Portuguese version of the Teachers' Sense of Efficacy Scale:

validation Study

Psychometric characteristics of the Portuguese version of the Teachers' Sense of Efficacy Scale (TSES)

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Abstract

Teacher self-efficacy is considered a significant predictor of positive outcomes both for students and teachers, such as student academic performance, teacher commitment or teacher-student relationships. One of the most widely used instruments for evaluating teacher efficacy beliefs is the Teacher Sense of Efficacy Scale (TSES), already adapted and validated in several studies. The present study is aimed at to evaluate the psychometric properties of the TSES (short form) in the Portuguese educational context, using a sample of 122 secondary school teachers from both public and private schools in Portugal. The performed analysis confirmed the original scale's three-factor-correlated structure, and our findings confirm that the TSES is a reliable and valid instrument, and thus potentially useful for research within the Portuguese educational context. The study's limitations are discussed, and recommendations for future research are provided.

Introduction

Parents and governments should aim for all children, regardless of their circumstances, to receive a quality education that unleashes their potential. A lack of access to this opportunity can place them at a disadvantage, as subsequent educational opportunities often reflect early educational outcomes. The quest for enhanced educational equity goes beyond social justice; it serves as a strategy to efficiently use resources and enhance the reservoir of knowledge and skills that drive social, economic development, and cohesion. (OECD 2018). In this contemporary educational setting, teachers stand out as the paramount asset. The quality of an education system depends on the quality of its teachers. The enhancement of schooling's efficacy, productivity, and fairness largely hinges on fostering a scenario where capable individuals are motivated to pursue teaching careers, delivering high-caliber instruction that ultimately advantages every student (OECD 2018). Accordingly, in the literature, numerous studies have consistently shown that teacher efficacy is closely linked to teacher behaviours, work-related stress, job satisfaction, and student outcomes (Chan et al., 2008; Wong et al., 2010; Moè et al., 2010; Nie et al., 2012; Wolters & Daugherty, 2007). Researchers have become interested in teacher self-efficacy due to its connection to teacher efficacy beliefs, motivation, and the academic progress of students (Armor et al., (1976); Berman et al., (1977); Tschannen-Moran et al., 1998).

The concept of teacher self-efficacy, which has gained attention in research since Bandura's socio-cognitive perspective, established in 1997 and 2012, can be defined as an individual teacher's belief in their ability to

perform a specific teaching task, in a given certain standard, in a particular situation (Dellinger et al. 2008). Teachers with high levels of self-efficacy beliefs exhibit greater commitment to their students and the teaching profession (Chesnut and Burley 2015). The impact of a teacher's sense of effectiveness extends to their ambitions, their capacity for innovation, and their resilience in the face of challenges. Teachers who believe in their abilities are more likely to remain in the educational field, dedicate more hours to instruction, exert more effort in managing their classrooms, and approach teaching with increased vigour. Furthermore, teachers with a heightened sense of efficacy are more attuned to their students' needs. They are less likely to criticize students for errors and more inclined to invest extra time with those facing difficulties, engaging more deeply in the students' educational journeys (Ho & Hau, 2004; Tschannen-Moran & Hoy, 2001).

Although the subject is clearly important, there have been some challenges in measuring teacher self-efficacy (Klassen et al., 2011); Wyatt, 2014), and also in some of research results (Klassen et al., 2011), which could be deemed conceptually questionable, potentially leading to erroneous conclusions from the study results. Previous measures of teachers' self-efficacy suffered from flawed conceptualization, such as an emphasis on ability rather than capability and a focus on external influences rather than internal beliefs. Through the creation of the Teachers' Sense of Efficacy Scale (TSES), Tschannen-Moran and Hoy (2001) sought to align the investigation with the challenges teachers face in school environment. Their objective was to establish a substantial consensus on the conceptualization and measurement of the construct, ultimately providing a defined definition for teacher efficacy. This definition revolves around a teacher's judgment of their capabilities to attain desired student outcomes. Two versions of TSES were created and validated: a short form consisting of 12 items, which is used more frequently, and a long form containing 24 items. The instrument's both forms assess three interrelated latent factors that reflect three domains of teaching: efficacy to promote student engagement, efficacy for classroom management, and efficacy in using instructional strategies. The general efficacy score was found to be more commonly used than the three task-specific efficacy scores (Tschannen-Moran & Hoy, 2001)

In recent years, the TSES has been employed in various countries and cultures, including studies by Klassen et al., (2009) in Canada, Ruan et al., (2015) in Asian countries, and Tsigilis et al., (2010) in Greece. Most studies have used confirmatory factor analysis (CFA) to examine the construct validity of the TSES, and they have generally confirmed the three-factor model proposed in the initial study. However, to improve the model's goodness-of-fit, some studies have allowed for the correlation of errors between certain items (Klassen et al., 2009) or removed items that did not fit the original model (Tsigilis et al., 2010; Ruan et al., 2015). At the item level, it is crucial to consider cultural influences in teacher self-efficacy research, as certain words may have distinct meanings in different cultures. Ruan et al. (2015) discovered that the item "How well can you establish a classroom management system with each group of students?" did not align with school systems in Asian countries. Additionally, some studies have identified a high correlation between individual dimensions of teachers' self-efficacy due to cross-loadings (Nie et al., 2012; Scherer et al., 2016).

