Special Educational Teacher Contextual Scale (SETCS): Adaptation and Psychometric Testing

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HOW TO CITE:
Abduh, B., Khairuddin, K. F., Tahar, M. M., & Zainal, M. S. (2025). Special Educational Teacher Contextual Scale (SETCS): Adaptation and Psychometric Testing. *International Journal of Special Education, 40*(1), 199-209.

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DOI:
https://doi.org/10.52291/ijse.2025.40.16

ABSTRACT:

This paper aimed to adapt and validate a special education teacher contextual scale (SETCS) that integrates organizational support, classroom infrastructure, and teachers' professional backgrounds into a unified framework. This study employed a quantitative survey involving a total of 109 special secondary educational teachers in a pilot study and 200 in the research field. Relevant items were adapted and validated with both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). A total of 23 items were removed after testing the content validity, and the three factors were established with 22 items. The CFA demonstrated high reliability, which corroborated the appropriateness of the three-factor measuring model. Specifically, the multi-group confirmatory factor analysis (MGCFA) revealed that the instrument yields similar response patterns, enabling comparisons of scale scores and testing for measurement invariance across different groups. The results indicated that the SETCS instrument has a sufficient level of reliability, lending scientific validity to the instrument designed to assess the contextual factors of special education teachers.

Keywords: Construct Validity, Content Validity, Contextual Instrument, Face Validity, Special Education Teachers

INTRODUCTION

Teacher's attributes enhance the teaching process (Bardach et al., 2022). However, there are various other elements impacting teachers' teaching practices (Fulmer et al., 2015). The complex factor is a contextual factor that interacts with the teacher's attributes. This situation is apparent in the field of special education, as shown in studies on the global and national levels regarding the contextual to personal factors, the career performance of special education teachers, and the continuity of students with disabilities education. Contextual factors encompass three primary aspects: classroom infrastructure support, organizational support, and government policy support. Kozma's (2003) model was highlighted by Fulmer et al. (2015), who suggested three different contextual levels: micro, meso, and macro. In this study, the micro level focused on the infrastructure support of special education classes, while the meso level focused on the organizational support of the special education teacher's workplace, and the macro level focused on pre-service teacher training. These aspects were also the basic elements guaranteeing effective teaching and the main condition for ensuring the good functionality of special education in schools (California Department of Education, 2020; Kavale, 2001). As emphasized by Thompson & Lesh (2023), contextual factors such as classroom infrastructure, school organization support, and teacher training are important constructs to understand their impact on special education teachers' effective teaching practices. Therefore, our research aim focuses on contextual variables in special education settings.

Classroom Infrastructure

The latest global study reported that the infrastructure for special education development remains a significant challenge in most countries (UNICEF, 2022). This study also stated that children with disabilities not only face poverty and inadequate nutrition but also face obstacles of assistive technology, digital technology, and weak facilities constraining the development of their education. Furthermore, poor infrastructure development leads to implications, including non-standard and inconsistent school incident reports, policies, and procedures in education services that do not reflect actual practices.

It was reported that insufficient attention is paid to effective special education systems, particularly in the infrastructure that could support students, families, and teachers. In Malaysia, studies by Yasin et al. (2010), Mihat (2019), and Alshoura (2021) were conducted in different years to investigate the development of infrastructure in special education classes. It was concluded that, despite a decade having passed, the level of class infrastructure in special education still requires significant improvement. Thus, further research on infrastructure support remains relevant for the field of special education in countries such as Malaysia and elsewhere.

Organisational Support

In schools, teachers are involved in the development of professionalism, school development, and assessment, which collectively form the environment, climate, and culture of the school, ultimately affecting the quality of teaching and learning (OECD, 2009; Admiraal et al., 2021). The contextual influence of the school is prominent in determining the success of the goals aimed at the students and the continuity of the teacher's duties as it involves motivation, commitment, and satisfaction of teaching and learning in the student-teacher relationship (OECD, 2009; Rubie-Davies et al., 2012; Saloviita & Pakarinen, 2021).

