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Yu, X., & Yen Abdullah, M. N. L. (2026). Psychometric Properties of the Teacher Support Subscale of the Child and Adolescent Social Support Scale: Evidence from Adolescents in Rural China. *Foro de Educación*, 24(1), 54-75. doi: https://doi.org/10.14201/fde.24104

Psychometric Properties of the Teacher Support Subscale of the Child and Adolescent Social Support Scale: Evidence from Adolescents in Rural China

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Recibido / Received: 23/09/2025
Aceptado / Accepted: 19/01/2026

Abstract: Teacher Support Subscale of the Child and Adolescent Social Support Scale (TSS-CASSS) is a commonly used measurement for evaluating how children and adolescents perceive social support. Although substantial empirical evidence has established the psychometric properties of the subscale, research on the subscales remains limited that capture different kinds of social support from the same source. The objective of this study was to investigate how the empirically derived dimensions of TSS-CASSS align with its theoretically proposed multidimensional structure among rural adolescents in China. This research provides the validation of the Chinese adaptation of the Teacher Support Subscale of the CASSS for the first time. Data were collected from a total of 938 junior middle school adolescents in rural China. Item analysis, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) procedures were employed to delineate the latent structure of the instrument and to determine the convergent validity and reliability. Results from both EFA and CFA supported a 21-item, four-factor structure (Emotional Support, Informational Support, Instrumental Support, and Appraisal Support), consistent with the original model. The model demonstrated excellent fit indices (χ^2/df = 1.28, *CFI* = 0.991, *TLI* = 0.99, *RMSEA* = 0.017, *IFI* = 0.991). Furthermore, split-half reliability (0.66-0.82), test-retest reliability (0.71-0.84), internal consistency (0.81-0.91), and convergent validity for the scale were all in the acceptable ranges, indicating that the adapted scale possesses strong reliability and construct validity for use among Chinese rural adolescents.

Keywords: Teacher Support Subscale, Factor Analysis, Psychometric Properties, Chinese Rural Adolescents.

1. Introduction

Teacher support is a critical component of education, closely linked to students' well-being, motivation, and academic achievement (Derakhshan & Fathi, 2024; Fan & Liu, 2024; Shen et al., 2024). Within supportive learning environments, it reflects nurturing relationships that help students succeed both academically and emotionally (Bayram Özdemir & Özdemir, 2020). This role is especially important in adolescence, a stage of rapid cognitive, emotional, and social development. Meanwhile, adolescents perceive and benefit from teacher support differently according to age, context, and

environment (Dessel et al., 2017; Schweder & Raufelder, 2019). In China, rural boarding middle schools provide a unique educational setting in which students spend much more time with teachers than their urban peers (Zhang et al., 2025; Zhong, Feng & Xu, 2024); In the settings, teachers are not just instructors; they are also emotional anchors and role models. Under these conditions, positive teacher-student interactions play an important role in shaping the developmental outcomes of adolescents. However, the majority of the existing measurement instruments are tailored to urban communities and do not usually reflect the reality of rural boarding students (Wu et al., 2024; Xie, Deng & Ma, 2023). Moreover, there is evidence that many instruments take a narrow view of teacher support, ignoring to address the construct's emotional, informational appraisal and instrumental dimensions (Xie et al., 2023).

One of the long-standing problems in the area is the lack of validated measures that can reflect the multidimensional nature of teacher support in different cultural and educational contexts. In order to fill this gap, the current study confirms the Teacher Support Scale by a sample of middle school students in rural China. Through exploring its psychometric properties in boarding schools, this study offers a context-sensitive tool to a poorly researched population and contributes evidence, which can be used to inform the global discussion on how teacher support is best measured and understood.

1.1. Teacher Support

Teacher support, as one particular form of social support, has received considerable research attention in the field of education, especially because of its essential contribution in adolescence. The concept of social support is widely understood as a multidimensional construct consisting of five elements: direction, disposition, characterization, provider, and form (Tardy, 1985). Direction in the framework refers to whether support is provided or not; disposition distinguishes between support that is merely perceived and support that is actually utilized; and characterization refers to the functional purposes that the support fulfills. In the meantime, assessment captures the personal judgments regarding its importance or adequacy. The provider component identifies the individuals or groups who provide support, which includes parents, teachers as well as peers. The form component describes the particular types of assistance which may be given, such as emotional, informational, instrumental, and appraisal support. Among Tardy's five proposed components, provider and form have received the greatest amount of empirical attention. Direction, disposition and characterization have, in comparison, been given relatively little attention, possibly because of practical considerations, since a full evaluation of all dimensions would take a significantly longer measurement process.