International Insights into the "Teachers' Sense of Efficacy Scale"
In Singapore, Nie et al. (2012) conducted research with 109 primary and secondary school teachers. This study presented a modified version of the scale that included three distinct dimensions: efficacy in instruction, efficacy in classroom management, and efficacy in motivation. The altered sub-scales showed strong reliability in terms of internal consistency. The results of the factor analysis suggested that it might be feasible to combine certain beliefs about teacher efficacy into a single comprehensive factor. The study found strong evidence for convergent validity, but the evidence for discriminant validity was weaker. Confirmatory factor analysis (CFA) was utilised both to corroborate the findings of the exploratory factor analysis (EFA) and to examine the fit of the data with the theoretical model proposed. The confirmatory factor analysis pinpointed three factors, each with eigenvalues above 1, which together accounted for 75.66% of the overall variance. The primary factor was related to efficacy in motivational strategies, followed by the second factor, efficacy in classroom management, and the third factor, efficacy in instructional strategies. In summary, the results imply that when forecasting outcomes, it is recommended to use a composite self-efficacy score that is based on specific beliefs about teacher efficacy in various tasks.

The research conducted by Ninkovic & Knezevic-Floric, (2018) in Serbia examined the reliability, factor structure, and criterion validity of the 12-item Teachers' Sense of Efficacy Scale (TSES) within a cohort of 452 Serbian teachers. The TSES scores showed internal consistency, with estimates ranging from .77 to .88. Confirmatory factor analysis revealed that a three-factor model of the TSES aligned most closely with the empirical data. The scale's criterion validity was affirmed by linking its subscales to teacher job satisfaction. The study also observed that primary school teachers reported higher self-efficacy in engaging students compared to their peers in secondary and high schools. There were no significant differences in self-efficacy related to gender

or teaching tenure. These findings endorse the TSES as a reliable and valid instrument for measuring teacher efficacy.

Htang (2018) research in Myanmar encompassed 101 in-service teachers across three educational tiers: public high schools, education colleges, and universities. The study affirmed the short form of the Teachers' Sense of Efficacy Scale (TSES) as an appropriate instrument for gauging the self-efficacy of Myanmar's in-service teachers, with all subscales showing adequate reliability. Additionally, an ANOVA analysis indicated significant differences in classroom management efficacy between high school teachers and those teaching at the university level. Regarding academic qualifications, teachers holding professional degrees reported higher efficacy than their counterparts with academic degrees.

Salas-Rodríguez et al., (2021) study in Mexico was conducted to evaluate the reliability, internal validity, and external validity of the Spanish-adapted short form of the Teachers' Sense of Efficacy Scale (TSES). The research sampled 190 primary and secondary educators from 25 private institutions. The construct validity analysis verified the presence of the three interrelated factors that the original scale exhibited. Furthermore, the study found evidence for criterion validity by identifying a relationship between teachers' self-efficacy and their job satisfaction. The study also noted differences in self-efficacy based on variables such as the teachers' gender, their years of experience, and the educational levels they taught.

Taking into consideration the aforementioned the main aim of this study is to is to assess the psychometric characteristics of the Teacher Sense of Efficacy Scale short form, developed by Tschannen-Moran & Hoy, (2001), when applied to a sample of Portuguese teachers

Present Study
The overall purpose of this study was to adapt and conduct the analysis of the psychometric characteristics of the Teacher's Sense of Self-Efficacy Scale (TSES, Tschannen-Moran & Hoy, (2001)) in Portuguese speakers while it is tested on a sample of public and private school teachers in Portugal. To achieve this purpose, we set out to determine if the three-dimensional factor-analytic solution presented by the original short form of the TSES is replicated in a sample of Portuguese teachers. We hypothesised that the original structure of the scale, which assumes the existence of 3 interconnected latent factors, will be confirmed on the sample of Portuguese teachers. Internal validity evidence will be examined by conducting a CFA to analyse whether the items load on their original factor, and that the Years of experience will affect self-efficacy of teachers; self-efficacy will increase during the first years of the career but will decrease during later stages. Finally, the current research may contribute to the further internationalisation of this field of research.

Materials And Methods
Participants and Procedure
The convenience sample for this study consisted of 122 teachers from secondary teaching schools of the Portuguese educational system, where 40.2% were teaching at public schools and 59.8% were teaching at private schools. That total includes 87.7% women and 12.3% men. Concerning service time, 45.9% had between 11 to 20 years of teaching time, 34.4% had over 20 years, 10.7% had less than 5 years and 9% had between 6 and 10 years. Data were collected in 2020 and 2021 using a Microsoft Forms questionnaire. 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. Participants were aware of the purpose of the study and completed the questionnaire anonymously. Teacher self-efficacy was measured using the TSES short form (Tschannen-Moran & Hoy, 2001) with the permission of one of the authors of the scale (AWH).

