The Construct Validation of the Teachers' Efficacy Scale in the Malaysian Context

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Abstract

Teacher efficacy, best explained in terms of student engagement, instructional strategies and classroom management, gives a great impact on student outcomes. The aim of the paper is to examine the underlying factors explaining teacher efficacy construct in the Malaysian context and thus validate the Teachers' Sense of Efficacy Scale (TSES), developed by Tschannen-Moran & Woolfolk Hoy (2001). A sample of 125 teachers comprising a combination of regular primary, secondary and government sponsored boarding school teachers was administered a bilingual Teachers' Sense of Efficacy Scale. The scale consisted of 24 items, equally divided into 8 items under each factor. The results of principal component analysis yielded five factors – three original ones and two additional subscales. However, the results did not support the notion that this efficacy measure has a stable factor structure. There are likely more factors than what have been recommended by Tschannen-Moran and Woolfolk Hoy (2001) before. This might due to the variation in the demographic characteristics of the sample. 62.89 % of the variation in the traits was explained by the five factors. It is concluded that the variability in factor solutions might due to different sample and context.

Keywords: Teacher Efficacy, Student Engagement, Instructional Strategies, Classroom Management, Principal Component Analysis

Introduction

Teacher efficacy has been given much attention as research has shown that teacher self-efficacy is consistently related to positive teaching and student learning outcomes (Tschannen- Moran & Woolfolk Hoy, 2001; Gibson & Dembo, 1984 as cited in Penrose, Perry & Ball, 2007). High efficacious teachers can motivate their students and thus enhance their cognitive development. Gibson and Dembo (1984) found that teachers with high efficacy were better able to keep students engaged in learning activities and "spent more time monitoring and checking seat-work" (as cited in Penrose et al. 2007). Moreover, greater efficacy also allows teachers to be less critical of students when they make errors (Ashton & Webb, 1986 as cited in Tschannen-Moran & Woolfolk Hoy, 2002) and to work longer with a student who is struggling (Gibson & Dembo, 1984 as cited in Tschannen-Moran & Woolfolk Hoy, 2002).

Evidence also suggest that teacher beliefs drive instructional pedagogy (Pajares,1992; Richardson, 1996; Thompson, 1992 as cited in Witcher et al, 2006). Teachers with strong efficacy tend to display greater levels of planning, organization and enthusiasm (Allinder, 1994 as cited in Tschannen - Moran & Woolfolk Hoy, 2002). Thus, identifying and

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understanding not only teachers' belief and its antecedents but also the ways to enhance it have great impact on student outcomes.

Best fits to Bandura's definition, Tschannen-Moran (1998) defined teachers' sense of efficacy as 'the teacher's beliefs in his or her capability to execute courses of action required to successfully accomplish a specific teaching task in a particular context' (as cited in Heneman III, Kimball, and Milanowski, 2006). This new model is firmly rooted in Bandura's construct of self efficacy (1977, 1986, and 1997). The Tschannen-Moran et al. (1998) proposed a model in which the teacher's analysis of teaching tasks and assessment of personal teaching competence underpinned the level specificity of teachers' sense of efficacy. Thus, the Teachers' Sense of Efficacy Scale was clearly intended to measure teacher self-efficacy within the teaching role rather than in the context of student achievement.

Statement of Problem

Less is known about what really affects and develops teacher efficacy as the conceptualization of the construct of efficacy itself vary, or is not conclusive. What more is the validity and reliability, and contextual applicability of the teacher efficacy measures are questionable (Tschannen-Moran & Woolfolk Hoy, 2001).This has led to the development of a new measure of teacher efficacy, called "Ohio State Teacher Efficacy Scale" (OSTES), that was rigorously refined and reduced, from 52-item a 24-item and a 12- item instrument using principal-axis factoring. Tschannen-Moran and Hoy (2001) conclude that these measures could be reasonably valid and reliable; moreover, the three dimensions of efficacy for instructional strategies, student engagement and classroom management represent the richness of teachers' work lives and fulfill the requirement of good teaching (Tschannen-Moran and Woolfolk Hoy, 2001 as cited in Heneman III, Kimball, and Milanowski, 2006).