The contextual influence of school on special education teachers' teaching practices is perceived as crucial (Chrzanowska, 2021), as reflected in many studies that linked welfare and the teachers' inadequacy with school factors (Robinson et al., 2019; Gokturk et al., 2021), such as unsupportive work environment (Gokturk et al., 2021; Saloviita & Pakarinen, 2021), the administrators' unpreparedness, and inadequate knowledge on the ways of supporting them (Robinson et al., 2019). The performance of teachers is attributed to the support of the work environment and the quality of teachers (OECD, 2005). In the context of special education, the intended support is provided by valuing input, providing effective feedback, and involving the teachers in decision-making and professional development opportunities in special education (Robinson et al., 2019; Kossewska et al., 2021).

Government Policy Support

National and school policies should prioritize the efforts to promote changes in the classroom (Pont, 2020). Therefore, teacher training is the primary prerequisite for producing new, competent teachers who are recognized through special certification in most countries (OECD, 2005). However, the reports by Cochran-Smith (2004) and Fischer et al. (2022) show that the development of teacher education is primarily theoretical and does not adequately focus on student learning.

In Malaysia, inclusive education policies, such as the *Zero Reject Policy* introduced under the Malaysia Edu-

cation Blueprint, have sparked criticism. Many teachers feel underprepared, and schools frequently lack the necessary resources to support diverse learners. This isn't a new concern. Gorard et al. (2020) also highlighted how policymakers sometimes cherry-pick data to suit national goals, overlooking the realities of classroom practice. When policies fall short, it can significantly impact how teachers deliver inclusive education—something that contradicts the values outlined in the Standard Guru Malaysia (SGM). That framework calls for teaching that's grounded in real evidence and tailored to every learner, especially those with special needs.

In this case, trainee teachers are required to master various teaching models and forms of support (Scull et al., 2020; Jaber et al., 2018; Khairuddin et al., 2018) in the field of special education, which demands an increase in the quality and retention of teachers' careers (Perryman & Calvert, 2020).

Although prior studies have explored teacher training, organizational support, and classroom infrastructure individually, they have rarely been examined in an integrated manner. Yet in real-world inclusive education settings, these elements function interdependently.

Meanwhile, the analysis of the current study by Scott et al. (2022) and a literature review by Billingsley and Bettini (2019) demonstrate that no previous research has been conducted on the interrelationship between these three levels in the development of issues related to the continuation of special education teachers' duties. Thus, the results concluded that no instrument measures the three contextual factors, particularly among special education teachers. This study addresses this methodological gap by synthesizing three validated tools into a comprehensive evaluation framework tailored for special education contexts.

In line with that, this study aims to adapt and validate the SETCS instrument. This study would also provide a more comprehensive and empirically robust instrument for creating an inclusive and equitable educational environment by integrating classroom infrastructure, organizational support, and professional teacher development. The instrument could also facilitate a deeper understanding of the interaction between contextual factors in shaping effective teaching, which would advance educational assessment methodologies and inform more pertinent policy development and strategic interventions. Resultantly, the approach would reinforce educational research through a more holistic and practical assessment instrument, which can be extended to additional contexts for further validation when refinements are required. Therefore, the objectives of this study are:

1. To adapt the contextual special education teacher scale based on Kozma' (2003) Contextual Model.
2. To conduct a psychometric analysis of the adapted scale to evaluate its validity and reliability among special education teachers.

RESEARCH METHOD

Study Samples

The present study focused on special secondary educational teachers, who play a crucial role in supporting students as they transition into adulthood. The significance of contextual factors, including classroom infrastructure, organizational support, and professional teacher development in enhancing the effectiveness of special educational instructions, motivated the current study to bridge the existing gaps and provide evidence-based policy recommendations to improve special educational teaching effectiveness and student outcomes. Notably, special secondary educational teachers were recruited through stratified random sampling from one state in each of the five Malaysian regions based on the highest number of integrated secondary schools and special education students (Special Education Department, 2021). District education offices and schools were randomly selected to ensure balanced representation (Creswell, 2018). Study approval was also obtained from the Universiti Kebangsaan Malaysia and the respective State Education Department, with the online questionnaire link disseminated through district educational officers to school administrators.

