www.bircu-journal.com/index.php/birci
Budapest International Research and Critics Institute-Journal (BIRCI-Journal)
Humanities and Social Sciences
ISSN 2615-3076 Online)
ISSN 2615-1715 (Print)
Budapest Institute

The Adaptation of the Teacher's Sense of Efficacy Scale (TSES-Indonesia): Designed for Gifted Students Educators

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Abstract

Teacher efficacy (TE) has been proven to have significant correlation to a teacher's performance in educating. Despite that significance, there are only a few TE scales available in Bahasa Indonesia, especially ones that are related to gifted students. This research is conducted to adapt Tschannen-Moran and Hoy's (2001) Teacher's Sense of Efficacy Scale (TSES) based on the adaptation guideline of International Test Commission ITC (2016). TSES contains three factors which includes student engagement, instructional strategies, and classroom management. Participants of this research amounts to 127 teachers who have previously or is currently teaching gifted students that are obtained through convenient and snowball sampling. Aiken's V is used to evaluate the scale's content validity. Evidence of construct validity is gathered through CTT, EFA and CFA analysis. The result of Aiken's V is considered of high value, which means each item shows relevancy in measuring the construct. With a Cronbach's Alpha value of 0,908, p-value of >0,05 from the CFA analysis, and CFI, TLI, NFI, IFI, RMSEA, SRMR and CR values that are in accordance with the criteria set. It can be concluded that the TSES-Indonesia (12 items) is proven to be valid and reliable.

Keywords
Adaptation; teacher efficacy; gifted students; TSES

I. Introduction

The development of a teacher efficacy (TE) measuring instrument will provide many benefits in the field of education, both for teachers and students. TE has been shown to be strongly associated with persistence, enthusiasm, commitment and teaching behavior of teachers, whereas for students TE is associated with achievement, motivation and self-efficacy beliefs (Tschannen-Moran & Hoy, 2001). A teacher's sense of their efficacy has also been associated to their behavior in the classroom; efficacy affects the effort that teachers put into teaching, their desired goals, and their level of aspirations. Teachers with high levels of efficacy tend to have better levels of planning and organization, are more open to new ideas and willing to try new methods to meet the needs of their students (Berman, McLaughlin, Bass, Pauly, & Zellman, 1977; Guskey, 1988, Stein & Wang, 1988). Development is a systematic and continuous effort made to realize something that is aspired. Development is a change towards improvement. Changes towards improvement require the mobilization of all human resources and reason to realize what is aspired. In addition, development is also very dependent on the availability of natural resource wealth. The availability of natural resources is one of the keys to economic growth in an area. (Shah, M. et al. 2020)

Maulana, Rangkuti, and Wahyuni (2020) have previously carried out the TSES adaptation process. However, this study was limited with their relatively small sample size

DOI: *https://doi.org/10.33258/birci.v5i3.6658*

and a limited scope to only reach elementary school teachers in Jakarta. In addition, the adaptation process from its original English version was translated by the researchers themselves while only focusing on grammatical translation rather than an accurate adaptation of context and characteristics of participants. The results of this study also suggest simplifying the rating, which resulted in the usage of a 1-6 rating scale.

There is debate revolving around the conceptualization of TE which contributes to the lack of clarity on how to measure this construct. After exploring and testing various instruments, a scale was created based on a TE model proposed by Tschannen-Moron, Woolfolk Hoy, and Hoy (1998). Based on the results of the literature review conducted by Tschannen-Moran, et al (2001), it is said that the context of a situation is relevant to TE. Regarding that, instruments designed to measure TE in the context of special education is still rarely developed. One of the few researchers who have explored this field is Coladarci and Breton (1997) who modified the items from Gibson and Dembo (1984) to accommodate this context. To further this effort to create more TE measuring instruments in the context of special education, researchers of this study is interested in adapting the TSES measuring tool to correct the shortcomings of the previously mentioned measuring instruments with this adaptation's high validity and reliability.

