The purpose of this study is to revise the Teacher Sense of Efficacy Scale (TSES), developed by Tschannen-Moran and Woolfolk Hoy (2001) and to examine its factorial, predictive, convergent and discriminant validity, as well as its internal consistency reliability. One hundred nine primary and secondary school teachers in Singapore participated in this research. The revised scale consists of three factors: efficacy for instruction, efficacy for classroom management, and efficacy for motivation. The revised sub-scales showed good internal consistency reliability. The factor analysis results also indicated that the specific teacher efficacy beliefs could be further collapsed into one general factor. The convergent validity was good but the discriminant validity was weak. The appropriate use of TSES is also discussed.

Keywords: teacher efficacy scale, validity, reliability, Singapore school teachers

Self-efficacy research has flourished in recent decades. One reason is the strong theoretical foundation developed by Bandura (1997) that provides educators with a clear framework for research. Another reason is its linkage to a variety of practical issues such as motivation, self-regulated learning and academic performance (Lau, Liem, & Nie, 2008; Liem, Lau, & Nie, 2008; Peters & Kortecamp, 2010; Usher & Pajares, 2008). Consistent with the general formulation of self-efficacy, teacher efficacy is defined as the judgment of the teacher’s capabilities to bring about desired outcomes of student engagement and learning (Tschannen-Moran & Hoy, 2001). Researchers have repeatedly found that teacher efficacy was strongly related to teacher behaviors, work stress, job satisfaction, student outcomes and it accounted for individual differences in teaching effectiveness (e.g., Chan, Lau, Nie, Lim, & Hogan, 2008; Chong, Klassen, Huan, Wong, & Kates, 2010; Moe, Pazzaglia, & Ronconi, 2010; Nie, Tan, Liu, Lau, Chua, 2012; Wolters & Daugherty, 2007).

Although much research has been done on the study of teacher efficacy, its conceptual framework and measurement is still being debated, revised and tested. For example, Gibson and Dembo (1984)’s Teacher Efficacy Scale (TES) has played a very important role in spawning teacher efficacy research. The TES includes two dimensions: self-efficacy and outcome expectation. However, the meaning of the second factor (outcome expectation) has been questioned. Bandura (1986) stated that outcome expectancy was a judgment of the likely consequences of a specific action, given an individual’s anticipated level of performance. Moreover, outcome expectancy added little to the explanation of motivation. Not only is the operationalization of TES questionable, but in Gibson and Dembo (1984)’s study, the psychometric properties have been shown to be weak—the two factors just accounting for 28.8% of the total variance. In addition, the appropriate measurement level of TES has also been a concern for researchers. Pintrich and Schunk (2002) have noted that the level of specificity is one of the most difficult issues to be resolved for cognitive or motivational theories that propose domain specificity. Bandura (1997) has argued that teacher...
Tschannen-Moran and Hoy (2001) developed the Teacher Sense of Efficacy Scale (TSES), corresponding to the tasks that teachers faced in school. The scale consists of three factors: efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement. The TSES was a promising development in the measurement of teacher efficacy with two forms, i.e., the long form with 24 items and the short form with 12 items. Both forms have three factors with good internal consistent reliability.

The TSES has been widely used in recent empirical studies in teacher efficacy and showed significant relations with teacher commitment, job satisfaction, classroom goal structures (e.g., Chan, et al., 2008; Chong, et al., 2010; Ciani, Summers, & Easter, 2008; Klassen & Chiu, 2010; Klassen, Usher, & Bong, 2010; Moe, et al., 2010; Tschannen-Moran & Hoy, 2007; Wolters & Daugherty, 2007). Klassen and his colleagues (Klassen et al., 2009) tested TSES in five countries and the results showed invariance in the factor structure across culturally different groups. In the studies mentioned earlier, the short form was used more frequently than the long form and general efficacy score was used more frequently than three task-specific efficacy scores.