Several studies verify that the TSES has a unified and stable factor structure measuring the three subscales. Using OSTES, Smith (2002) in his correlational study of teacher efficacy and school performance revealed the same three factors that the original authors of the scale produced (Factor 1- Classroom Management, Factor 2 - Student Engagement and Factor 3 – Student Engagement). This proves that TSES is both reliable and valid.

However, when some kind of modification made on TSES, the results might produce different picture. The three subscales of TSES encompass teachers' sense of personal teaching efficacy but not general teaching efficacy. To address both, Koehler (2006) added six additional questions to measure the General Teaching Efficacy construct with the aim to evaluate teachers' beliefs in their abilities to overcome students' factors such as students' family background, previous education, and special education status and the analysis yielded four factors accounting for 52% of the total variance and successfully retained two of the three TSES subscales (i.e. Efficacy for Instructional Strategies and Efficacy for Classroom Management).

What more when the instrument was to be employed in the local setting, the factor structure again was expected to be unstable as the measure would be applied particularly to a

diverse background. Thus, the purpose of this paper is to examine the underlying factors explaining teacher efficacy construct in Malaysian context and thus validate the Teachers' Sense of Efficacy Scale (TSES), developed by Tschannen-Moran & Woolfolk Hoy (2001) by demonstrating that its constituent items load on the same factor. The research questions to be addressed are:

1. What constructs accounts for variance in teachers' sense of efficacy?

2. Do the constituent items under each dimension load on the same factors with respect to student engagement, instructional strategies, and classroom management?

The three-factor solutions or dimensions of the scale (i.e. Student Engagement, Instructional Strategies and Classroom Management) are believed to better represent the task of teaching. It is hoped that results from the study would increase our understanding on teacher efficacy construct.

Methodology

Participants

Surveys were distributed to 160 respondents ranging from primary and secondary teachers. A total of 125 surveys were returned. Out of 125, 36 teachers taught a full boarding school, 70 were from regular secondary school and 19 were primary school teachers. The sample was made up of 27 males (21.6%) and 98 females (78.4%) with an average age of approximately 33 years. Most of them (85%) underwent tertiary education. The summary of the demographic characteristics of respondents are follows:

Table 1: Demographic Characteristics of Respondents

Variable	n frequency	Percent
Type of School		
Primary	19	15.2
Secondary	70	56.0
Full Boarding Sec Sc	36	28.8
Gender		
Male	27	21.6
Female	98	78.4
Professional Qualifications		
Teaching Certificate	10	8.0
Education Diploma	20	16.0
Bachelor in Education	57	45.6
Other bachelor degree	24	19.2
Master	8	6.4
Others	6	4.8

Method

Since the administration of the questionnaires was done within 2 weeks, random selection was not feasible. The sampling method employed is then purposive in nature since representativeness or sampling for proportionality is not the primary concern of the study.

Procedure

Researchers contacted school administrators over phone and sought their discretion to allow them to collect data for this study. The administration of surveys was assisted by the vice principals of selected boarding school and primary/secondary schools. Of 160 questionnaires, 125 were returned for a response rate of 78 percent. Participants were assured that their responses would be kept confidential.

Measure

Teacher Sense of Efficacy Scale (TSES), developed by Tschannen-Moran and Woolfolk Hoy in 2001 is a 24-item questionnaire anchored at a 9-point continuum, ranging from 1 – Nothing to 9 – A Great Deal; it was equally categorized into three 8-item subscales, namely, Efficacy for Student Engagement, Efficacy for Instructional Strategies and Efficacy for Classroom Management and their reliability coefficients were .81, .86, and .86 respectively Similarly, in their 2002 study their Cronbach's alphas for teacher efficacy subscales were .88, .87 and .88 respectively (Tschannen-Moran and Woolfolk Hoy, 2002). In this study, the same TSES was adopted and then revised to seek its appropriateness to local setting. Retaining 24 items but in a five- point Likert type scale ranging from "Nothing" to "A Great Deal", researchers replaced a few words that might confuse the respondents with similar ones to keep the meaning in tact. The translated items in Malay were placed below each item. The instrument, therefore, was bilingual to ensure all the respondents, including those who were not well-conversant in English be treated fairly in terms of contextual meaning of the items.