The Teachers' Sense of Efficacy Scale (TSES) was developed based on the teacher efficacy design made by Tschannen-Moran, Woolfolk Hoy, and Hoy (1998). This instrument was developed using the theoretical basis of Rotter's social learning and Bandura's social cognitive, as well as the results of evaluating the previous TE measuring instrument which was found to not have a strong psychometric basis and has dimensions that were too specific. Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) formulated a model that splits Teacher Efficacy into three dimensions, namely student engagement (SE), instructional strategies (IS), and classroom management (CM). The level of a teacher's efficacy is seen from the total score of the three dimensions of the TSES. Referring to Bandura's research, Tschannen-Moran and Hoy (2001) defines SE as how teachers feel confident in building relationships with students, including motivating and solving student problems. Indicators of SE are signs of friendliness to students, helping students solve their problems, and knowing how to deal with difficult students. IS refers to how teachers believe in their ability to help students score academically. The indicators are the presence of confidence in answering questions from students, having a comprehensive approach in explaining the subject matter, and knowing the level of understanding of students well. CM refers to the teacher's competence in managing the classroom in a directed and orderly manner. The indicator includes the teacher's ability to handle problems that arise in the classroom and ensure that the teaching plans are implemented properly.

Based on what was discussed above, researchers of this study decided to adapt the Teacher's Sense of Efficacy Scale (TSES) in the context of gifted students. Through the adaptation process of this instrument, this research aims to provide additional information and benefits in the field of education, especially for schools and the government in Indonesia which has removed the Cerdas Istimewa dan/atau Berbakat Istimewa (CI-BI) class, designed for gifted students in 2014 and has since changed regulations regarding acceleration programs into credits for gifted students. With this change, gifted students have little choice but to study in regular classes or take accelerated classes. Looking at the significant influence of TE on the teacher's teaching process and its impact on students, it is important to measure the level of TE, especially regarding teachers of gifted students. Thus, this study aims to adapt TSES for teachers who have previously or are currently

teaching gifted students in Indonesia, as well as revealing the factor structure of the TSES measuring instrument at the same time.

II. Research Method

Data analysis was carried out using the construct validity method that are divided into two steps, which are the Exploratory Factor Analysis (EFA) and the Confirmatory Factor Analysis (CFA) that utilizes the help of JASP version 0.15.00. EFA has a function to determine the structure of factors and CFA is carried out to confirm whether the items on the TSES measuring tool can be used to confirm a factor (Ferdinand, 2014). Netemeyer et al., (2013) stated that the evaluation of the CFA model in general can use four criteria, namely (1) model convergence and acceptable range of parameter estimates, (2) fit indices, (3) significant of parameters estimated and related diagnostics, and (4) measurement invariance across multiple samples.

III. Result and Discussion

3.1 Stage 1: Pre-condition Stage

Efforts done at this stage included visiting The Ohio State University website at the link https://u.osu.edu/hoy.17/research/instruments/ on September 10, 2021. On this page, Anita Woolfok Hoy as the developer of the Teacher's Sense of Efficacy Scale (TSES) attaches a permission letter for using the TSES measuring tool and adapting it into other languages.

3.2 Stage 2: Translation of the Measuring Instrument Stage

The first step taken at this stage is to translate each item from English to Bahasa Indonesia in a process called forward translation which is carried out by two professional translators, followed by backward translation which is translating from the forward translation result back to English that was also carried out by two professional translators, as shown in the following table.