Although the factorial validity of TSES is good, it also faces a few problems. The conceptual problem is that although, the third factor is named efficacy for student engagement, it actually mixes motivational strategies (e.g., How much can you do to motivate students who show low interest in school work? How much can you do to help your student value learning?) with higher order thinking strategies (e.g., How much can you do to foster students to think critically? How much can you do to foster student creativity?). The weak content clarity has been verified with empirical evidence. For example, Wolters and Daugherty (2007) found that some items in this subscale had low or double loadings in exploratory factor analysis (EFA). Fives and Buehl (2010) also found that some items were not loaded for the specific factors it was designed for. The psychometric problem is that the factor structure was not clear due to the high inter-factor correlations. Tschannen-Moran and Hoy (2001) conducted a one-factor exploratory factor analysis for all items on different tasks and found adequate factor loadings. These results questioned the task specificity of teacher efficacy. However, Tschannen-Moran and Hoy (2001) did not use confirmatory factor analysis (CFA) to compare second-order factor structural model and one factor model. In particular, they did not test the convergent and discriminant validity of the subscales to provide further evidence on the appropriate measures and use of TSES.

Given these issues regarding the robustness of the teacher efficacy construct, and its specificity, the main purpose of this study was to validate a revised version of the TSES in the Singaporean context. As part of this validation process, the reliability and factorial validity of the TSES were assessed. We compared a second-order structural model with a one-factor model to select the best fitting model. In addition, the convergent and discriminant validity of the TSES were assessed by correlating the TSES with relevant teacher behaviors.

**METHOD**

**Sample**

Participants were 109 full-time in-service primary and secondary school teachers in Singapore. They were randomly selected from three primary and three secondary schools. The schools were drawn through stratified random sampling. The population of 172 primary schools and 158 secondary schools were first divided into three strata based on their aggregate prior achievement, i.e., top third, middle third, and bottom third. One school was then randomly selected from each stratum. A total of 28.4% of the participants were male, and 71.6% of the participants were Chinese, 19.3% Malay, 4.6% Indian, 4.6% of other ethnic origins. The mean age of the teachers was 37 years and the mean year of teaching experience was 12 years. In Singapore, English is the language of public administration, education, and business.

**Measures**

The items in the four scales were used in this study: TSES, instructional strategies scale, motivational strategies scale and behavior management strategies scale.

One group interview was conducted to revise the scales in terms of the content validity, item construction and relevance to the Singaporean context. Two educational psychologist and three school teachers participated in the interview. The two educational psychologists were requested to read the guide for constructing self-efficacy scales before the interview (Bandura, 2006). The measures were administered in English and thus no translation was needed.

**Teacher sense of efficacy scale.** The long 24-item version of TSES developed by Tschannen-Moran and Hoy (2001) was used in the survey. Before testing, the items were rephrased or rewritten to make them appropriate for the conceptual framework and Singaporean context. To improve the content validity, three items in the original scales under efficacy for student engagement were deleted because they did not directly represent the motivational strategies. Twenty-one items were measured on a five-point Likert scale from 1, “not well at all”, to 5, “very well”.

TEACHER EFFICACY SCALE
Behavior management strategies scale. Adapted from the Mathematics Enhancement Classroom Observation Record Scale (MECORS) (Schafer, Nesselrodt, & Stringfield, 1998), the behavior management strategies scale was used to measure teachers' frequency to use behavior management strategies in their classrooms. The revised scale contained seven items which were measured on a five-point Likert scale from 1, "never", to 5, "always". The internal consistency reliability (Cronbach's $\alpha$) was .88. EFA of behavior management strategies scale indicated a one-factor solution and this factor accounted for 59.01% of the total variance. The factor loadings ranged from .69 to .85. CFA indicated the seven items collapsed into one factor, and the fit indices were good, $\chi^2=12.55$, $df=9$, $p=.18$, TLI=.9, CFI=.98, RMSEA=.06.

Instructional strategies scale. Adapted from the Mathematics Enhancement Classroom Observation Record Scale (MECORS), the instructional strategies scale was used to measure teachers' frequency to use effective instructional strategies in their classrooms. The revised scale contained seven items which were measured on a five-point Likert scale from 1, "never", to 5, "always". The internal consistency reliability (Cronbach's $\alpha$) was .87. EFA of instructional strategies scale of indicated a one-factor solution and this factor accounted for 57.96% of the total variance. The factor loadings ranged from .60 to .80. CFA indicated the six items collapsed into one factor, and the fit indices were good, $\chi^2=23.65$, $df=14$, $p=.05$, TLI=.95, CFI=.97, RMSEA=.08.