A list of special secondary educational teachers was obtained from the respective district educational offices to determine the number of samples from each stratum and to select teachers within each stratum randomly. Random selection was applied within each state to ensure a well-distributed and representative sample. The questionnaire structured via Google Forms was systematically distributed. The questionnaire link was initially shared with senior special educational assistants, who disseminated the link to randomly selected teachers within the identified schools to guarantee compliance with the stratified sampling technique. Consequently, 109 special secondary educational teachers participated following the sample size recommendations for exploratory factor analysis (EFA) (Yong & Pearce, 2013). Additional data from 200 teachers were also collected for confirmatory factor analysis (CFA) to strengthen model validation, ensuring that the stratified sampling method was effectively implemented while optimizing research resources (Rumrill et al., 2011).

The Adaptation of Conceptual Instrument

The contextual factors in this study included a combination of three instruments adopted to measure three sub-constructs: special education teachers' perceptions of classroom infrastructure factors, school support, and the implications of teacher specialist training. To measure teachers' perceptions of special education class infrastructure, items suggested by Fletcher and Lee Parks (1983) and research instruments by Hanafi et al. (2013) were adopted. While reliability and validity values were not reported, they were highlighted in this study through an analysis of the reliability and validity of the constructed instrument.

The second instrument used to measure teachers' perception of school support was adapted from the Perceived Organisational Support instrument by Eisenberger et al. (1986). While the original instrument of this study comprised 36 items, 10 question items selected in this research demonstrated the highest factor weighting value (Eisenberger et al., 1986). Similarly, the high-reliability value of Cronbach's Alpha for this instrument, which amounted to 0.97, indicated high consistency and repeatability.

The final instrument of the sub-construct of contextual factors in this study was an instrument measuring teachers' perceptions of the implications of specialized training. The Perception of Your Initial Teacher Training Survey instrument, developed by Lowe (2012), involved measuring teachers' perceptions of their readiness in teaching, delivery, assessment, and class management. Out of five instrument sections, only four sections with 25 question items were included. Based on a pilot study report conducted by Lowe (2012), the reliability value for the Perception of Your Initial Teacher Training Survey instrument exceeded 0.899, indicating consistent internal consistency across the question items and the instrument.

At the initial stage of instrument adaptation, three different instruments were combined, involving a total of 47 question items. Meanwhile, the face validity process involved three translation process techniques proposed by Brislin (1970), ensuring that the items and instruments in Malay could be answered by respondents at the pre-test without amendments (Sekaran & Bougie, 2016). This was followed by a content validity process by 12 experts in relevant fields. Content Validity Ratios (CVRs) and Content Validity Indices (CVIs) for each item were calculated using the Lawshe (1975) method, which resulted in the removal of 23 items as they did not meet the sufficient construct specifications based on expert evaluation. Items that received 50% or more of the experts' votes as necessary were successfully retained. According to Ayre and Scally (2014), content validity assessment ensures that an instrument measures the content area. This step ensures the items suit the study context, since Eisenberger et al. (1986) original instrument was designed for a broader setting. The developed questionnaire employed an interval scale ranging from 1 to 7 points (where 7= strongly agree and 1=strongly disagree) (Taherdoost, 2019). The original instruments were in Malay but are presented here in English for clarity.

Ethical Considerations

The ethical principles in conducting the research included aspects of confidentiality, obtaining permission to conduct research, and obtaining consent to use and adopt instruments. Before the study, approval was received from the UKM Research Ethics Committee (Human) with reference number UKM PPI/111/8/JEP-2022-688, as well as from the Education Policy Planning and Research Division, Ministry of Education Malaysia, the State Education Department, and the District Education Office.

Psychometric Analysis

Exploration Factor Analysis (EFA)

The EFA analysis was conducted in the SPSS 25 program. This analysis aims to assess the structural validity of the questionnaire items (Ahmad Bahuri et al., 2021; Mehtap & Ozlem, 2017) at the initial stage of developing a specific instrument for measuring latent variables. However, direct assessment is not feasible in this measurement (Tavakol & Wetzel, 2020). Factorability is assessed through item correlation based on Kaiser-Meyer-Olkin (KMO) (Giske et al., 2023) (≥ .60) to determine sampling adequacy. Bartlett's Test of Sphericity should yield a significant result ($p < .05$) (Swami & Barron, 2018).