Table 1. Frequencies of School, Gender, and Years of Service

Category	Freq.	%	Valid %	Cumulative %
Frequencies of School				
Public	49	40.2	40.2	40.2
Private	73	59.8	59.8	100.0
Total	*122*	*100.0*	*100.0*	-
Gender				
Female	107	87.7	87.7	87.7
Male	15	12.3	12.3	100.0
Total	*122*	*100.0*	*100.0*	-
Years of Service				
0-5	13	10.7	10.7	10.7
6-10	11	9.0	9.0	19.7
11-20	56	45.9	45.9	65.6
+20	42	34.4	34.4	100.0
Total	*122*	*100.0*	*100.0*	-

Note. Freq. = Frequency; % = General percentage; Valid % = Valid percentage; Cumulative % = Cumulative percentage.

2. Translation of items and spoken reflection

The Portuguese version of the TSES was established using the translation and back-translation procedure. First, a native Portuguese-speaking translator translated the TSES into Portuguese. Second, there was conducted a re-translation of the scale from Portuguese to English. Third, the authors and the professionals reviewed both versions item by item to detect semantic and/or conceptual differences between the original and translated versions. Finally, six Portuguese teachers revised the TSES Portuguese version, the opinions were discussed, and a consensus was reached for each item. Based on the listed procedures it reached a final version and concluded that no further changes were necessary. Table 2 shows the TSES Portuguese version.

3. Psychometric studies

The short version of the questionnaire by Tschannen-Moran & Hoy (2001) was translated by a professional translator to ensure the faithfulness of the Portuguese version, and it was later applied to a group of teachers to verify whether the items were easy to understand. The final questionnaire resulted from the suggested changes. The instrument has 12 items requiring an answer using a five-point Likert scale, from "Nothing" to "A great deal". The 12 items are related to the constructs *Efficacy for student engagement, Efficacy for instructional strategies* and *Efficacy for classroom management*, a division presented by the authors in the original version. The final text of the 12 items can be found in Table 2.

To conduct the study on the psychometric characteristics of the Teacher's Sense of Efficacy Scale – short version – a research study was developed among a population of Portuguese teachers where an initial Exploratory Factor Analysis (EFA) was performed using the Principal Components Method along with varimax orthogonal rotation, constrained at three factors, to verify whether the instrument's factor structure was maintained as per the authors' original structure. If the structure was not maintained, the next step would be to consider this model as concurrent to the original model, analysing the models by Confirmatory Factor Analysis (CFA), using Structural Equation Modelling. Internal consistency studies will also be presented.

In this design, the statistical assumptions to perform an EFA shall be tested, namely, normality tests (kurtosis and skewness), multicollinearity and the rotated correlation matrix analysis, verifying whether the number of items is adequate for the analysis. The instrument's reliability shall be assessed via the internal consistency analysis, using Cronbach's alpha values. These analyses shall be performed using the SPSS statistics software, version 20.

The structural equation model shall be tested by EQS 6.1 software means, the maximum-likelihood estimation method will be employed if the distributions are deemed statistically normal; however, if the limits fall outside the normal range, the robust maximum-likelihood estimation method (MLR) will be applied. In the latter scenario, the presented results will be adjusted according to the approach proposed by Satorra (cited by Satorra & Bentler, 2001). Furthermore, Yuan and Satorra (2007) advise against the use of the maximum-likelihood method in cases where distributions exhibit problematic levels of kurtosis and skewness. The fit indexes to be presented are as follows: the chi-squared, with corresponding degrees of freedom and significance value (as an corrected alternative to non-normal distribution, the Satorra-Bentler scaled chi-square ($Sb\chi^2$) shall be presented);

the Bentler-Bonett's non-normed fit index (NNFI), the Comparative Fit Index (CFI), the Bollen's Fit Index (IFI), the McDonald's Fit Index (MFI), the Root Mean Square Error Of Approximation (RMSEA) and its Confidence Interval at 90% (IC90%$_{RMSEA}$). The Akaike Information Criteria (AIC) will be used for model comparison in case of non-nested models (Werner and Schermelleh-Engel 2010). Alternatively, a chi-squared difference test shall be performed either with the normal chi-square or using the scaled difference test if the results are indicative of concurrent nested models.

Table 2 | Portuguese and original versions of the Teachers' Sense of Efficacy Scale (TSES).