Motivational strategies scale. The motivational strategies scale was adapted from the Patterns of Adaptive Learning Survey (Midgley, et al., 1995). The revised scale contained four items which were measured on a five-point Likert scale from 1, "never", to 5, "always". The internal consistency reliability (Cronbach's $\alpha$) was .77. EFA of motivational strategies scale indicated a one-factor solution and this factor accounted for 65.84% of the total variance. The factor loading ranged from .69 to .90. CFA indicated the four items collapsed into one factor, and the fit indices were good, $\chi^2=0.08$, $df=2$, $p=.95$, TLI=1.034, CFI=1.00, RMSEA=.00.

Procedure
An online survey was conducted. The schools were mailed the URL for the survey, with a request to send it to every teacher in the school, accompanied by a letter explaining the nature and general aim of the study and directions on how to do the online survey.

RESULTS

Factor analysis
A principal-components analysis on teacher efficacy measurement with oblique (Promax) rotation revealed a three-factor structure for these measures. CFA was used to confirm the result of EFA as well as test if the data supported the conceptual structure. We selected 12 items from the 21 items based on the EFA and CFA results. Some items were deleted because of low factor or serious double loading in EFA, or high correlation between errors of items in CFA. In the revised TSES, 12 items were left and each dimension comprised of four items. There were three factors with eigenvalues of more than 1 and these three factors accounted for 75.66% of the total variance. The first factor was efficacy for motivational strategies (EMS). The second factor was efficacy for classroom management (ECM). The third factor was efficacy for instructional strategies (EIS). Table 1 presents the factor loadings. CFA results indicated that the fit indices of the three correlated factors model were good, $X^2=79.34$, $df=51$, $p=.007$, TLI=.96, CFI=.97.

Table 1

<table>
<thead>
<tr>
<th>Exploratory and Confirmatory Factor Structure for Teacher Self-Efficacy Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMS</strong></td>
</tr>
<tr>
<td>EMS2 help your students value learning?</td>
</tr>
<tr>
<td>EMS3 motivate students who show low interest in schoolwork?</td>
</tr>
<tr>
<td>EMS5 improve the understanding of a student who is failing?</td>
</tr>
<tr>
<td>EMS8 get through to the most difficult students?</td>
</tr>
<tr>
<td>ECM8 make your expectations clear about student behavior?</td>
</tr>
<tr>
<td>ECM3 get students to follow classroom rules?</td>
</tr>
<tr>
<td>ECM2 control disruptive behavior in the classroom?</td>
</tr>
<tr>
<td>ECM5 keep a few problem students from ruining an entire lesson?</td>
</tr>
<tr>
<td>EIS5 respond to difficult question from your students?</td>
</tr>
<tr>
<td>EIS6 provide appropriate challenges for very capable student?</td>
</tr>
<tr>
<td>EIS1 implement alternative strategies in your classroom?</td>
</tr>
<tr>
<td>EIS3 provide an alternative explanation or example when students are confused?</td>
</tr>
</tbody>
</table>

Note. Factor loadings $<.3$ are omitted.
Figure 1. The best fit model of TSES.

Table 2
Factor Means and Inter-factor Correlations

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>EIS</th>
<th>EMS</th>
<th>ECM</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIS</td>
<td>3.88</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMS</td>
<td>3.98</td>
<td>.68</td>
<td>.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECM</td>
<td>4.23</td>
<td>.69</td>
<td>.61</td>
<td>.64</td>
<td></td>
</tr>
</tbody>
</table>

Table 3
Fit Indices of Two Models

<table>
<thead>
<tr>
<th></th>
<th>$X^2$</th>
<th>df</th>
<th>$p$</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>345.37</td>
<td>55</td>
<td>.000</td>
<td>.62</td>
<td>.68</td>
<td>.22</td>
</tr>
<tr>
<td>Model 2</td>
<td>79.34</td>
<td>51</td>
<td>.007</td>
<td>.96</td>
<td>.97</td>
<td>.07</td>
</tr>
</tbody>
</table>

RMSEA=.07. Each subscale had good reliability ($\alpha = .91$ for efficacy for motivational strategies, $\alpha = .91$ for efficacy for classroom management, and $\alpha = .83$ for efficacy for instructional strategies).