Through the PCA procedure, variables are selected based on the volume of data that could be explained. This selection involves the removal of items that may affect validity and reliability (Knekta et al., 2019). PCA is a commonality that accounts for a portion of the variance of an item explained by a factor. In this case, a higher communality value increases the factors extracted to explain the item (Tavakol & Wetzel, 2020). In this study, the PCA analysis ensured that each question item for each sub-construct was grouped with its corresponding extracted factor.

Confirmatory Factor Analysis (CFA)

The CFA process in the measurement model involved analyzing the factor loading of each item, covariance, and

correlation value to determine whether the data for the variable was normal or abnormal. Then, CFA was performed to test the fit of the index model for every construct involved. The analysis of this level would produce results from the RMSEA, CFI, and Chi-square readings and determine the appropriateness index for the achieved construct (Awang et al., 2018). The tests performed at the CFA stage were conducted to ensure the normality of data distribution, and to assess convergent validity (via AVE) and composite reliability (CR).

RESULTS

Content Validity

The CVI value for the contextual construct was 0.809, involving the removal of 23 items with values below the CVR critical value of 0.667. The results of this content validity analysis retained 24 question items for the contextual instrument, including five items for the infrastructure support sub-construct, five items for the organizational support sub-construct, and 14 items for the teachers' specialist training sub-construct. Additionally, several items involved sentence restructuring based on expert recommendations, as they included two instructions for one item and general, vague sentences.

Psychometric Analysis: Exploratory Factor Analysis

Based on the analysis, the KMO value for the contextual factor questionnaire item was 0.913, which exceeded 0.5. It was indicated that the KMO value fulfilled the specified condition: the sample size was sufficient to conduct factor analysis despite the absence of multicollinearity issues. Furthermore, Bartlett's Sphericity test presented a significant value of 0.00 ($p < 0.05$), indicating the significance of the correlation based on the items and constructs in this EFA. Thus, it can be concluded from the KMO value and Bartlett's Test of Sphericity that the sample size and the results in this factor analysis meet the standards for conducting factor analysis tests.

The analysis of the Measure of Sampling Adequacy (MSA) correlation value between the items and the commonalities value after the extraction process presented the items that could be removed if necessary. These items included values of below 0.5. The initial analysis of the extraction process, based on the PCA approach and factor rotation using the varimax method, resulted in four component factors. Given that this contextual factor variable initially involves a combination of three instruments, the process of dropping items took place. In this process, two items were removed from the sub-construct of the micro factor, namely, the teacher's perception of classroom infrastructure.

Following the item removal process, all the remaining items were recorded as the original factor components: Specialized Training, Organizational Support, and Infrastructure. The value in the rotated component matrix after this process demonstrated that factor 1 contained 14 items for the Specialised Training sub-construct. Meanwhile, factor 2 contained five items for the Organisational Support sub-construct, and factor 3 contained three items for the infrastructure sub-construct (Table 1).

The three factors collectively predicted a cumulative variance of 74.481%, which exceeded the standard variance value of 60%. In this case, a good dispersion of items was achieved. The reliability value for the entire contextual construct was .952. According to Cohen et al. (2007), the reliability values for each sub-construct and the entire contextual instrument demonstrate high consistency when tested multiple times.

CFA Analysis

After exploratory factor analysis (EFA), confirmatory factor analysis (CFA) is used to test a hypothesized factor structure. At this stage, 203 respondents participated. After the outlier test, the data of three respondents were dropped (Kline, 2016) because they may have originated from respondents who do not belong to the population of this study. Furthermore, the contextual factor construct consisted of three sub-constructs with a total of 22 items. Based on Figure 4.1, the loading factor for every item exceeded 0.6, indicating its relation to its construct. The model fit was achieved with an RMSEA value of 0.082, which met the minimum level set, while the CFI value was 0.946 and the TLI value was 0.939, both exceeding 0.9. In addition, Chisq/df showed a considerably good value of 2.338, which was lower than 3.0 (Awang et al., 2023).