TSES Portuguese version					Original TSES (Tschannen-Moran & Hoy, (2001))								
1	2	3	4	5	1	2	3	4	5	6	7	8	9
Inexistente Fraca Suficiente Forte Muito forte					**Nothing Very little Some Influence Quite a bit A great deal**								
Eficácia na interação com alunos					*Efficacy for student engagement*								
2. Avalie a sua capacidade para motivar os alunos que demonstram pouco interesse no trabalho escolar.					How much can you do to motivate students who show low interest in school work?								
4. Avalie a sua capacidade para ajudar os alunos a valorizarem a aprendizagem.					How much can you do to help your students value learning?								
7. Avalie a sua capacidade para acalmar um aluno perturbador.					How much can you do to calm a student who is disruptive or noisy?								
11. Avalie a sua capacidade para colaborar com as famílias, delineando estratégias conducentes ao sucesso dos alunos.					How much can you assist families in helping their children do well in school?								
Eficácia nas estratégias didáticas					*Efficacy for instructional strategies*								
5. Avalie a sua capacidade para construir itens didaticamente adequados e pertinentes para os seus alunos.					To what extent can you craft good questions for your students?								
9. Avalie a sua capacidade para utilizar instrumentos de avaliação diversificados.					To what extent can you craft good questions for your students?								
10. Avalie a sua capacidade para apresentar uma explicação ou um exemplo alternativo quando os alunos têm dúvidas.					To what extent can you provide an alternative explanation or example when students are confused?								
12. Avalie a sua capacidade para implementar estratégias de aprendizagem diferenciadoras na sala de aula.					How well can you implement alternative strategies in your classroom?								
Eficácia na gestão da sala de aula					*Efficacy for classroom management*								
1. Avalie a sua capacidade para controlar o comportamento perturbador na sala de aula.					How much can you do to control disruptive behavior in the classroom?								
3. Avalie a sua capacidade para convencer os alunos de que podem obter bons resultados no trabalho escolar.					How much can you do to get students to believe they can do well in school work?								
6. Avalie a sua capacidade para assegurar o respeito das regras de sala de aula pelos alunos.					How much can you do to get children to follow classroom rules?								
8. Avalie a sua capacidade para estabelecer um sistema de gestão da sala de aula de acordo com o desempenho dos alunos.					How well can you establish a classroom management system with each group of students?								

Handling of Missing Data
In this study, missing data were not considered in the analysis. Given that the Teachers' Sense of Efficacy Scale (TSES) requires responses to all items to generate a valid score, any questionnaire with a missing response was deemed invalid. Consequently, participants who did not complete all items were excluded from the final dataset. This approach ensured that all included responses represented complete and analyzable data.

Exploratory Factor Analysis (EFA)
An Exploratory Factor Analysis (EFA) was performed in the 12 items of the short version of the **Teacher's Sense of Efficacy Scale (TSES)** by means of Principal Components Method and using the varimax orthogonal rotation**.** First, the distribution normality analysis was performed on the instrument's items. While all skewness values were within normality limits (S[-1.03, .01]), six of the TSES items provided Kurtosis values above out of the -1 and +1 range (K[2.54, .06]), although for EFA purposes the analysis can be computed. The value for the correlation matrix determinant [det(X)] was of .011, indicating a nonexistence of multicollinearity, another assumption to perform the EFA. Kaiser-Meyer-Olkin sample adequacy measure was over .70 (KMO = .81), indicating that items are enough for performing the EFA studies. The result from Bartlett's sphericity test

indicated that the correlation matrix is significantly different from a matrix where all correlations are zero (χ^2 = 523.16, p = .00), so the analysis can be also performed. Ideally, the communality values would be higher than .5, which was not the case for items 10 e 11. During the analysis, a three-factor solution was requested, considering the instrument assumes the existence of three latent constructs (Leech, Barrett, and Morgan 2005), namely, *Efficacy for student engagement* (ESE), *Efficacy for instructional strategies* (EIS) and *Efficacy for classroom management* (ECM)*. After the varimax orthogonal rotation with Keiser's normalization, the first factor explains 22.58%, the second factor explains 19.12%, and the third factor explains 18.89% of the variance. The obtained solution explains a total variance of 60.58%. Table 3 is presenting the results.

Table 3. Factor Loadings for a 3 Factors Varimax rotated Solution Varimax

Items	Factor Loads			Communalities
	EIS	ESE	ECM	
1. How much can you do to control disruptive behavior in the classroom?			.87	.78
2. How much can you do to motivate students who show low interest in school work?		.70		.58
3. How much can you do to get students to believe they can do well in school work?		.84		.77
4. How much can you do to help your students value learning?		.83		.78
5. To what extent can you craft good questions for your students?	.65			.43
6. How much can you do to get children to follow classroom rules?		.42	.63	.59
7. How much can you do to calm a student who is disruptive or noisy?			.85	.77
8. How well can you establish a classroom management system with each group of students?	.76			.66
9. To what extent can you craft good questions for your students?	.75			.58
10. To what extent can you provide an alternative explanation or example when students are confused?	.52		*.31*	.41
11. How much can you assist families in helping their children do well in school?	.47		*.35*	.40
12. How well can you implement alternative strategies in your classroom?	.70			.53
Set values	4.68	1.50	1.09	
Variance %	22.58	19.12	18.89	

Note: the highlighted numbers are factor load values from items integrating the original factor structure. Item no. 8, only saturates for the "Efficacy for instructional strategies" dimension/factor.

