the unconstrained model (M1). Even the most restricted model (M5) that assumed invariance in measurement residuals produced an acceptable fit (x^2 (481) = 1288.428, p < 0.000, CFI = 0.909, RMSEA = 0.038, ΔCFI = 0.002).

Table 2
Goodness of Fit Indexes of Simultaneous Analysis across Gender

Model	χ^2	DF	P	CFI	RMSEA
M1. Unconstrained	1066.921	412	0.000	0.926	0.037
M2. Measurement weights	1091.343	431	0.000	0.926	0.036
M3. Measurement intercepts	1234.001	453	0.000	0.912	0.038

Table 2

Model	χ^2	DF	P	CFI	RMSEA
M4. Structural covariances	1248.781	459	0.000	0.911	0.038
M5. Measurement residuals	1288.428	481	0.000	0.909	0.038
Saturated model	0.000	0		1.000	0.121
Independence model	9378.517	506	0.000	0.000	

Note. CFI: Comparative fit index; RMSEA: Root mean square error of approximation

Factor loadings (range 0.50 to 0.76), measurement intercepts, structural covariances and measurement residuals were all substantial and invariant across gender. That is, the structure of self-efficacy is similar in men and women teachers. The average of common metric correlations among the three factors was .713 (see Figure 1) indicating a strong association among the three factors. The structure as proposed by the developer of the instrument is generalizable to settings other than the one it was originated in. Hence, it can be used for research and assessment purposes.

Comparison of Self-efficacy by Gender: Multivariate analysis of variance (MANOVA) was conducted with gender as the independent variable and the three subscales of self-efficacy as dependent variables. The results of MANOVA revealed that male and female Omani teachers don't perceive their efficacy equally in the three sub-domains of self-efficacy (Lambda (3, 2217) = 0.965, p < 0.000, squared eta = 0.035). Table 2 shows the means and standard deviations of each of the subscales by gender. As can be seen in Table 3, female teachers were more efficacious than male teachers in engaging and motivating students. Also, female teachers were more efficacious than male teachers in teaching strategies; while male teachers were more efficacious than female teachers in dealing with difficult students and classroom management.
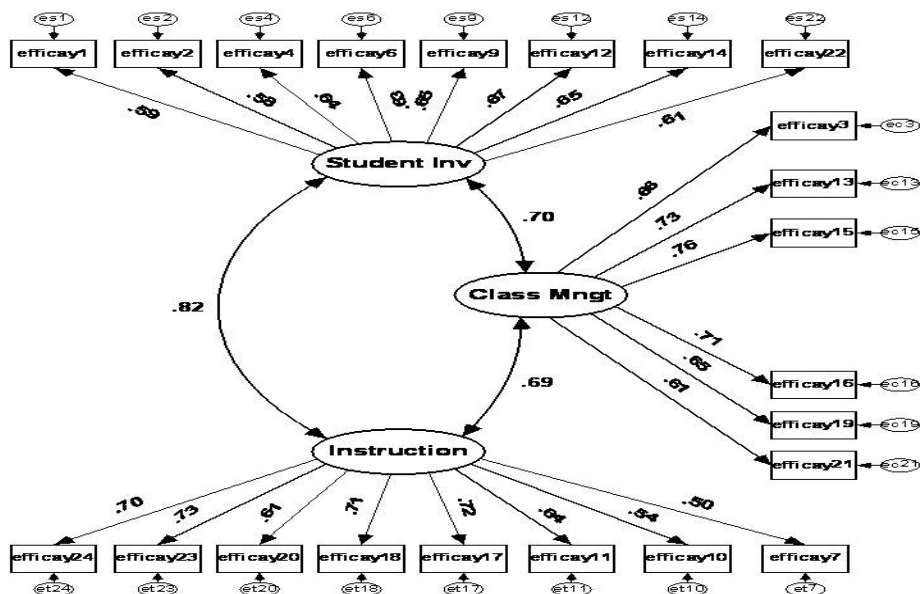
621

Figure 1
Common Metric Estimates of Factor Loadings and Factor Correlations
for the Teachers' Sense of Efficacy Scale

With these results, the Teachers' Sense of Efficacy Scale can be used to assess teachers' self-efficacy of Omani teachers. Also, based on structure invariance across gender, it is acceptable that mean comparisons on each of the three subscales be made as well as the full scale.

Table 3
Mean, Standard Deviation, and F Statistics of Differences in Self-Efficacy
Subscales among Omani Male and Female Teachers

SE Subscales	Sex	N[a]	Mean	Std. Deviation	F
Motivating students	Male	899	33.11	5.24	16.11*
	Female	1322	33.95	4.51	
Classroom management	Male	899	24.88	3.68	7.34*
	Female	1322	24.47	3.27	
Teaching & instructional strategies	Male	899	35.98	4.75	17.55*
	Female	1322	36.77	4.08	

a N is not the same as in the original sample because of some missing data. * p < .01

DISCUSSION

This study supports the conceptualization of teacher self-efficacy as a multidimensional construct and shows that the Teachers Self-Efficacy Scale can be a useful measure of the construct for Omani teachers. The subscales were somewhat strongly correlated as found by Skaalvik & Skaalvik (2010). Also, the factor loadings (i.e., the validity of the items) and item intercepts as well as factor correlations were invariant across gender indicating that the items and constructs have similar psychometric characteristics. As a result of similarity in the instrument structure across gender, subscale means and even correlations can be compared across gender.