The Multi-Group CFA (MGCFA) was conducted to assess measurement model equivalence across male and female groups. Specifically, configure and metric invariances were appraised to ensure consistency in factor structure and meaning for valid comparisons. Configural invariance was corroborated as the baseline model, with acceptable fit indices (χ^2/df = 2.128, GFI = 0.728, CFI = 0.909, RMSEA = 0.075), indicating a consistent factorial structure across gender groups (Collier, 2020). The metric invariance test, which constrained factor loadings, demonstrated an insignificant difference from the configural model and affirmed metric invariance (CMIN = 12.117, df = 19, p = 0.881). The findings postulated that the constructs were measured consistently across male

Table 1: **Factor loading for the contextual factor (EFA) of the pilot study (n = 109)**

Factor/ Item	
Factor 1: Teacher Training Program	
The teacher training program I received made me ready to:	
KL9: Make an assessment of student development	.865
KL11: Manage student behavior for an effective learning	.862
KL7: Design and conduct diagnostic assessments of student knowledge and skills to plan and adapt instruction	.836
L10: Manage a class that has a learning atmosphere that is encouraging, respectful, supportive, and flexible in learning activities	.833
KL12: Addressing the learning needs of students who have behavioral problems	.831
KL6: Use a variety of teaching strategies	.825
KL13: Build positive relationships with students	.819
KL4: Identify when and how to adapt teaching strategies so that all students have the opportunity to understand and learn	.817
KL8: Make decisions about teaching based on the type of student disability data	.813
KL14: Understand the rights and responsibilities of students and teachers	.782
KL2: Plan lessons that use technology effectively	.772
KL5: Using students' feedback to improve teaching	.772
KL3: Make decisions about teaching based on findings in the classroom	.757
KL1: Plan appropriate lessons according to MBPK's intellectual, physical, social and emotional levels	.706
Factor two: Organisation Support	
KO4: This organization is willing to assist me in my work as best as I can	.871
KO2: The organization is very concerned about my well-being	.853
KO3: Organisations care about my satisfaction at work	.843
KO1: This organization appreciates my contribution to its excellence	.767
KO5: The organization is proud of my achievements at the workplace	.763
Factor 3: Infrastructure	
KI2: The infrastructure in the classroom was modified to be easy to use by MBPK	.856
KI3: The infrastructure in the classroom is modified so that it is safe to be used by MBPK	.837
KI1: The infrastructure in the classroom is modified for the MBPK	.773
Total eigenvalues: Factor 1: 11.878; Factor 2: 3.057; Factor 3: 1.451	
% variance: Factor 1: 53.991; Factor 2: 13.895; Factor 3: 6.595	
Total Variance: 74.481	

and female groups, which validated cross-group comparisons (Collier, 2020). Thus, the findings established both configural and metric invariances, supporting the reliability of the measurement model in gender-based analyses (Figure 1.).

Convergent validity, Composite Reliability and Normality

The Convergent validity (AVE) value for all constructs exceeded 0.5 (0.767), while the composite reliability value (CR) was higher than the minimum value of