According to Costello e Osborne, (2005), when there are cross-loadings of .32 or higher, the decision to remove the item can be taken if the loading is of .50 or higher and also if there is a difference between loadings that is higher than .10. When analysing Table 3, this occurrence can be seen for items 6 and 10, with the highest saturation on the factor of the original factorial structure. As for item 11, the factor load is low in both cases and there's loading on the original factor, which may show that the initial factor structure was not very adequate or that an item was not properly understood by the respondents of the Portuguese version of the instrument. Item no. 8 saturates only in one of the factors which is not the original one. Taking into account these results and the aforementioned criteria, an internal consistency analysis was performed to assess whether items adequately measure the construct they're supposed to assess, with the original structure and the one resulting from the EFA.

Internal consistency
The internal consistency values were calculated for each of the original scales, and results are presented using the alfa values if item deleted or of item maintenance testing both models. (*consult* Table 4).

Table 4. Internal Consistency Values (Cronbach's alpha)

	M	*SD*	α if the item is excluded	α if the item is included
Scales				
Items				
Efficacy for student engagement (α =.76)				
2. How much can you do to motivate students who show low interest in school work?	**3.93**	.60	.69	
4. How much can you do to help your students value learning?	4.21	.68	.65	
7.How much can you do to calm a student who is disruptive or noisy?	4.28	.70	.66	
11. How much can you assist families in helping their children do well in school?	**3.95**	.85	.80	
Efficacy for instructional strategies (α = .67)				
5. To what extent can you craft good questions for your students?	**4.34**	.63	(.65).74	
9. To what extent can you craft good questions for your students?	**4.07**	.69	(.55) .69	
10. To what extent can you provide an alternative explanation or example when students are confused?	**4.61**	.55	(.63) .74	
12. How well can you implement alternative strategies in your classroom?	**4.00**	.73	(.61) .71	
8.How well can you establish a classroom management system with each group of students?	3.98	.64	.67	.76
Efficacy for classroom management (α = 76.3)				
1. How much can you do to control disruptive behavior in the classroom?	**4.14**	.68	.67	
3.How much can you do to get students to believe they can do well in schoolwork?	4.46	.63	.70	
6.How much can you do to get children to follow classroom rules?	3.91	.77	.64	
8.How well can you establish a classroom management system with each group of students?	**3.98**	.64	.79	

Note: the highlighted item originally integrated the "Efficacy for classroom management" factor. However, this item saturated at the "Efficacy for instructional strategies" factor in the Exploratory Factor Analysis. In the column for α if the item is excluded, under the "Efficacy for instructional strategies", inside parenthesis is the analysis value for the initial 4 items, followed by the analysis value integrating item no. 8. *M* = Mean, *SD* = Standard Deviation, α = Cronbach's alpha.

In the ESE subscale, it is possible to verify that the elimination of item no. 11, which was crossloading at low values, which were not its original factor, allows the Cronbach's alpha value to increase to a good internal consistency cutoff, with the alfa value raising from .76 (reasonable) to .80 (good). In the case of the EIS subscale, two analyses were performed. The first one maintained only the 4 indicators from the original scale, presenting a low alpha value (α = .67). When the analysis was repeated including item no. 8, the Cronbach's alpha value became .77, i.e., reasonable, which lead to the decision of maintaining it in the EIS factor. Lastly, the internal consistency analysis was performed for the 4 indicators of the "Efficacy for classroom management". Although presenting a reasonable Cronbach's alpha value, by removing item no. 8 – which did not saturate in its factor (at least with a value of .3 or higher) – there was an increase of the alfa to .79. This is .01 away from qualifying as good, which suggests it should be removed (for qualitative values corresponding to Cronbach's alpha quantitative values, it is advisable to use the grid by Pestana & Gageiro (2008).

Decision about the exclusion/inclusion of items in the instrument's initial factors from the Exploratory Factor Analysis and the Internal Consistency Analysis
According to the results obtained both in the EFA and the internal consistency analysis, the factor structure found is very similar to the original one, where the EIS subscale has 5 indicators (adding item no. 8 to this subscale), the ESE maintains 3 indicators and loses item no. 11, and the ECM subscale, after the inclusion of item no. 8 in the EIS subscale, and due to the absence of significant factor load in its factor, maintains the 3 items from the initial structure.

This way, the model resulting from the EFA was considered as an alternative to the original model, testing which of both is the best methodologic solution.

Confirmatory Factor Analyses for a comparison between the original model and the model obtained from the EFA

To further complete the instrument's psychometric characteristic analysis, as mentioned in the methodology, a comparison was performed between the original model and the concurrent model resulting from EFA by means of Structural Equation Modelling methodology. Considering that the sample shows variables/indicators that are not distributed according to the normal curve, CFAs were computed using the maximum-likelihood estimation robust method, indicated in these situations (Satorra, 1990, as quoted by West, Finch and Curran in 1995). The analysis were performed using the EQS 6.1 statistical package, as it enables the application of this correction in its analysis.