Results

The data was tested for the suitability through the use of three standard measures: the Kaiser-Meyer-Olkin measure (KMO), Bartlett's test of sphericity and an examination of the diagonal values of the anti-image correlation matrix of the factor analysis (Tabachnick & Fidell, 2001). All three measures indicated the suitability of the data for factor analysis.

Initial Analysis

An examination of the correlation matrix of the data demonstrates considerable correlations in excess of .3(see Appendix A). In addition, Table 2 shows the Kaiser-Meyer-Olkin measure of sampling adequacy was greater than .6 with the overall measure of sampling of adequacy (MSA) of .901 ($x = 1435.116$, $df = 253$). Kaiser (1974) recommends that values above .9 as superb (as cited in Field, 2005). Furthermore, the Bartlett's test of sphericity was also large and significant ($p < 0.01$) and thus, factorability is assumed.

Table 2: KMO and Bartlett's Test - Before and After Item Deletion

KMO and Bartlett's Test		Initial Analysis	After Item Deletion
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.901	.903
Bartlett's Test of Sphericity	Approx. Chi-square	1435.116	1435.116
	df	253	253
	Sig.	.000	.000

The KMO statistics or correlation coefficients were mostly large, all above .50, ranging from .841 to .933. Moreover, the partial correlations were mostly small which indicated there was a weak relationship and thus showed that there was a factor underlying these data. According to Hair et al. (2000), if the correlation matrix is factorable, the MSA values on the diagonal of the anti-image correlation should be large while the value of the negatives of the partial correlations should be small.

Examining each of these KMO statistics and the anti-image correlation matrices, it could be concluded that the correlation matrix is not an identical matrix, the sample size was sufficient relative to the number of items in the scale and the correlations among the individual items are strong enough to suggest that the correlation matrix was factorable (Pett, Lackey & Sullivan, 2005).

In the extraction phase, the value for each variable should be .50 or higher. The communality values ranged from .513 to .793 except Item 6 which accounted for .488. The item came under the Efficacy in Student Engagement Subscale and read as "How much can you do to get students to believe they can do well in school work?" and therefore, would be dropped from the next iteration of the principal component analysis.

Initial principal components analysis indicated only five factors reached the default criteria, i.e., eigenvalues of 1.00 or greater. About 61.83% of the total variance in the 24 variables was attributable to the first five components. Component 1 explained a variance of 9.611, which was 40.05% of the total variance of 24 while Component 2 explained a variance of 1.534, accounted for 6.39%. About 46.44% of the total variance in the 24 standardized variables was attributable to the first two components. The remaining 3 components altogether accounted for 15.39% of the total variance.

A varimax rotation was performed to enhance the interpretability of the principal components or factors. The results showed that the first component loaded high and positive on seven variables, ranging from .6 to .82. The second component loaded moderately and positive on 3 variables. Similarly, the remaining Components (3, 4 and 5) loaded moderately on 4, 3 and 3 variables respectively. Only loadings greater than .5 are included.

After Item Deletion

An investigation of the correlation matrix revealed that many variables were with loadings greater than .30. Therefore, it was appropriate to proceed with the initial extraction process.

Bartlett's test of sphericity ($\chi 2$ (253) =1435.116, p<.001) and Kaiser-Meyer-Olkin's MSA (0.90) indicated that the data were suitable for factor analysis. The MSAs ranged from .842 to .937 exceeding .70. Like the KMO statistic, the individual MSAs were half meritorious and half marvellous according to Kaiser's rule (see Table 2).

For the communality estimates, they were high at the initial extraction process and ranged between .522 and .789. This could be seen in Table 4.