Social support is commonly defined as a person's belief that others will provide help, whether broadly defined or tied to specific needs, whether actively provided by members of their network of close relationships. Such support increases functioning and serves as a buffer against adverse outcomes (Malecki & Demaray, 2002). Within the broader framework, teacher support reflects student perceptions of the assistance they receive from teachers in four interrelated dimensions, namely emotional, informational, appraisal and instrumental. Emotional support involves expressions of trust, care, empathy, and affection from teachers (Roorda et al., 2017). Informational support is defined as advice, guidance, or relevant information to help students overcome academic or personal problems. Appraisal support entails constructive feedback

and encouragement that helps students to appraise and enhance their performance or self-concept (Malecki & Demaray, 2002). Instrumental support involves practical help, such as offering time, resources, or direct help (Malecki & Demaray, 2002).

An increasing number of researches have indicated the critical role of teacher support in shaping developmental and educational outcomes. There is evidence of a positive association with students' self-concept, resilience and mental health (Azpiazu et al., 2025). In the Chinese context, teacher support has been associated with reduced anxiety and depression, mainly through the impact on self-perception, although these effects seem to be stronger for urban students than rural ones (Azpiazu et al., 2025). In early education, emotional support helps children to be socially competent and adjust well in the classroom (Pakarinen, Lerkkanen & von Suchodoletz, 2020). Both emotional and instrumental support have also been found to decrease student loneliness by creating inclusive and positive classroom environments, with effects sometimes moderated by gender, emotional support having a greater impact for girls, and instrumental support having a greater impact for boys (Morin, 2020). In spite of the advances, a wide range of the earlier literature conceptualized teacher support as a unidimensional construct; Recent scholarship has highlighted the significance of considering it multidimensional, arguing that different forms of support potentially affecting different aspects of students' well-being and adjustment. The shift stresses the need to use the instruments which can adequately capture the complexity of teacher support in varied educational settings.

1.2. Teacher Support Scale

In line with the multidimensional conceptualization of social support proposed by Tardy (1985), recent researches have increasingly been focused on the role of teacher support in promoting academic and psychosocial development of adolescents. Teacher Support Subscale of the Child and Adolescent Social Support Scale is one of the most widely used instruments to evaluate the perceived social support, which include from teachers. The Teacher Support subscale of the CASSS measures four types of support, namely emotional, informational, appraisal and instrumental, from the teacher source (Rueger, Malecki & Demaray, 2010; Styck et al., 2025). Each of the four types of support has a different role to in academic performance, psychological adjustment, as well as behavioral outcomes. For example, Tennant et al. (2015) found that teacher emotional support was significantly associated with improved GPA and reduced internalizing and behavioral issues, especially among girls, who also benefited more from informational and instrumental support in standardized academic tests. Similarly, Rueger et al. (2010) reported gender differences in both the perception and effectiveness of teacher support, with girls perceiving and benefiting from more emotional and informational support than boys, suggesting the need for gender-sensitive applications of the CASSS.

Cross-cultural validation studies have additionally shown the relevance and psychometric robustness of the Teacher Support subscale. In Japan, the four-factor structure and high reliability ($\alpha > .90$) were confirmed by Shinkawa et al. (2023), who also found that Japanese students placed more importance on emotional rather than instrumental support, reflecting East Asian collectivist values. In Romania, the scale was validated by Chiş, Copaci and Rusu (2017) among bilingual adolescents, showing high internal consistency ($\alpha = 0.91$ for frequency) and high cross-language correlations, which is an indication of semantic and conceptual equivalence. In the U.S., Styck et al. (2025) found

further evidence for the structural validity of the four-dimension model, although they found only partial measurement invariance by gender, raising caution about making gender comparisons. In the Chinese context, there is still a lack of research. A review of related studies (e.g., Chen, Bian & Zhu, 2023; Sadoughi & Hejazi, 2023) suggests that although the CASSS has been used occasionally, the Teacher Support subscale has not been psychometrically validated in mainland China yet. Students might perceive emotional and appraisal support in a different way than in Western cultures because of cultural focus on teacher authority and academic performance. These cultural differences underscore the importance of localizing validation and adaptation of teacher support measures.

All in all, the results across countries and populations provide support for the CASSS Teacher Support subscale as a reliable and theoretically-grounded measure of adolescents' perceived support from teachers, which include the four core dimensions. However, more research is required to determine its cross-cultural and demographic invariance, especially in underrepresented countries such as China. Such research would increase the applicability of the scale for global educational and psychological practice. However, while the reliability indices showed acceptable standards, other important psychometric properties of the teacher support questionnaire have not been extensively explored, including item analysis, concurrent validity, and measurement invariance. This lack of thorough validation limits the generalizability of the scale and limits its practical application in research contexts. Its applicability in the Chinese context is not clear. Given the great differences of the Western and Chinese family and educational environment, it is necessary to further investigate the structure and functioning of teacher support in the Chinese context. With the permission of the original authors of the Child and Adolescent Social Support Scale, the present study aims to assess the reliability and validity of the Chinese version of the Teacher Support Subscale of the Child and Adolescent Social Support Scale among rural Chinese adolescents. In particular, the research analyzes the item-level performance, tests the measurement invariance between genders, and explores the unique characteristics of teacher support in this group.