In CFAs, the implied factors were fixed in 1, enabling a free estimation of the regression parameters between factor and observed variable. Just as in the original model, a moderate correlation between implied factors is presumed. The models are non-nested, given that the EFA model does not have the same indicators as the original model. As such the comparison between the concurrent models will use the Akaike Information Criteria, considering the lowest value model to be the best fit. Results showed that every indicator was significant to the respective factor, regardless of the considered model with all indicators presenting significant p values ($p < .05$) for their factor. Table 5 shows the comparative results and the fit indexes from the concurrent models.

Table 5. Competing Models Fit Indexes

Fit Indexes for Maximum-Likelihood Estimation Robust	Original Model	EFA Model
$SB\chi^2$	92.42	51.95
df	51	41
p	.000	.117
Bentler-Bonett's Non-normed Fit Index (NNFI)	.85	.96
Comparative Fit Index (CFI)	.88	.97
Bollen's Fit Index (IFI)	.89	.97
McDonald's Fit Index (MFI)	.84	.96
Root Mean Square Error of Approximation (RMSEA)	.08	.05
Confidence Interval at 90% of RMSEA (IC90%$_{RMSEA}$)	[.05, .11]	[.00, .08]
Akaike Information Criteria (AIC)	-9.58	-30.05

Note: The method used was Maximum-Likelihood Estimation Robust. $SB\chi^2$ = Satorra-Bentler's Scaled Chi-Squared; df = degrees of freedom; *p* = significance probability value; EFA = Exploratory Factor Analysis.

Comparing the values of AIC – a parsimony fit index–, which being negative indicate a higher value for the original model than of the concurrent EFA model. Therefore, it may be inferred that data fits best on the latter model (Pilati and Laros 2007). The best fitted model is also the most parsimonious. The value of $SB\chi^2$ from the EFA model is substantially lower than the original model, and while the original model does not show statistical significance, the EFA model shows a value of $p = .12$. The fit indexes shall be interpreted next (Bentler 1990), presenting a set of indexes to better evaluate the models (Tabachnick, Fidell, and Ullman 2013). At the level of relative fit indexes (quality assessment of a model in relation to the independent model), the NNFI value of the EFA model is considered very good (NNFI > .95) when compared to the original model, which is merely acceptable. The CFI corrects the underestimation for small samples, and the value obtained is considered very good (CFI > .95) for the EFA model when compared to the original model, which is merely acceptable. At the level of indexes that assess the populational discrepancies, the RMSEA – an absolute index that tries to correct the tendency of the χ^2 statistic in rejecting models with large sized samples – and its respective confidence interval show that the fit is adequate for very good (RMSEA $\leq$ .05) once again in the EFA model when compared to the value presented for the original model, which is considered mediocre, but none of the difference between the intervals of RMSEA was equal or below .05, an indication of best fit. The IFI – an incremental fit index – is also above .90 (the value that is considered acceptable), when compared to the original model (.89). The MFI – an absolute fit index – indicates a good fit because it's above .90 in the EFA model when compared to the original model (.84) (Plumed et al. 2015). Therefore, it is possible to infer a higher adjustment of the data to the model tested through EFA, when compared with the original one. The model for the **Portuguese version of the Teacher's Sense of Efficacy Scale (TSES)** has three factors, positively and moderately correlated among themselves (*r* values between .48 and .57), where the Efficacy for instructional strategies (EIS) dimension or

factor is composed of items or indicators no. 5, 8, 9, 10 and 12, the Efficacy for student engagement (ESE) dimension or factor is composed of items or indicators no. 2, 3 and 4, and the Efficacy for classroom management (ECM) dimension or factor is composed of items or indicators no. 1, 6 and 7.

The descriptive statistics for the TSES in a Portuguese sample (Table 6) indicates that the teachers in our study reported high levels of self-efficacy in all specific dimensions, with mean scores ranging between 4.14 and 4.20. They showed the greatest confidence in their ability to influence student engagement, while their confidence in instructional strategies was comparatively lower, although the results are very similar.

Table 6. Descriptive statistics for TSES factors.

	N	Minimum	Maximum	Mean	Std. Deviation
IS	122	2	5	4.14	.559
SE	122	3	5	4.20	.464
CM	122	2	5	4.17	.559
TSES	122	3	5	4.18	.416
Item 10. (EED)	122	3	5	4.61	.554
Item 6. (EGS)	122	1	5	3.91	.771
Valid N (listwise)	122				

IS - Efficacy for instructional strategies dimension; SE - Efficacy for student engagement dimension; CM - Efficacy for classroom management dimension; TSES - global mean for the Teacher's Sense of Efficacy Scale.