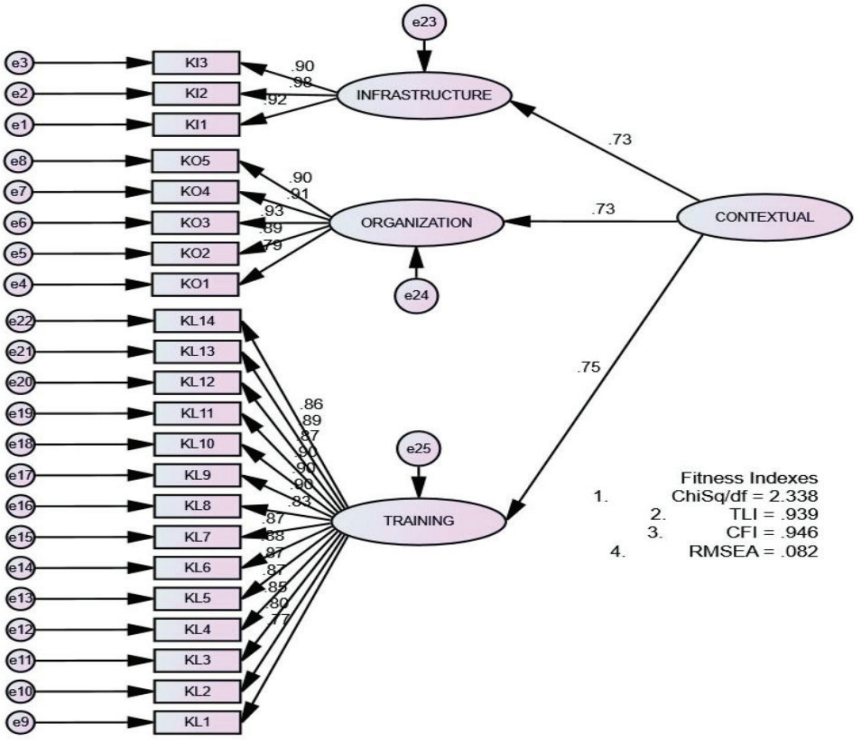

Figure 1: A contextual factor construct measurement model

0.60 (0.967). Overall, the results indicated that all the involved constructs achieved convergent validity and composite reliability. The normality test conducted for all constructs in this research demonstrated that the skewness values ranged from -0.015 to -1.632, indicating that the data distribution was within the normal range, from a 1.5 to -1.5 level of achievement in normality (Awang et al., 2023). The kurtosis value also exhibited a good reading when the critical region value ranged from -2.877 to 6.34, which was lower than 7.0 (Awang et al., 2023).

DISCUSSION

Based on the literature, the development of past studies on the teaching and learning aspects in the field of special education should involve various contextual factors. However, no instrument makes a more comprehensive assessment of the contextual factors that cover the three levels (Kozma, 2003, as cited in Fulmer et al., 2015). Accordingly, this research aims to develop a contextual factor instrument for special education teachers. It involves three levels: classroom infrastructural support at the micro level, organisational support at the meso level, and specialist teacher training, which represents the macro level.

At the initial stage of instrument development, three different instruments were combined, involving a total of 47 question items. Meanwhile, the face validity process involved three translation techniques to ensure that the items and instruments in Malay could be answered by respondents at the pre-test stage without amendments (Sekaran & Bougie, 2016). This was followed by a content validity process conducted by 12 experts in relevant fields, which resulted in the removal of 23 items as they did not meet the sufficient construct specifications based on expert evaluation. Items that received 50% or more of the experts' votes as necessary were successfully retained. According to Ayre and Scally (2014), content validity assessment ensures that an instrument measures the content area. Notably, this step is crucial in determining the question items that fit the context of the study, given that one of the original instruments used in the research (Eisenberger et al., 1986) encompasses a more general context.

The present study adapted and validated a contextual instrument to measure three key subconstructs in special education, namely classroom infrastructure, professional teacher development, and organizational support. The employed instruments encompassed the Fletcher and Lee Parks Instrument (1983), Hanafi et al. (2013), the perceived organizational support instrument by Eisenberger et al. (1986), and the initial teacher training survey by Lowe (2012), which underwent modification and validation processes to ensure suitability within the special educational context. The instruments were subjected to face validity analysis based on Brislin (1970) to ensure

that the content was conceptually translated and adapted appropriately. Subsequently, content validity analysis, as described by Lawshe (1975), resulted in the retention of 24 high-quality items from the original 47 items (CVI = 0.809, CVR = 0.667), indicating that the retained items were relevant and meaningful within the study context.