2. Methods

2.1. Participants

The adaptation of the scale was guided by two studies that drew on different samples, as summarized below.

Study One: In the context of the research, a convenience sampling method was used to select participants in three rural junior middle schools in Xiangyang City of Hubei Province in China. The initial 45-item version of the scale was administered, followed by Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) as well as reliability and validity testing. In line with prior studies, the sample size for EFA should be at least five times the number of items. A total of 998 questionnaires were distributed, yielding 938 valid responses. The sample included 466 females (49.68%) and 472 males (50.32%). A total of 329 students were from Grade 7, 288 students from Grade 8, and 321 students from Grade 9 with a mean age of 14.12 years (SD = 1.01), ranging from 12 to 16 years.

Study Two: Two months later, a subsample of 71 students from the original sample completed the scale again to assess test–retest reliability. Data were collected through

paper-and-pencil questionnaires during mental-health classes with teacher assistance, and all forms were distributed and collected following a standardized procedure.

2.2. Instruments

The study was an adaptation of the Teacher Support Subscale of Child and Adolescent Social Support Scale, which was created by Malecki and Demaray (2002). Due to the particular characteristics of adolescents in rural China, it was necessary to revise the scale to ensure that it is relevant to this particular group. For this reason, the original scale was changed. The modified scale uses a five-point rating system ranging from 1 ("never") to 5 ("always") and consists of four dimensions of teacher support, namely emotional support (13 items), informational support (10 items), appraisal support (12 items) and instrumental support (10 items); All 45 items underwent cross-cultural adaptation as well as content validity assessment. Exploratory Factor Analysis (EFA), together with Confirmatory Factor Analysis (CFA) was used to assess the scale's structure, with factor loadings set at a threshold of 0.50 or higher. Building on the criterion, 24 items were removed during the EFA process, thus resulting in the final structure.

The revised scale consists of following four dimensions. Emotional support (7 items) is captured through items reflecting care, trust and encouragement, like "My teacher cares about me." Informational support (5 items) addresses advice, guidance and sharing of useful information to assist with personal or academic decisions, like "My teacher explains information about extracurricular activities." Appraisal support (3 items) is concerned with recognition and constructive feedback, such as "When I am not paying attention in class, my teacher reminds me to listen carefully." Instrumental support (6 items) encompasses academic support and assistance in daily life, like "When I encounter problems in class, my teacher takes time to help me understand the material".

School Engagement Scale: the instrument of school engagement that was developed by Wang and colleagues. In its original form, the scale contains 30 items that cover four domains of engagement: cognitive (6), behavioral (8), emotional (8), and social (8). Each item is scored on a five-level Likert scale ranging from "Not at all like me" to "Very much like me." The initial version of the scale demonstrated satisfactory internal reliability (as indicated by a Cronbach's alpha of 0.81 for the general engagement factor) as well as strong predictive validity (as indicated by positive correlations with academic achievement and educational aspirations). The convergent validity of the Teacher Support Subscale of Chinese Adolescent School Social Support Scale (CASSS) for rural Chinese adolescents was determined by examining the correlations between this subscale and each of the corresponding dimensions of school engagement.

A growing number of studies have provided evidence for cross-sectional associations between various forms of teacher support and school engagement of students (Federici & Skaalvik, 2014; Olana & Tefera, 2022; Prananto et al., 2025; Wang & Eccles, 2012; Wang & Eccles, 2013). Recent studies have continued to confirm this pattern. The emotional support of teachers remains closely related to higher degrees of engagement, which means that warmth, care, and responsiveness in the classroom can be considered the primary factors to keep students engaged in the learning process (He, Feng & Ding, 2024; Patrick, Ryan & Kaplan, 2007). Instrumental forms of support, such as guidance and practical help, contribute to engagement by encouraging communication and developing the ability of students to complete difficult academic tasks (Huang & Wang, 2023). Evidence also

suggests that perceived teacher support boosts engagement indirectly by meeting the basic psychological needs of students and increasing their motivation to learn (Xu, Wu & Wei, 2024). In addition, a recent meta-analysis showed that teacher support has been positively associated with engagement in students in a variety of educational settings (Tao et al., 2022; Wu, Fu & Zhang, 2023). Collectively, these findings highlight the consistent and multifaceted role of teacher support in promoting adolescents' school engagement.

2.3. Procedure

The purpose of this study is to adapt the Teacher Support Subscale of the CASSS for rural adolescents. The research was conducted in several sequential phases, and Table 1 summarizes each phase along with a brief description.

Table 1: Summary of Different Phases of the Study.