Table 1. Example of the Forward Translation of Items

Factor	Original Items	Forward Translation result
Engagement	How much can you do to get gifted students to believe they can do well in schoolwork?	*Seberapa mampukah Anda membuat siswa cerdas istimewa percaya mereka mampu mengerjakan tugas sekolah dengan baik?*
Instructional Strategies	To what extent can you provide an alternative explanation or example when gifted students are confused?	*Seberapa mampu Anda menjelaskan atau memberikan contoh alternatif ketika siswa cerdas istimewa mengalami kebingungan?*
Classroom Management	How well can you implement alternative strategies in your classroom?	*Seberapa baik Anda dalam menerapkan strategi alternatif pembelajaran di kelas Anda?*

Sources: Personal data (2021)

3.3 Stage 3: Synthesizing Translation Stage

The results of forward and backward translation from four different agencies were synthesized by the researchers. Input was then obtained from four Universitas Padjadjaran's Educational Psychology Master's students. At this stage the researchers changed several sentences to suit the research context, namely regarding whether the teacher is currently teaching or have previously taught gifted students. Next, the researchers conducted a peer review based on the format of Davis (1992) in Polit & Beck (2005) and inquired from the researchers' acquaintance who was a psychology graduate that had been a teacher to provide an assessment. The results of the peer review were then processed by the researchers and used as material for consideration to improve the adapted TSES items.

Table 2. Example of forward Translation Item

Factor	Synthesized Item	Backward Translation result
Engagement	*Seberapa mampukah Anda membuat siswa cerdas istimewa percaya mereka mampu mengerjakan tugas sekolah dengan baik?*	How capable are you in convincing the gifted students to believe that they can complete their homework properly?
Instructional Strategies	*Seberapa mampu Anda menjelaskan atau memberikan contoh alternatif ketika siswa cerdas istimewa mengalami kebingungan?*	To what extent can you provide alternative explanations or examples when gifted students are in confusion?
Classroom Management	*Seberapa baik Anda dalam menerapkan strategi alternatif pembelajaran di kelas Anda?*	How good are you at implementing alternative strategies in your classroom?

Sources: Personal data (2021)

3.4 Stage 4: Reviewing Translation Results Stage

The expert judgment process for the items of the TSES that have been developed so far is carried out by five experts who are psychologists in the field of education. The expert judgment process is carried out by providing a review form with categories of assessment which includes relevance, importance, and clarity.

3.5 Stage 5: Readability Test Stage

The cognitive interview method was conducted on the finalized items as a form of readability testing conducted on five teachers who had taught gifted students in Indonesia. Readability tests are carried out to ensure instructions and all items can be easily understood. The procedure was carried out by preparing a cognitive interview form in which the teachers are asked to give an assessment and provide information regarding items that have low readability scores, as well as suggestions for improvement. As a result, a suggestion to provide context-specific information on several items that are considered confusing were obtained. The cognitive interview process is carried out online through Google Meet.

3.6 Stage 6: Administration of Instrument

At this stage, the researchers arranges the items in an online form using a scale (1-6). The instrument will be given out via a link that can be opened and filled out online. This link would then be distributed to teachers who have taught gifted students in Indonesia. The researchers spread the link via social media, such as WhatsApp and Facebook. In addition, the researchers also made letters asking several schools for permission to conduct research involving their teachers. The first part of the form was designed to obtain informed consent from the respondents before filling out the instrument questionnaire.

3.7 Stage 7: Analysis of the Results

The analysis was carried out using the Classical Test Theory (CTT) approach, EFA and CFA. The data analyzed came from 127 participants. Item scoring is done by assigning a number to the choices of answer chosen by the respondent. The final score is obtained by adding up the value of the total score due to the nature of the scale being used which is a summative rating scale (Cohen & Swerdlik, 2018). After the analysis, 12 out of a total of 24 item pools were selected to be used.