Table 2 presents the means, standard deviations, and inter-factor correlations. Because the inter-factor correlations were very high, there were two possible solutions: one was to use the one factor solution to interpret it as general teacher sense of efficacy (model 1), another was to use second-order factor analysis to examine whether first level factors can be collapsed into a more general second-order factor (model 2). Table 3 presents the fit indices of the two models. The fit indices indicated that model 2 had a better fit. Figure 1 presents the second-order factor analysis result. The results indicated that the data and the model fit well and the second-order factor structure was appropriate for describing the teacher efficacy structure.
Table 4
Correlations of Teacher Efficacies and Teaching Behaviors

<table>
<thead>
<tr>
<th></th>
<th>EFFICACY</th>
<th>EIS</th>
<th>EMS</th>
<th>ECM</th>
<th>IS</th>
<th>MS</th>
<th>BM</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFFICACY</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIS</td>
<td>.86**</td>
<td>1</td>
<td>.63**</td>
<td>.61**</td>
<td>.64**</td>
<td>.58**</td>
<td></td>
</tr>
<tr>
<td>EMS</td>
<td>.88**</td>
<td></td>
<td>1</td>
<td>.42**</td>
<td>.62**</td>
<td>.51**</td>
<td></td>
</tr>
<tr>
<td>ECM</td>
<td>.87**</td>
<td>.61**</td>
<td>.64**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td>.58**</td>
<td>.55**</td>
<td>.54**</td>
<td>.42**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS</td>
<td>.60**</td>
<td>.51**</td>
<td>.55**</td>
<td>.50**</td>
<td>.63**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BM</td>
<td>.61**</td>
<td>.49**</td>
<td>.58**</td>
<td>.52**</td>
<td>.68**</td>
<td>.68**</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. **p<.01. Efficacy: efficacy score composited from three subscale scores; EIS: Efficacy for instructional strategies; EMS: efficacy for motivational strategies; ECM: efficacy for classroom management; IS: instructional strategies, MS: motivational strategies; BM, behavioral management.

Predictive, convergent and discriminant validity

Teacher efficacy beliefs (general and task-specific) were correlated with relative teaching strategies. The correlations are presented in Table 4. The high correlations between teacher efficacy beliefs and teaching strategies indicated that TSES had good predictive validity. The correlations among the efficacy beliefs and teaching strategies were higher than the correlations between the efficacy beliefs and strategies, thus indicating good convergent validity. The correlation between EIS and IS (.55) and the correlation between ECM and BM (.52) were a little higher than the other two relevant correlations. The correlation between EMS and MS (.55) was lower than the correlation between EMS and BM (.58). For testing the difference of two correlated sample correlation coefficients, t-test was used and the results indicated they were all insignificant.

DISCUSSION

The factorial validity and reliability of the revised TSES

The study examined the validity of a revised version of the TSES made to fit the Singaporean context. The revised TSES (Singapore version) has three factors and 12 items with good internal consistency reliability. This shorter version of the TSES is practical and parsimonious. Even though it has fewer items than the original, it is still reliable, and has good psychometric properties.

Both EFA and CFA results indicated that there were specific teacher efficacies which focus on different tasks. The factorial structure was consistent with Tschan nen-Moran and Hoy (2001)'s conceptual framework and other empirical studies conducted in different countries (Fives & Buehl, 2010; Klassen et al., 2009; Tsigilis, Koustelios, & Grammatikopoulos, 2010), indicating that the factorial structure for TSES is relatively stable across different countries and cultures. In contrast from previous studies, a second-order CFA was conducted in the current study and the results indicated that the specific efficacies can be collapsed into one general factor. Specifically, in comparison with the one-factor CFA, the second-order CFA showed better model-data fit, which suggested that the best description of the factorial structure of TSES should be three task-specific factors and the three factors can be further collapsed into one general factor, rather than having all items collapsed into one factor. The second-order CFA results suggested that the appropriate measure of teacher efficacy should be task specific and different task-specific task efficacy measures can be further calculated as a composite score, namely general teacher efficacy.