Table 3 displays the amount of variance for each component before and after rotation. Five components were retained since they had eigenvalues greater than 1. Prior to rotation, the first component accounted for 40.64% and the second was 6.29%. After rotation, the first five components accounted for 18.86%, 11.78%, 11.65%, 10.63% and 9.98% of the total variance respectively.

Table 3: Variance Accounted for by Principal Components

Component	Eigenvalue	Extraction Sums of Squared Loadings		Rotation Sums of Squared Loadings	
		% of Variance	Cumulative %	Variance (%)	Cumulative (%)
1	9.347	40.641	40.641	18.860	18.860
2	1.446	6.287	46.928	11.777	30.637
3	1.418	6.164	53.092	11.649	42.286
4	1.184	5.148	58.240	10.634	52.920
5	1.069	4.647	62.887	9.967	62.887
6	.997				
7	.816				
8	.803				
9	.696				
10	.630				
11	.571				
12	.518				
13	.482				
14	.438				
15	.406				
16	.400				
17	.333				
18	.312				
19	.287				
20	.259				
21	.218				
22	.208				
23	.163				

Table 4 shows 5 rotated factors. The first 6 items were found to correlate to the first component with factor loadings ranged from 0.58 to 0.80. Five items were moderately

correlated on Component 2; two were with large correlation coefficients .i.e. .71 and .70. In the same vein, the next three items were also moderately correlated on Component 3 with factor loadings, ranging from .57 to .70.

Table 4: Varimax with Kaiser Normalization Rotated of Principal Component Analysis Factor Matrix

	Component					communality
Variables	1	2	3	4	5	
ClssMCalm	.804					.705
ClssMContr	.689					.680
ClssMRuin	.688					.522
ClssMRules	.688					.724
ClssMResDis	.613					.647
EnggFailing	.575					.789
InstcDStratg		.709				.602
EnggFamily		.695				.631
ClssMSystem		.589				.697
InstcAdjust		.553				.629
InstcVariet		.537				.661
InstcChalleng			.70			.602
InstcAlter			.66			.599
InstcDiffQ			.56			.654
EnggCreativ						.596
EnggDiffic				.744		.654
EnggMotiv				.720		.612
EnggCritic				.620		.599
ClssMExpect				.495		.634
ClssMRutin					.681	.564
InstcGoodQ					.545	.526
InstcAssess					.540	.601
EnggValue					.497	.555

In contrast, the following three items were highly correlated with loadings of .74, .72 and .62, leaving the last item on the same component with a low loading, that is, .495. This item was retained in that when rounded up it became .50. Finally, the last four items are found also to be moderately correlated.

Table 5 shows Cronbach's alphas of internal consistencies for each of the components were 0.88, 0.83, .60, .70 and .78 respectively. The correlations among the items in each component were highly correlated, indicating the items were honing on the same construct, namely, the principal components or factors.

Table 5: Reliability Statistics

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Factor 1	.8835	.8827	6
Factor 2	.8269	.8303	5
Factor 3	.6044	.6137	3
Factor 4	.6955	.6947	4
Factor 5	.7757	.7769	4

Of six items, five were originally under the subscale of Efficacy in Class Management and were thus, labeled as Efficacy in Class Management. Five items under Component 2 plainly dealt with Efficacy in Instructional Strategies. Component 3 was labeled as Efficacy in Response Creativity. The labeling was as such because the items are closely related to teachers' responses in challenging situations wherein not all teachers can be naturally creative and effective. Component 4 was retained as Efficacy in Student Engagement as three questions originated from the subscale.