3.8 Classical Test Theory Analysis

The results of analyzing content validity using Aiken's V based on the expert judgment and cognitive interview processes are 0.95 and 0.92 (both high category), respectively. Following that analysis, the researchers conducted a normality test using the Kolmogorov-Smirnov method through SPSS and got the significance value of > 0.05, meaning that the data was normally distributed. Furthermore, this method of analysis obtains the correlation value with a range of 0.514 to 0.760. According to Field (2009), a good value for corrected item-total correlation is above 0.3. Based on these provisions, all TSES adaptation items can represent the TE construct well. Then, to measure reliability, it was found that Cronbach's alpha of the Bahasa Indonesia version of the TSES was 0.947 for 24 items and 0.908 for 12 items. According to George and Mallery (in Gliem & Gliem, 2003) Cronbach's alpha value above 0.9 belongs to the excellent category. This shows that the Bahasa Indonesia version of the TSES adaptation is reliable due to its homogeneous nature and good item consistency. However, several other figures such as Nunnally (1978) say that Cronbach's alpha correlation values that are above 0.90 need to be avoided. Nunnally (1978) states that Cronbach's alpha value above 0.90 indicates redundant items. Because the original measuring instrument from TSES has two versions, namely the long version and the short version, the researchers will make an analysis based on these two versions, so that later a comparison can be obtained based on the results of item analysis and CFA.

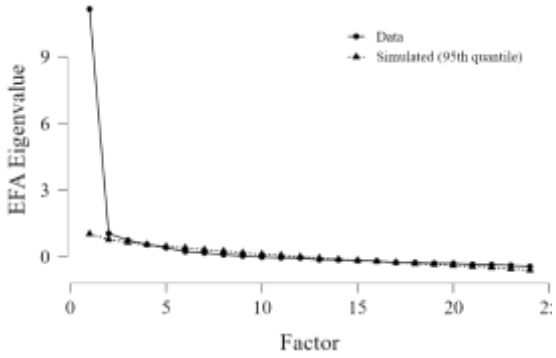
3.9 Hypothesized Measurement Model

Based on the results of a literature review conducted for the journal about the model of the TSES measuring instrument is still not clear, there are still differences of opinion from the results of research using the TSES measuring instrument. If you refer to Tschannen-Moran and Hoy (2001) who are the developers of the TSES, this measurement instrument is multidimensional by measuring factors such as student engagement, instructional strategies, and classroom management, but further research uses the TSES measurement instrument from Tschannen-Moran and Hoy (2001) found that the TSES is unidimensional (Maulana, et al., 2020; Dufin, French, & Patrick, 2012; Nie, Lau, & Liau, 2012; Turner & Carlson, 2003), in spite of that there are also studies that say that TSES can be unidimensional or multidimensional (Zai, 2016).

Because the dimensional model is still not clear, the researchers has a measurement hypothesis to test this assumption that will be proven using the EFA and CFA analysis methods.

1. Does the TSES have an adequate factor structure to be used in the context of teachers teaching gifted students?
2. Does TSES have a unidimensional or multidimensional model?

3.10 Exploratory Factor Analysis (EFA)



Sources: Personal data (2021)

***Figure 1**. Scree Plot*

Figure 1 shows a scree plot that can show the number of factor structures from the measuring instrument, it appears that there is one factor from the TSES measuring instrument, this result is in line with the findings of previous studies (Maulana, et al., 2020; Dufin, French, & Patrick, 2012 ; Nie, Lau, & Liau, 2012; Turner & Carlson, 2003). The total variance that can be explained by the model is 46% which is in one factor, besides that it is based on factor loading using oblique rotation (promax) using the maximum likelihood approach. Oblique rotation can be used on constructs where each factor has the possibility of being correlated with each other (Osborne, 2014), meaning that it can be interpreted that the three factors of TSES namely SE, IS, and CM have a correlation with each other. An item is said to have a significant factor loading if it has a value above 0.3 (Field, 2013). Based on the results of the factor loading TSES has a value with a range of 0.51 to 0.81. So that it can be interpreted that TSES-Indonesia tends to cluster in one factor, but the researchers did not evaluate the results of this analysis further because EFA was only used to identify the number of factors that compose the scale of teacher's sense of efficacy.

3.11 Confirmatory Factor Analysis (CFA)

The initial CFA analysis on the teacher's sense of efficacy variable is presented in table 3 which shows that the measurement model is still not fit. According to Hu and Bentler (1999), the accuracy of the model can be seen from several parameters, namely chi square p-value ($p > 0.05$), Goodness of Fit (GFI), Root mean square error of approximation (RMSEA < 0.05), Comparative Fit Index (CFI > 0.9), Standardized Root Mean Square Residual (SRMR < 0.08), NFI, IFI, and TLI. This initial analysis resulted in parameter values that does not meet the established criteria. The factor loading model for each item can be seen in Figure 2.