Phase of the Study	Data Analysis Procedures	Sample Description	Dimensions (items)	Items Remained
Phrase I: Instrument drafting and Cross-cultural adaptation	Literature review; Item construction; Translation expert adaption(n=4)	The cross-cultural adaptation the procedure included independent forward and back translations carried out by four qualified translators (an associate professor and two lectures majoring in English working in university of China, a PhD student majoring in TESOL), followed by a review by a four-member expert committee with psychometric and linguistic expertise, and concluded with content validation involving 10 rural adolescents.	Emotional Support (13) Informational support (10) Appraisal support (12) Instrumental support (10)	45
Phrase II: Assessing content validity	Experts' analysis(n=6)	The content validity evaluation was carried out by six university-based experts who possessed 8 to 24 years of professional experience in developmental psychology, educational psychology, and psychological measurement and assessment, and who held academic positions ranging from lecturer to full professor.	Temo (13) Informational support (10) Appraisal support (12) Instrumental support (10)	45
Phrase III: Item analysis	CITC; Cronbach's αif item deleted;	n=938 from two junior middle schools in Hubei province in rural China. The sample included 472 male students (50.32 %) and 466 female students (49.68%). Their ages averaged 14.12 years (SD = 1.01), with a minimum age of 12 and a maximum age of 16.	Emotional support (7) Informational support (5) Appraisal support (3) Instrumental support (6)	45
Phrase IV: Assessing construct validity	KMO and Bartlett's Test; Exploratory Factor Analysis (n=938)		Emotional support (7) Informational support (5) Appraisal support (3) Instrumental support (6)	21
	Confirmatory Factor Analysis; Convergent validity (AVE) CR; Discriminate validity		Emotional support (7) Informational support (5) Appraisal support (3) Instrumental support (6)	21
Phrase V: Assessing Convergent Validity	Related constructs correlation	*n*=938 from two junior middle schools in Hubei province in rural China. 50.32% males and 49.68 % females.	Emotional support (7) Informational support (5) Appraisal support (3) Instrumental support (6)	21
Phrase VI: Assessing Reliability	Measures of internal consistency, Split-half methods and Test–retest assessments (after two months)	(1) *n*=938 from three junior middle schools in Hubei province in rural China. 50.32% males and 49.68 % females. (2) The test-retest reliability was assessed by conducting a follow-up test on a subsample of 71 participants from the original sample of 938.	Emotional support (7) Informational support (5) Appraisal support (3) Instrumental support (6)	21

In phase I, the instrument was adapted by first drafting the instrument, followed

by cross-cultural adaptation conducted by translation experts. The adaptation of the instrument relied on a carefully designed sequence of forward translation followed by back-translation. (Benlidayi & Gupta, 2024; Cruchinho et al., 2024) to adapt the scale, including forward translation, translation review, back-translation, validity check, expert review, and a pre-test. An associate professor in educational psychology and a Ph.D. student in English education independently translated the Teacher Support Questionnaire from English to Chinese, ensuring that the meaning stayed the same. They then compared their versions and resolved unclear wording through discussion. Two language experts carried out the back-translation, and any differences from the original were reviewed and revised based on expert suggestions to improve clarity. To check if the translated version was easy to understand, ten rural Chinese adolescents were invited to give feedback. After making necessary adjustments based on their responses, the finalized Chinese version of the scale was produced.

In phase II, six experts evaluated the content validity of the scale. Six experts in the field of educational psychology, including professors and doctoral-level scholars, were involved in reviewing the content validity of the revised Teacher Support Subscale of CASSS. An expert review was conducted in which all items were scrutinized for relevance, clarity of expression, and cultural relevance so that the measure would adequately capture the principal facets of teacher support. In the phase III and phase IV, SPSS 26.0 was employed to input the data in this study. Descriptive statistics, tests of normality, item-level evaluations, and exploratory factor analysis were conducted on the dataset. Additionally, confirmatory factor analysis (CFA) was conducted using AMOS28.0 for structural equation modelling. Significance decisions were made using a two-tailed p-value cutoff of 0.05.

In phase V, convergent validity was assessed by calculating the correlations between the scale scores and measures of conceptually related constructs. This analysis yielded evidence that the instrument behaves as expected in the larger nomological network; In phase VI, the reliability was investigated via a number of complementary methods. Internal consistency was examined using Cronbach alpha, stability was evaluated by the split half reliability coefficient and temporal stability was estimated by a two-month test-retest procedure. Collectively, the indicators provide a comprehensive support for the scale reliability.

2.4. Data Analysis

IBM SPSS Statistics 26.0 was used to input and analyse the data. The analyses consisted of descriptive statistics, normality tests, item tests as well as exploratory factor analysis. Confirmatory factor analysis was performed in AMOS 28.0 to examine the structural model. All samples and subsamples met the required minimum sample size.