Table 6: Factor Loadings After Rotation

Teachers' Sense of Efficacy Scale	Factor loadings
Factor 1	
Q.15. How much can you do to calm a student who is disruptive or noisy?	.804
Q. 3. How much can you do to control disturbing behavior in the classroom?	.689
Q.19. How well can you keep a few problematic students from ruining an entire lesson?	.688
Q.13. How much can you do to get students to follow classroom rules?	.688
Q.21. How well can you respond to disobedient students?	.613
Q.14. How much can you do to improve the understanding of a student who is failing?	.575
Factor 2	
Q.16. How well can you establish a classroom activities management system with students of different behaviours?	.709
Q.17. How much can you do to adjust your lessons to accommodate individual differences among students?	.695
Q.18. How much can you use a variety of assessment strategies?	.589
Q.22. How much can you assist families in helping their children do well in school?	.553
Q.23. How well can you implement different strategies in your classroom?	.537
Factor 3	
Q.7. How well can you respond to difficult questions from your students?	.704
Q.20. To what extent can you provide an alternative explanation or example when students are confused?	.667

Teachers' Sense of Efficacy Scale	Factor loadings
Q.24. How well can you provide appropriate challenges for very capable students?	.569
Factor 4	
Q.1. How much can you do to help the most difficult students?	.744
Q.2. How much can you do to help your students think critically?	.720
Q.4. How much can you do to motivate students who show low interest in school work?	.620
Q.5. To what extent can you make your expectations clear about student behavior?	.495
Factor 5	
Q.10. How much can you assess student comprehension of what you have taught?	.681
Q.11. To what extent can you develop good questions for your students?	.545
Q.8. How well can you establish routines to keep classroom activities running smoothly?	.540
Q.9. How much can you do to help your students to value learning?	.497

Finally, the last four items under Component 5 basically touched on general student assessment and therefore it was labeled as Efficacy in Student Learning Assessment. This five-component model represented the combination of the three original principal components and appeared to reflect adequately the factor structure of the 24-item teachers' sense of efficacy. Q.12 was deleted when the rotation method was applied. The item concerned with the belief that the teachers can foster creativity in students.

Discussion

The analysis found that the three dimensions of teacher sense of efficacy did exist. However, the results of the study did not support the notion that this efficacy measure has a stable factor structure. The principal component analysis suggested that there are likely more factors than what have been recommended by Tschannen-Moran and Woolfolk Hoy (2001) before particularly when it was applied in the Malaysian context. This variability prevailed might due to the variation in the demographic characteristics of the sample of the study. The sample encompassed three different groups of teachers of different level of academic qualifications: primary, regular secondary and full boarding school that is wholly sponsored by the government. Teachers of different groups might differ from each other in the light of efficacy.

Furthermore, Tschannen-Moran and Woolfolk Hoy (2001) realized that the instrument, albeit in its promising form, opens new possibilities for research. They recommended that more research is needed to investigate factors that contribute to efficacy judgment and how efficacy beliefs are established particularly when teachers have undergone many phases of their teaching life. This substantiates the results of the analyses that different factor structure

would be expected when respondents in the sample are from different age range. They certainly have undergone many different experiences and acquire different forms of training. Similarly, from the literature too, Koehler (2006) found four structure solutions when she attempted to add six new questions to address general teaching efficacy as well. This might indicate that if a new perspective on teacher efficacy is added to the instrument, the result might be different too and thus, prove that there are possibilities that teachers' belief might differ from what have been postulated.

The sample of the study comprised in-service teachers with an average of 33 years varying in the form of environment they are in. Many were from urban schools and some from a full boarding school. This also might contribute to different self-efficacy and teaching efficacy as they were from different school environment. This is line with what have been suggested by Tschannen-Moran and Woolfolk Hoy (2001) that there is a need to understand efficacy beliefs among in-service teachers which have somewhat established. Thus, re-conceptualization of the subscales is called for to best fit a general Malaysian context.

Conclusions

In the light of the study, testing and validating further a measuring instrument like Tschannen-Moran and Woolfolk Hoy (2001) is likely to help either in substantiating or revealing what have been underlying dimensions of a construct, namely, teacher efficacy. Since teacher efficacy has varying degree in its meaning itself and construct validity, the stable factor solutions for TSES might also be affected as well particularly when there is little has been done to validate the instrument in different settings like in Malaysia.

Acknowledgements

The authors wish to render their gratitude towards the continuous assistance of Dr Zainurin Abd Rahman in making the paper a success.

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