Based on the model obtained, the researchers decided to modify it to achieve a better and fit measurement model. Modification of the model is done by removing items that

have a loading factor below 0.5 (Hair et al., 2014) because a loading factor below 0.5 indicates the item has a low quality. The researchers modified the model by deleting items on the Bahasa Indonesia version of the TSES scale. The original TSES measuring instrument has two versions, namely the long form and short form, based on this the researchers decided to analyze using the short form of TSES using items number 3, 4, 6, 9, 11, 13, 15, 16, 18, 20, 22, and 23. Therefore there are 12 items to be analyzed with four items within each subscale/factor. Furthermore, the researchers conducted covariance on the items in reference to the recommendation results from the modification indices (Hair et al., 2014).

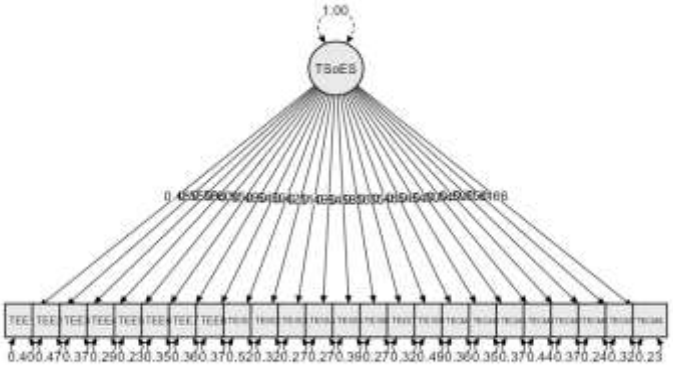
In this study, modification indices were carried out on items within the same factor to avoid changing the original theory model, this way it could be justified theoretically even though in this study it was proven to be unidimensional. The items analyzed with covariance were TEIS3 (7), TEIS5 (18), TEIS6 (20), TECM4 (13), TECM5 (15), TEE5 (9), TEE8 (22), TECM1 (3). Modification indices can be used because in this case due to its accordance with the reliability results on classical test measurements which resulted a Cronbach's alpha > 0.9 which according to Nunnally (1978) indicates redundant items. Therefore, analyzing the covariance of items can be one solution to get a fit model in this study.

Table 3. *TSES Pre-modification Accuracy Parameter*

Category	**Parameter Fit**	**Output**	**Criteria**	**Details**
Absolute Fit	*Chi square P-Value*	< 0,01	> 0,05	Unfit
	Goodness of fit index (GFI)	0,68	> 0,90	Unfit
	Root mean square error of approximation (RMSEA)	0,11	< 0,08	Unfit
	Norm fit Index (NFI)	0,70	> 0,90	Unfit
	Incremental fit index (IFI)	0,79	> 0,90	Unfit
Incremental fit	*Comparative fit index* (CFI)	0,78	> 0,90	Unfit
	Tucker-Lewis Index (TLI)	0,76	> 0,90	Unfit
Parsimonious fit	*Parsimonious Normal Fit Index* (PNFI)	0,64	0,60-0,90	Fit

Sources: Personal data (2021)

Model plot



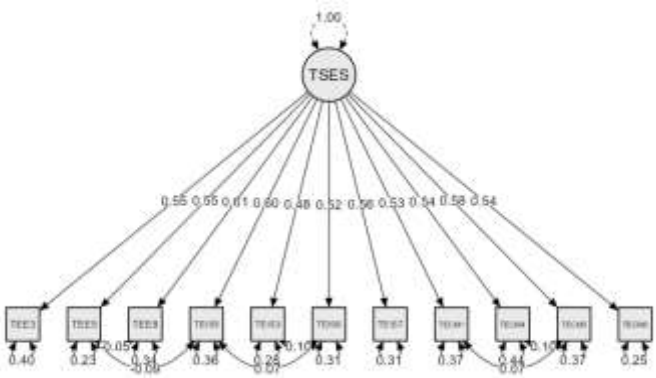
Sources: Personal data (2021)
Figure 2. *Teacher's Sense of Efficacy Initial Measurement Model*