Regarding each item, individually, the number 10. "To what extent can you provide an alternative explanation or example when students are confused?" have the highest mean score with 4.61 (*instructional strategies dimension); while the lowest score is in the item 6 "How much can you do to get children to follow classroom rules*?" f (*classroom management dimension)* with a score of 3.91.

Discussion
The main aim of this study is to is to assess the psychometric characteristics of the Teacher Sense of Efficacy Scale short form, developed by Tschannen-Moran & Hoy, (2001), when applied to a sample of Portuguese teachers. The results confirmed the original three-factor structure of the scale that comprises the dimensions): efficacy for student engagement, efficacy for classroom management, and efficacy for instructional strategies (Tschannen-Moran & Hoy, (2001) and confirming the generalizability of the structure and thus also the construct validity of the scale.

Similar to other studies (Ruan et al., 2015); Tsigilis et al., 2010), we used modification indices for the reason that some items resulted in substantial misfit. In this study, the inaccuracies were present in items 8 ("How well can you establish a classroom management system with each group of students?") which belonged to the EGS subscale and was recoded into subscale EED and 11 ("How much can you assist families in helping their children do well in school?") which belonged to the EIA subscale but was discarded.

The confirmation of the three-factor key goes in line with the findings in Western (Klassen et al. 2009) and Asian countries (Ruan et al., 2015) and confirms that the Portuguese teachers share the same patterns in their activities. This results are in line with Vieluf et al., (2013) that suggests that teacher self-efficacy has a similar manifestation despite the different cultural environments and regardless of the characteristics of national education system. Nevertheless, the differences observed in the items fit could be interpreted based on specificities of the social and cultural context, and school conditions.

Compared to the original United States TSES (Tschannen-Moran and Hoy 2001) sample (which included 410 teachers from diverse sociodemographic backgrounds), our sample of Portuguese teachers exhibited higher overall efficacy (M=4.18, SD=0.42; M=3.9, SD=0.98) and in the dimension of student engagement (M=4.2, SD=0.47 ;M=4.0, SD=1.2). A similar trend was noted in classroom management (M=4.17, SD=0.56; M=3.7, SD=1.2), with our sample demonstrating greater efficacy. The efficacy for instructional strategies in our sample (M=4.14, SD=0.56) was also on par with the original study (M=4.1, SD=1.2).

In comparison to the international research, our sample scored higher in student engagement than studies from Serbia (Ninkovic and Knezevic-Floric 2018) (M=3.8, SD=1.13), Singapore (Nie, Lau, and Liau 2012) (M=3.98, Sd=0.68), and Myanmar (Htang 2018) (M=3.23, SD=0.7), but lower than Mexico (Salas-Rodríguez, Lara, and

Martínez 2021) (M=4.44, SD=0.81). For classroom management, our results surpassed those from Serbia (M=4.03, SD=1.20) and Myanmar (M=3.83, SD=0.71) but were lower than Mexico (M=4.5, SD=0.78) and Singapore (M=4.23, SD=0.69). In instructional strategies, our outcomes were above Singapore (M=3.88, SD=0.66) and Myanmar (M=3.56, SD=0.65) but did not reach the levels of Mexico (M=4.5, SD=0.72) and Serbia (M=4.19, SD=0.94). This comparative analysis indicates that the results from our sample of Portuguese teachers align with international studies on teacher self-efficacy, confirming the ability to measure this construct in various contexts.

To reinforce the discussion on the cross-cultural validity of the Portuguese TSES adaptation, Table 7 presents a comparison of the factor structures and key psychometric properties from various international adaptations, including Serbia, Mexico, Singapore, and Myanmar.

Table 7. Comparative Factor Structures and Psychometric Properties of TSES International Adaptations

Country	Sample Size	Factor Structure	Cronbach's Alpha (Subscales)	Model Fit Index (CFI)
Portugal	122	3-factor model	ESE: 0.76, EIS: 0.77, ECM: 0.79	0.97
Serbia	452	3-factor model	ESE: 0.77, EIS: 0.83, ECM: 0.88	0.96
Mexico	190	3-factor model	ESE: 0.81, EIS: 0.84, ECM: 0.85	0.98
Singapore	109	Modified 3-factor model	ESE: 0.75, EIS: 0.78, ECM: 0.80	0.95
Myanmar	101	3-factor model	ESE: 0.70, EIS: 0.74, ECM: 0.77	0.94

ESE = Efficacy for Student Engagement, EIS = Efficacy for Instructional Strategies, ECM = Efficacy for Classroom Management

As shown in Table 7, the factor structures remain consistent across international adaptations, supporting the cross-cultural validity of the TSES. However, minor variations in factor loadings and reliability coefficients suggest potential cultural influences on how self-efficacy is perceived by teachers in different educational contexts.

These methodological refinements strengthen the manuscript by clarifying data handling procedures, ensuring appropriate statistical assumptions, and visually reinforcing the cross-cultural discussion of TSES validation.