Female teachers showed more efficacies in engaging students and in teaching strategies while male teachers believed they were better in managing the classroom. This result is not surprising in the Omani society since female teachers who join the profession are of diverse academic background and those who score high in high school. In comparison, male teachers who join the profession are those who were not able to enter other professions such as medicine, engineering or business. These professions are not easily accessible to females in the Omani society. In fact, male teachers refrain from entering the teaching profession, while high achieving females opt to the teaching profession. Abu-Hilal, Aldhafri, Kilani, Kazem, Al-Qaryouti and Alkharusi (2014) reported that female Omani teachers scored higher than male Omani teachers in IQ vocabulary and matrix reasoning tests. Also, Abu-Hilal et al. (2014) reported that female teachers were less burned out than male teachers. Socially, teaching is more acceptable for females than other professions such as medicine, engineering, business and nursing. Families have a strong saying in the future of girls and sometimes decide the kind of study the girl should pursue. Female teachers in Oman report less absenteeism than male teachers. They teach more classes than male teachers. Abu-Hilal et al. (2014) reported that students evaluate female teachers more favorably than male teachers. Tran et al. (2013) argued that teachers who have more interaction with students are more efficacious and are liked more by their students. Female Omani teachers indicated that they are more efficacious

than male teachers in engaging students. This result is not surprising since women are known to be more affectionate and caring than men.

Conclusion and Recommendations

The results of this study attested the construct validity of the Teachers' Sense of Efficacy Scale. Furthermore, the construct validity was also evidenced in the invariance structure. The items of the instrument proved to be valid in measuring what they were supposed to measure. Also, the reliability estimates were good. Therefore, the instrument can easily and readily be used for research purposes and assessment. It is recommended that this instrument be used with other variables such as subject matter to see if teachers in different subjects have different levels of efficacy.

References

Abu-Hilal, M., Aldhafri, S., Kilani, H., Kazem, A., Al-Qaryouti I., & Alkharusi, H. (2014). *Evaluation of teachers in Public Schools in the Sultanate of Oman: A Study in Quality.* Technical report, Sultan Qaboos University.

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

Bursal, M. (2009). Turkish preservice elementary teachers' self-efficacy beliefs regarding mathematics and science teaching. *International Journal of Science and Mathematics Education, 8,* 649-666.

Cheung, G., & Rensvold, R. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9,* 233-255. doi: 10.1207/S15328007SEM0902_5

Dimitrov, D. (2010). Testing for factorial invariance in the context of construct validation. *Measurement and Evaluation in Counseling and Development, 43,* 121-149.

Guo, Y., Piasta, S., Justice, L., & Kaderavek, J. (2010). Relations among preschool teachers' self-efficacy, classroom quality, and children's language and literacy gains. *Teaching and Teacher Education, 26,* 1094-1103.

Guven, S. & Cakir, O. (2012). A study on primary school English teachers' self-efficacy beliefs. *Education and Science, 37,* 163.

Mackay, J., & Parkinson, J. (2010). Gender, self-efficacy and achievement among South African technology teacher trainees. *Gender and Education, 22*(1), 87-103.

Midgley, C., Feldlaufer, H., & Eccles, J. (1989). Change in teacher efficacy and student self- and task-related beliefs in mathematics during the transition to junior high school. *Journal of Educational Psychology, 81*(2), 247-258. doi: 10.1037/0022-0663.81.2.247

Oh, S. (2011). Preservice teachers' sense of efficacy and its sources. *Psychology, 2*(3), 235-240.

O'Neill, S., & Stephenson, J. (2012). Exploring Australian pre-service teachers sense of efficacy, its sources, and some possible influences. *Teaching and Teacher Education, 28,* 535-545.

Soodak, L, & Podell, D. (1993). Teacher efficacy and student problem as factors in special education referral. *Journal of Special Education, 27*(1), 66-81.

Soodak, Podell, D., & Lehman, L. (1998). Teacher, student, and school attributes as predictors of teachers' responses to inclusion. *The Journal of Special Education, 31*(4), 480-497.

Tran, N., Schneider, S., Duran, L., Conley, A., Richland, L., Burchinal, M., Rutherford, T., Kibrick, M., Osborne, K., Coulson, A., Antenore, F., Daniels, A., & Martinez, M. (2012). The effects of mathematics instruction using spatial temporal cognition on teacher efficacy and instructional practices. *Computers in Human Behavior, 28,* 340-349.

Tschannen-Moran, M., & Woolfolk Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching & Teacher Education, 17,* 783-805.

Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68,* 202-248.

Wyatt, M. (2010). An English teacher's developing self-efficacy beliefs in using group work. *System, 38,* 603-613.