Predictive, convergent and discriminant validity

In addition to the factorial validity, the current study also examined the predictive, convergent and discriminant validity which were rarely reported in previous studies. These results suggested that predictive validity and convergent validity were good. However, the discriminant validity was not good and the specific efficacy did not have higher correlation with the relevant teaching strategies. The general teacher efficacy had stronger predictive power than the specific efficacy. One purpose in developing the task-specific scale is to enhance the predictive power in the relevant teaching tasks. However, our results do not support this claim. Our results suggested that it may not be ideal to use task-specific teacher efficacy to improve the predictive power of specific practices. The high correlations among different components of self-efficacy beliefs may create multicollinearity problem in multiple regression. For example, Wolters and Daugherty (2007)'s study showed positive bivariate correlation between self-efficacy for management and mastery goal structure, but negative regression coefficient when regressing mastery goal structure on three self-efficacy beliefs. In some recent research using teacher efficacy as a predictor of teacher commitment and job satisfaction (e.g. Chan et al., 2008; Duffy & Lent, 2009; Moe, et al., 2010; Rots, Aelterman, Vlerick, & Vermeulen, 2007), researchers used general
teacher efficacy score rather than the task specific teacher efficacy score as predictor(s). This may also suggest that the appropriate use of TSES is to utilize a composite score of general teacher efficacy score based on the three sub-scale scores.

CONCLUSION AND IMPLICATIONS

This study has two important implications for research and practice. First, the current results support the stability of three-factor structure of TSES. Therefore, it is recommended that the measures of teacher efficacy should be task-specific. Second, second-order CFA confirmed that the three factors can be further collapsed into one general factor. The discriminant validity of task-specific efficacy was not good and the general teacher efficacy showed better predictive power. In conclusion, this finding suggests that the general self-efficacy score, composited from task-specific teacher efficacy beliefs, should be used for prediction purposes.

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REFERENCES


APPENDIX

1. Teacher Sense of Efficacy Scale (12 items)

  Efficacy for instruction
  1. How well can you respond to difficult question from your students?
  2. How well can you provide appropriate challenges for very capable students?
  3. How well can you implement alternative strategies in your classroom?
  4. How well can you provide an alternative explanation or example when students are confused?

  Efficacy for motivation
  5. How well can you help your students value learning?
  6. How well can you motivate students who show low interest in schoolwork?
  7. How well can you improve the understanding of a student who is failing?
  8. How well can you get through to the most difficult students?

  Efficacy for classroom management
  9. How well can you make your expectations clear about student behavior?
  10. How well can you get students to follow classroom rules?
  11. How well can you control disruptive behavior in the classroom?
  12. How well can you keep a few problem students from ruining an entire lesson?

2. Behavior management strategies
  1. I establish specific rules and consequences for student misbehavior.
  2. I monitor the entire classroom.
  3. I correct misbehavior immediately.
  4. I reward (e.g., praise) good behavior.
  5. I use consistent disciplinary practices.
  6. I discourage misbehavior.
  7. I discuss behavioral problems with students to get their perspectives.

3. Instructional strategies
  1. I present new material in small steps.
  2. I explain difficult ideas in a simple way.
  3. When the pupil does not understand the question, I rephrase it.
  4. I check that the pupils understand the lesson
  5. I am well prepared.
  6. I systematically review previously taught materials.
  7. I give the pupils feedback on their exams or tests.

4. Motivational strategies
  1. I make a special effort to give my students work that is creative and imaginative.
  2. I make a special effort to give my students work that has meaning in their everyday lives.
  3. I make my subject/s really interesting.
  4. I stress to students that I want them to understand the work rather than just memorize it.