To begin with, the distribution of the data was checked for normality through using the skewness and kurtosis measures. Hair et al. (2009) and Byrne (2010) show skewness between –2 and +2 and kurtosis between –7 and +7 indicate approximate normality.

Secondly, the data were assessed using descriptive statistics, critical ratio (CR) analysis, corrected item–total correlations (CITC), as well as internal consistency tests so as to examine item discrimination and reliability. The CR index was obtained through contrasting the highest and lowest 27% of respondents based on their total scores, with values ≥ 3.00 meaning acceptable discrimination and ≥ 3.50 representing a stricter

threshold. CITC assesses the degree of contribution of each item to the overall internal consistency of the scale. A CITC of ≥ 0.30 is generally regarded acceptable, though higher values (e.g., 0.40 or 0.50) are recommended depending on the sample size as well as precision required (Zijlmans et al., 2019). Internal consistency was evaluated via Cronbach's alpha; Based on George and Mallery (2010), alpha values between 0.70 and 0.79 show acceptable reliability, values from 0.80 to 0.89 reflect good reliability and coefficients of 0.90 or higher represent excellent reliability.

Thirdly, an exploratory factor analysis was performed on SPSS 26.0 to determine the factor structure of the CASSS Teacher Support Subscale. The suitability of the data for this analysis was confirmed via the Kaiser–Meyer–Olkin measure and Bartlett's test of sphericity. A KMO value greater than 0.70, together with a significant Bartlett's test ($p < 0.05$), was taken as evidence that the data were suitable for factor analysis (Backhaus et al., 2021). Within factor analysis, structural validity requires that each item's factor loading exceeds 0.40 and that the commonality is above 0.50 (Kline, 2016).

Fourthly, a confirmatory factor analysis was performed in AMOS 28.0 to validate the structural model of the CASSS Teacher Support Subscale. Convergent validity was considered adequate when the average variance extracted (AVE) exceeded 0.50 and the composite reliability (CR) was greater than 0.70.

Based on Gim Chung, Kim and Abreu (2004), discriminant validity is achieved when the square root of the AVE for each latent construct exceeds its highest inter-factor correlation. Model fit is deemed acceptable when $\chi^2/df \leq 5$ (Kline, 2016), and CFI, TLI, IFI and NFI values in the range of 0.90 to 0.95 were interpreted as acceptable, while scores exceeding 0.95 reflected excellent model fit (Byrne, 2010); RMSEA values under 0.05 were interpreted as evidence of a close model fit, whereas values ranging from 0.05 to 0.08 were viewed as indicating an acceptable level of fit.

Lastly, reliability assessments involved internal consistency, which was evaluated through Cronbach alpha, split-half and test-retest reliability. Both the final scale and the School Engagement Scale were repeated twice to evaluate test-retest reliability and convergent validity. Effects associated with correlations were judged to be small when r was under 0.30, moderate when r ranged from 0.30 to 0.49, and large when r fell between 0.50 and 0.84.. A threshold of 0.85 was used to flag possible issues with discriminant construct validity (Franke & Sarstedt, 2019).

2.5. Ethical Considerations

Ethical considerations were fully observed throughout the research process. The data collecting procedure was approved by the Ethics Committee of North China University of Technology. The research survey was distributed in mental health education classes in two rural middle schools in the Hubei Province of China. During these sessions, the teachers distributed paper-based questionnaires and informed the students about their rights, voluntary participation and confidentiality.

3. Results

3.1. Content Validity

The experts rated each item according to its relevance, clarity and cultural appropriateness

to ensure that each item corresponded well to the essential aspects of teacher support. Item-level content validity indices ranged from 0.83 to 1.00 and experts achieved total agreement on 21 items, indicated by an I-CVI of 1.00. The scale's universal-agreement CVI was 0.89, which is higher than the recommended minimum value of 0.80. These findings suggest that the questionnaire has good content validity and can be used for measurement of perceived teacher support among rural adolescents in China.

3.2. Descriptive Statistics and Item Analysis

To evaluate the reliability and item-level properties of the adapted scale, descriptive statistics, item analysis and internal consistency tests were performed. Analysis of the adapted Teacher Support Subscale showed excellent reliability with the composite scale having a Cronbach's alpha of 0.94 (Table 1). All four subdimensions showed good reliability with alpha coefficients of 0.907 for Emotional Support, 0.876 for Informational Support, 0.807 for Appraisal Support, and 0.882 for Instrumental Support. The results of this study showed that the adapted instrument has good reliability and appropriateness in measuring teacher support among rural adolescents in China, which supports the adaptation process and confirms its suitability for this cultural context.

Table 3: Item analysis of Teacher Support Subscale of Child and Adolescent Social Support Scale (TSS-CASSS).