The test results of the final modification can be seen in table 4. It can be seen that the Chi-square p-value of the final model is above 0.05. This shows that the model is fit, meaning that there is no significant difference between the ideal model and the proposed model based on observational data. The values of CFI, TLI, NFI, IFI, RMSEA, AND SRMR are in accordance with the criteria set to obtain a fit model. So that it can be said that the final model is fit, and the proposed model can be said to be fit with evidence of empirical data. The complete model and loading factor for each item in the final model can be seen in Figure 4.

Table 4. *TSES Final Model Accuracy Parameters*

Category	Parameter fit	Output	Criteria	Details
Absolute Fit	*Chi square P-Value*	< 0,14	> 0,05	Fit
	Goodness of fit index (GFI)	0,93	> 0,90	Fit
	Root mean square error of approximation (RMSEA)	0,04	< 0,08	Fit
	Norm fit Index (NFI)	0,93	> 0,90	Fit
	Incremental fit index (IFI)	0,99	> 0,90	Fit
Incremental fit	*Comparative fit index* (CFI)	0,99	> 0,90	Fit
	Tucker-Lewis Index (TLI)	0,98	> 0,90	Fit
Parsimonious fit	*Parsimonious Normal Fit Index* (PNFI)	0,67	0,60-0,90	Fit

Sources: Personal data (2021)



Sources: Personal data (2021)
Figure 3. *Final TSES Model*

3.12 Convergent Validity

The main purpose of CFA is to test the construct validity of the theory underlying the measurement. A fit model becomes the main indicator of whether the measuring instrument being tested truly reflects the theoretical construct being measured (Hair, et al., 2019). In addition to measuring the accuracy of the model through CFA, construct validity can also be seen from Construct Reliability (CR). Reliability itself can be said as the internal consistency of an instrument that can be measured based on the level of homogeneity of the items. CR is obtained by calculating the square of the number of factor loadings for each factor and the number of error variances.

In Hair et al., (2010) it is explained that the reliability test in CFA consists of Construct Reliability (CR) and Variance Extracted (AVE). Hair et al., 2010 explained that the CR value 0.7 is considered good reliability, while the CR value between 0.6 and 0.7 is considered acceptable reliability, with a note that the indicator has a factor load that matches the criteria. High construct reliability indicates that there is internal consistency, which means that all items consistently represent the same latent construct. Based on the data in Table 12, that the Bahasa Indonesia version of TSES has a CR value of > 0.7 which would mean that the Bahasa Indonesia version of the TSES which is adapted to the context of teachers who teach gifted students has good construct reliability and meets the principle of convergent validity.

3.13 Construct Reliability Calculations

Tabel 5. *CR Value*

Indicator	**λ**	**Error**	**λ ²**	**CR**
TEE3	0,67	0,55	0,45	0,919
TEE4	0,75	0,44	0,56	
TEE5	0,76	0,43	0,58	
TEE8	0,73	0,46	0,53	
TEIS3	0,66	0,56	0,44	
TEIS5	0,7	0,51	0,49	
TEIS6	0,69	0,52	0,48	
TEIS7	0,7	0,51	0,49	
TECM1	0,66	0,57	0,44	
TECM4	0,62	0,61	0,38	