The EFA results indicated that the data were suitable for factor analysis, with a KMO value of 0.913 and a significant Bartlett's test of sphericity ($p < 0.001$). Principal component analysis (PCA) also revealed a cumulative variance of 74.481%, which is explained by the three primary factors, confirming a stable factor structure. Furthermore, the CFA demonstrated an optimal measurement model (CFI = 0.946, TLI = 0.939, RMSEA = 0.082, $\chi^2/df = 2.338$), indicating that the model fit the empirical data and met the validity standards stipulated by Bentler (1990). The MGCFA also corroborated the stability of the scale across groups by attaining configural invariance ($\chi^2/df = 2.128$, GFI = 0.728, CFI = 0.909, RMSEA = 0.075) and metric invariance (CMIN = 12.11, df = 19, p = 0.881). The findings ascertained that the instrument could be applied across different populations with high stability. Moreover, Cronbach's alpha for the overall scale was 0.92, which suggested high reliability (Nunnally & Bernstein, 1994). Each subconstruct also exhibited high Cronbach's alpha values, which further affirmed the stability and reliability of the instrument in measuring the intended constructs.

An empirically validated instrument was adapted based on the validity, reliability, and psychometric analyses in this study. The contextual instrument could be utilized in future research to examine the effectiveness of classroom infrastructure and teacher training in special education. This contributes to the improvement of research methodologies in special education, as previous studies employed instruments that were not contextually validated. In addition, empirical evidence was provided to the existing literature, aligning with the perceived organisational support theory (Eisenberger et al., 1986) and the teacher training model by Lowe (2012), through more specific data for special education. The current results were also consistent with prior scholars, including Lawshe (1975), Brislin (1970), and Nunnally and Bernstein (1994), regarding the importance of instrument validity and reliability in social research.

The current study offers positive implications for inclusive educational policy and practice, with the validated instrument serving as a foundation for policymakers to improve classroom infrastructure and special education teacher training systematically. The findings could also assist teacher training institutions and educational ministries in evaluating the effectiveness of current training programs and performing improvements based on current empirical data. Additionally, future researchers can leverage the MGCFA results to apply the instrument in various populations for robust comparative analyses across groups. The validated measurement model can also be used in studies related to teacher professional development and special educational quality. In summary, the present study has made a significant contribution to the current literature by adapting existing instruments to the special educational context and conducting a rigorous and empirical validation process. The instrument can be employed to empirically assess classroom infrastructure and teacher training from an inclusive perspective, serving as a foundation for future research and evidence-based policymaking in special education.

Conclusion and implication

The SETCS scale, based on Kozma's 2003 model, has passed validity and reliability tests, as well as psychometric tests. This demonstrates that the scale is valid and reliable for assessing factors that influence the effectiveness of special education. This scale can be used to plan, evaluate, and improve special education practices more comprehensively. Future special education studies could apply this tool, which indicates trends in contextual factors following reiterative outcomes and multi-group data collection cycles. The study implications could be helpful for special education teachers to develop relevant strategies and assist school administrators and policymakers in identifying key components that efficiently manage and develop teacher and physical resources. Such strategy would promote quality educational opportunities and foster the potential of each special needs student.

LIMITATION

This study involves fully quantitative measurements, using questionnaires that require self-report answers. In the context of this study, this method is suitable because the data can be tested through direct analysis using appropriate statistical tests. However, since it depends on self-assessment, it tends to produce subjective, socially desirable answers and only involves an overview of variables because it involves a large number of respondents. Therefore, there is a need for further, more detailed research through various methods, such as observation and interviews, involving the triangulation of subjective data to achieve convincing validity.

ACKNOWLEDGEMENT

None

ETHICAL APPROVAL STATEMENT

The ethical approval required for conducting this research was obtained from the UKM Research Ethics Committee (Human) (Approval Number: UKM PPI/111/8/JEP-2022-688; Document Date 2022/12/12).

DECLARATION OF INTEREST STATEMENT

The author reported no potential conflict of interest.

FUNDING

We express our heartfelt gratitude to all the officers from the Department of Education and District Education Offices and the special education teachers in schools who were directly and indirectly involved in the data collection process. We would like to thank the Universiti Kebangsaan Malaysia for supporting the publication of this article under GG-2024-063 grant, the Tabung Agihan Penyelidikan grant and the Faculty of Education.

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