Dimension	Items	M (SD)	Skew	Kurt	CITC	Cronbach's α after Removing the Item
Teacher emotional support (Temo)	Temo1	3.76 (1.037)	-0.476	-0.54	0.708	0.894
	Temo2	3.97 (1.028)	-0.74	-0.214	0.7	0.895
	Temo3	3.95 (0.999)	-0.692	-0.248	0.727	0.892
	Temo4	3.78 (1.082)	-0.644	-0.283	0.714	0.893
	Temo5	3.9 (1.029)	-0.663	-0.267	0.736	0.891
	Temo6	3.72 (1.101)	-0.532	-0.508	0.745	0.89
	Temo7	3.62 (1.139)	-0.431	-0.64	0.717	0.893
Teacher informational support (Tinf)	Tinf6	3.64 (1.162)	-0.544	-0.528	0.708	0.849
	Tinf7	3.69 (1.148)	-0.523	-0.584	0.713	0.848
	Tinf8	3.45 (1.193)	-0.389	-0.764	0.726	0.845
	Tinf9	3.49 (1.233)	-0.384	-0.814	0.711	0.849
	Tinf10	3.62 (1.138)	-0.438	-0.625	0.673	0.858
Teacher appraisial support (Tapp)	Tapp4	4 (1.024)	-0.801	-0.108	0.651	0.741
	Tapp5	4.06 (0.96)	-0.777	-0.062	0.661	0.731
	Tapp6	3.94 (0.998)	-0.608	-0.414	0.655	0.737
Teacher instrumental support (Tins)	Tins5	3.61 (1.143)	-0.478	-0.575	0.686	0.863
	Tins6	3.57 (1.171)	-0.419	-0.737	0.711	0.859
	Tins7	3.65 (1.141)	-0.495	-0.628	0.685	0.863
	Tins8	3.59 (1.155)	-0.468	-0.638	0.704	0.86
	Tins9	3.38 (1.242)	-0.278	-0.951	0.683	0.864
	Tins10	3.04 (1.334)	-0.056	-1.152	0.694	0.863

3.3. Exploratory factor analysis

Significant results from Bartlett's test, $\chi^2(210) = 10854.678$, $p < 0.001$, indicated that the correlation between items was sufficient to conduct a factor analysis. The KMO coefficient was found to be 0.95, which is well above the recommended value

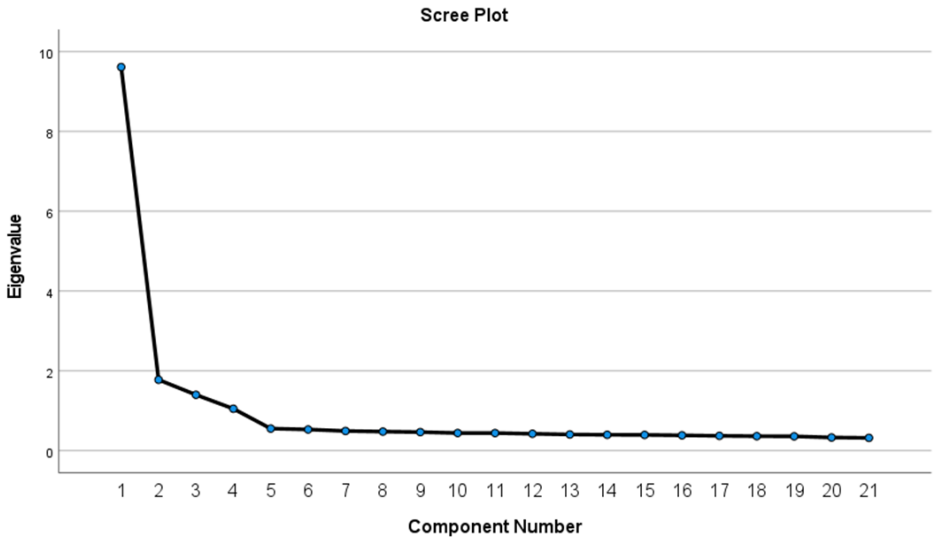
of 0.70 (Tabachnick & Fidell, 2007). Given the large sample size (N = 938), this value represents a high level of sampling adequacy; according to Tabachnick and Fidell (2007), KMO values above 0.80 are rated as meritorious, thus reinforcing the suitability of the dataset for factor extraction (see Table 4).

Table 4: Kaiser-Meyer-Olkin Sampling Adequacy Test and Bartlett's Sphericity Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.963
Bartlett's Test of Sphericity	Approx. Chi-Square	10854.678
	df	210
	Sig.	0.000
Note: df = denotes degrees of freedom, Sig.= indicates statistical significance.		

Exploratory factor analysis was performed using principal axis factoring with oblique rotation, given the theoretical expectation that the factors might be interrelated. The results produced a four-factor structure that explained 68.74% of the total variance. (see Figure 1). This result was generally consistent with the original conceptual structure of the revised scale, which was initially theorized to include four broad factors.

Figure 1: Factor Loadings of Exploratory Factor Analysis.