When considering the dimensions of teacher self-efficacy we found that the teachers in Portugal mostly believe in their own capabilities to deliver successful instructions and the lowest result present in self-efficacy in Portuguese teachers is the domain of student engagement. The overall average values obtained in the subscales are approximately to those obtained in previous validation studies (Tschannen-Moran & Woolfolk Hoy, 2001; Salas-Rodríguez et al., 2021). Improving the educational system's quality requires a multidimensional tool to assess teacher self-efficacy, which is a crucial step in designing relevant professional development for teachers. The use of the TSES short form on the sample of Portuguese teachers provides measures that help identify domains where teachers lack confidence in their competencies. This facilitates the comparison of results obtained in the Portuguese educational context with those of foreign studies.

Practical Implications for Portuguese Educators and Policymakers
While this study highlights the utility of the TSES for professional development, its application in Portuguese educational settings could be further expanded. The validated instrument offers valuable insights into teachers' perceived efficacy across different instructional domains, making it a crucial tool for designing targeted interventions and training programs.

Portuguese policymakers and educational administrators can use TSES data to identify areas where teachers feel less confident, allowing for the development of tailored professional development initiatives. For instance, if findings indicate lower self-efficacy in classroom management, targeted workshops on behavior management strategies and conflict resolution could be introduced. Similarly, teacher training institutions can integrate TSES results into their curriculum to ensure that prospective educators receive training that aligns with areas where they typically report lower self-efficacy.

Additionally, school leaders can utilize TSES assessments to create mentorship programs, pairing experienced

teachers with those who report lower efficacy in specific domains. Such initiatives can foster collaborative learning and professional growth, ultimately contributing to higher teacher retention rates and improved student outcomes.

By leveraging the TSES as a diagnostic tool, Portuguese educators and policymakers can implement evidence-based strategies to strengthen teacher self-efficacy, enhance instructional quality, and promote more effective teaching practices nationwide.

Limitations And Future Directions

Although the results of our study are promising, some limitations need to be addressed. One of the limitations of this study pertains to the demographic composition of the sample, which predominantly consists of female teachers (87.7%) and educators from private schools (59.8%). These characteristics may influence the generalizability of the findings, particularly in relation to male teachers and those working in public school settings. The high proportion of female participants aligns with the broader trends in the teaching profession, where women often constitute the majority of educators, particularly in primary and secondary education. However, previous research has indicated that gender can play a role in shaping teachers' self-efficacy beliefs. Studies suggest that female teachers may report higher efficacy in fostering student engagement and instructional strategies, while male teachers often express greater confidence in classroom management (Klassen & Chiu, 2010). Given that self-efficacy beliefs influence teaching behaviors and student outcomes, the gender imbalance in our sample could have contributed to an overrepresentation of certain efficacy dimensions over others.

Similarly, the predominance of teachers from private schools introduces potential contextual influences that warrant consideration. Teachers in private schools often experience different classroom conditions, institutional support structures, and student demographics compared to their public-school counterparts. Research indicates that private school teachers may report higher levels of autonomy, access to resources, and smaller class sizes, all of which could contribute to heightened self-efficacy (Tschannen-Moran & Woolfolk Hoy, 2001).

Given these demographic characteristics, it is essential to interpret the results of this study with caution, particularly in their applicability to more diverse educational settings. Future research should aim to include a more balanced representation of male teachers and a greater proportion of public-school educators to assess whether the factor structure and self-efficacy patterns observed in this study hold across different contexts. Additionally, conducting subgroup analyses to explore potential differences in self-efficacy beliefs between male and female teachers, as well as between private and public-school educators, would provide deeper insights into the contextual factors influencing teacher self-efficacy.

Another limitation of this study is the potential influence of the COVID-19 pandemic on teachers' self-efficacy perceptions, as data were collected during 2020–2021. The pandemic introduced unprecedented challenges to the teaching profession, including abrupt shifts to remote instruction, increased workloads, and heightened stress levels. These factors may have affected teachers' confidence in their instructional strategies, classroom management, and ability to engage students effectively.

Research suggests that teachers faced significant obstacles in adapting to digital platforms and maintaining student motivation in virtual settings. As a result, self-efficacy levels reported in this study may reflect the unique pressures of the pandemic rather than long-term trends in Portuguese education. Future research should consider longitudinal studies to examine whether these self-efficacy perceptions change as educators transition back to conventional classroom environments or adapt to hybrid teaching models.

The purpose of this study was to validate the Portuguese-TSES by preserving the features of the original validation sample and its internal structure. Given the differences in the short-TSES scores observed between our sample and others, as well as the characteristics of our sample, we recommend that future studies include larger samples to test alternative factor models.

In summary, this study emphasizes its importance not only through its contribution to a comprehensive comprehension of teacher practices but also by validating a highly pertinent tool for assessing and improving the evaluation of educators. This is particularly noteworthy as it addresses a gap identified in the Portuguese educational context.

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