TECM5	0,68	0,54	0,46
TECM6	0,73	0,47	0,53
TOTAL	8,35	6,17	5,83

3.14 Discussion

The purpose of this study was to adapt the Teacher's Sense of Efficacy Scale (TSES) developed by Tschannen-Moran & Hoy (2001) to accomodate the context of gifted students in Indonesia. To carry out this process, the validity and reliability of the adapted measuring instrument were tested. Aiken's V is used to evaluate the content validity of the measuring instrument, then CTT is used to evaluate the reliability of the measuring instrument. CTT is used to obtain Cronbach's Alpha as a coefficient of internal consistency of a construct and the reliability of a measuring instrument. After testing, the results of the alpha coefficient on reliability are classified as very good. Cronbach's alpha correlation values above 0.90 need to be noted for researchers because according to Nunnally (1978) this indicates redundant items. Furthermore, the corrected item-total correlation analysis shows a good discriminatory power. According to Field (2009) a good corrected item-total correlation has a value above 0.3. Based on these provisions, all TSES adaptation items can represent the Teacher Efficacy construct well.

The study conducted by Tschannen-Moran and Hoy (2001) has a correlation with a range of 0.49 to 0.75 and a reliability of 0.90 for the TSES short form. This means that the value of the validity and reliability of the original version of TSES is not much different from the results of this study which has a correlation of 0.51 to 0.76 and a reliability of 0.908. Furthermore, the results of a research conducted in Indonesia by Maulana et al., 2020 showed a reliability value of 0.95. This result shows a results that are not much different either. The researchers realizes that it is still necessary to compare the results with studies that have the same context, namely TSES in the context of gifted students, but studies related to the adaptation of the TSES measuring instrument to this context was not found, hence using studies mentioned above.

During the TSES adaptation process there were items that became eliminated. Initially the researchers adapted the TSES by using the long form which had 24 items, but after an analysis was carried out from using the CTT to CFA the results did not fit. So finally the researchers decided to adapt the TSES by using a short form consisting of 12 items referring to the modification steps that can be taken to make the items fit. In addition, answering the research hypothesis of the results of the EFA shows that TSES is a unidimensional measuring tool, so that the factors in TSES only measure one construct, namely teacher self-efficacy. These results are in line with research from (Maulana, et al., 2020; Dufin, French, & Patrick, 2012; Nie, Lau, & Liau, 2012; Turner & Carlson, 2003) that TSES is a unidimensional measuring tool. The results of this dimensional model are different from the results of research from Tschannen-Moran & Hoy (2001) and Zai (2016) which say that TSES is a multidimensional measuring tool.

Based on the results of the analysis of validity, reliability, and CFA in this study, it shows that the Bahasa Indonesia version of TSES can be used to assist in measuring the self-efficacy of teachers who have or are teaching gifted students in Indonesia by using self-efficacy factors on SE, IS, and CM. In this study, there are shortcomings, namely the number of respondents is still limited to be able to represent the number of teachers who have previously or are currently teaching gifted students. The shortcomings found in this study can be corrected in future studies.

IV. Conclusion

The Bahasa Indonesia version of the Teacher's Sense of Efficacy Scale (TSES)-Short Form (TSES - SF) which consists of three factors with a total of 12 items, is proven to be valid and reliable by psychometric measurements. The corrected item-total correlation value is in the range of 0.514 to 0.760 and Cronbach's Alpha for the Bahasa Indonesia version of the TSES-SF is 0.908, indicating that the TSES-SF is proven to be valid and reliable. Exploratory Factor Analysis shows values with a range of 0.51 to 0.81, meaning that the Bahasa Indonesia version of the TSES SF is unidimensional. Confirmatory Factor Analysis shows that GFI is 0.93, RMSEA is 0.04, IFI is 0.99, CFI is 0.99, TLI is 0.98, and PNFI is 0.67. So it can be concluded that the Bahasa Indonesia version of the TSES-SF can be used to measure teacher's sense of efficacy in a population of teachers who are currently or have previously taught gifted students. Furthermore, the suitability between the number of items and the number of samples used should be considered in future studies, for the adequate data obtained in this current study can be strengthened further with more samples. In addition, to support the development of research and measurement related to gifted students, it would be beneficial to have the government form a special platform or database that could be used as a reference.

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