The pattern matrix is shown in Table 5. A total of seven items loaded onto Factor I (Emotional Support), five items loaded onto Factor II (Informational Support), three items onto Factor III (Appraisal Support), and six items onto Factor IV (Instrumental Support). Items exhibiting loadings below 0.40 or showing notable cross-loadings were eliminated in subsequent steps of the analysis (Kim et al., 2016). Through the factor-analytic procedure and the use of an oblique rotation technique, the analysis identified a four-factor pattern in which 21 items were preserved.

Table 5: Exploratory factor analysis Results of TSS-CASSS.

Items	Components			
	Temo	Tinf	Tapp	Tins
Temo1. My teacher cares about me.	**-0.834**	-0.079	0.009	0.006
Temo2. My teacher treats me fairly.	**-0.716**	-0.033	0.038	0.104
Temo3. My teacher encourages us to ask questions about what we learn.	**-0.819**	0.001	-0.022	0.003
Temo4. My teacher encourages me when I'm in trouble.	**-0.79**	0.053	0.063	-0.103
Temo5. My teacher praises me when I do well.	**-0.831**	-0.012	0.005	-0.019
Temo6. My teacher takes the initiative to care about my learning progress.	**-0.777**	0.082	-0.004	-0.006
Temo7. When I got poor exam results, my teacher would encourage me and cheer me up.	**-0.728**	0.067	-0.048	0.094
Tinf6. My teacher teaches me strategies (such as:how to create study plans and manage time).for learning more effectively.	-0.038	**0.785**	-0.023	0.037
Tinf7. My teacher explains information about extracurricular activities.	0.011	**0.89**	-0.023	-0.063
Tinf8. My teacher explains the school arts activities that I can participate in.	-0.012	**0.8**	-0.027	0.066
Tinf9. My teacher shares information about competitions (e.g.sports activities) that I can take part in.	0.02	**0.79**	0.086	-0.008
Tinf10. My teacher shares their life experiences to help me plan my future studies.	-0.026	**0.728**	0.036	0.039
Tapp4. When I am not paying attention in class, my teacher reminds me to listen carefully.	0.006	0.000	**0.781**	0.105
Tapp5. When I do not complete my homework properly, the teacher asks me to do it again.	-0.013	0.035	**0.853**	-0.039
Tapp6. When I answer questions incorrectly, my teacher explains why I was wrong and teaches me how to correct it	-0.022	-0.004	**0.846**	-0.008
Tins5. My teacher provides me with learning materials.	-0.009	0.002	0.01	**0.777**
Tins6. My teacher takes time after class to explain the materials I don't understand.	-0.017	-0.004	0.037	**0.778**
Tins7. My teacher spends time helping me learn test-taking skills.	-0.03	0.001	-0.069	**0.815**
Tins8. When I encounter a difficult question in class, my teacher takes time to help me understand the material.	0.044	0.068	-0.003	**0.791**
Tins9. When I have problems with my homework, my teacher tutors me individually.	-0.01	-0.016	0.051	**0.756**
Tins10. When I am sick at school, my teacher helps me (e.g., take me to the hospital or buy medicine for me)	-0.022	0.007	0.051	**0.745**

The extracted factors accounted for 65.92% of the total variance, a value that exceeds the 40% minimum commonly suggested by Marin-Garcia and Carneiro (2010) and is therefore considered adequate (see Table 6). Moreover, prior studies have indicated that total variance explained above 50% is generally acceptable in social science research, further supporting the construct validity of the scale.

Table 6: Total Explained Variance of TSS-CASSS.

Factor	Sc Loading	% Of Variance	Cumulative %
Teacher emotional support	9.615	45.785	45.785
Teacher informational support	1.777	8.463	54.249
Teacher appraisal support	1.4	6.668	60.916
Teacher instrumental support	1.051	5.006	65.922
Note. The table displays the factorial structure where the cumulative percentage value was 65.92% of the total variance of the scale, which, according to Marin-Garcia and Carneiro (2010), is considered acceptable as it exceeds the expected minimum of 40%.			

3.4. Confirmatory Factor Analysis

The assumption of multivariate normality was assessed prior to model estimation.

Mardia's tests of multivariate skewness and kurtosis indicated that the data satisfied the normality assumption (all *p-values* > 0.05), with skewness values (absolute) ranging from 0.056 to 0.801, and kurtosis values (absolute) between 0.038 and 1.152. Consequently, the maximum likelihood (ML) estimator was used in AMOS 28.0 to test the measurement model.

The hypothesized measurement model of the four latent dimensions: emotional, informational, appraisal, and instrumental support from teachers. The final structure included 21 items distributed evenly across these components. Model specifications and fit indices are summarized in Tables 5–7, and standardized factor loadings are reported in Table 4. All the loadings were between 0.734 and 0.792, which indicate strong relationships between the indicators and their corresponding latent constructs.

Convergent validity is established when theoretically related indicators converge, showing strong shared variance in representing a common latent dimension, reflecting consistency in assessing the underlying concept (Fornell & Larcker, 1981); In contrast, discriminant validity refers to the extent to which latent constructs are distinguishable, so that observed variables measuring different constructs do not overlap or have high correlations. While convergent validity confirms the consistency of items that measure the same construct, discriminant validity makes sure the conceptual and empirical independence of different constructs, thus validating the clarity and uniqueness of the constructs that are measured (Fornell & Larcker, 1981; Henseler & Chin, 2010).

Table 7: Standardized Factor Loadings from the TSS-CASSS.

Dimensions	Items	Factor Loading	AVE	C.R.(Critical Ratio)
Teacher emotional support (Temo)	Temo1	0.744	0.582	0.907
	Temo2	0.746		
	Temo3	0.765		
	Temo4	0.754		
	Temo5	0.775		
	Temo6	0.792		
	Temo7	0.766		
Teacher informational support (Tinf)	Tinf6	0.771	0.587	0.876
	Tinf7	0.759		
	Tinf8	0.791		
	Tinf9	0.773		
	Tinf10	0.735		
Teacher appraisal support (Tapp)	Tapp4	0.773	0.583	0.808
	Tapp5	0.762		
	Tapp6	0.756		
Teacher instrumental support (Tins)	Tins5	0.739	0.558	0.883
	Tins6	0.766		
	Tins7	0.734		
	Tins8	0.757		
	Tins9	0.735		
	Tins10	0.752		

Composite reliability (CR) was calculated to determine the internal consistency

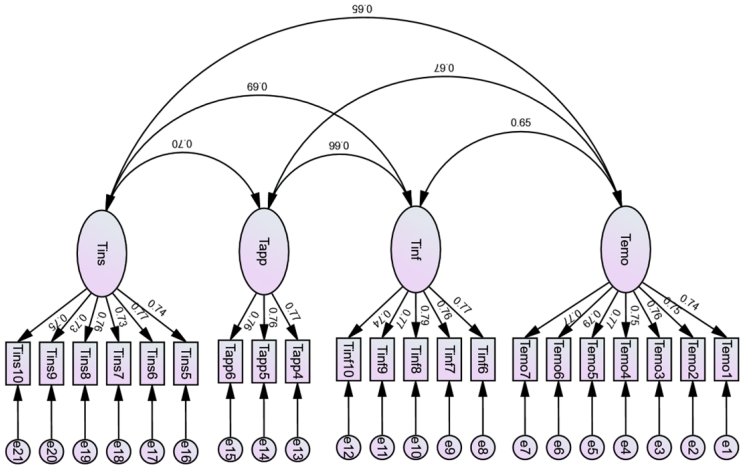
for the four latent dimensions (see Table 7). The CR coefficients varied between 0.808 and 0.907, proving high reliability across all constructs. The average variance extracted (AVE) values ranged from 0.558 to 0.587, each of which exceeds the commonly accepted threshold of 0.50, which indicates that the items in each factor share enough variance to justify their representation of the same construct (Fornell & Larcker, 1981). Evidence for discriminant validity is shown in Table 8. The square roots of the AVE values were bigger than the correlations between factors in the respective rows and columns, which means that each construct was more related to its items rather than other constructs. This pattern supports the uniqueness of the four dimensions.

Based on established structural equation modeling criteria (Kline, 2016), satisfactory model fit is typically indicated by χ^2/df values below 5, incremental fit indices like CFI, TLI, IFI, and NFI values approaching or exceeding 0.90, and RMSEA values at or below 0.08. More stringent guidelines consider $\chi^2/df < 3$, RMSEA < 0.08, and CFI, IFI, and TLI above 0.80 to reflect adequate model performance.As reported in Table 9 and illustrated in Figure 2, the present model met these standards with strong fit statistics: *$\chi^2/df = 1.28$, RMSEA = 0.017, IFI = 0.991, CFI = 0.991, and TLI = 0.99*. These indices collectively indicate that the proposed four-factor structure provides an excellent representation of the data and supports the soundness of the measurement model.

Table 8: Discriminate validity of the Teacher Support Subscale of Child and Adolescent Social Support Scale (TSS-CASSS).

Dimension	Temo	Tinf	Tapp	Tins
Temo	**0.763**			
Tinf	0.654	**0.766**		
Tapp	0.673	0.658	**0.764**	
Tins	0.654	0.693	0.702	**0.747**

Figure 2: Confirmatory Factor Analysis Model of the TSS-CASSS for 21 Items.



Foro de Educación, v. 24, n. 1, enero-junio / january - june 2026, pp. 54-75.
e-ISSN: 1698-7802

Table 9: The Confirmatory Factor Analysis Results of TSS-CASSS.

Model Fitting Index	Analysis Value	Good Fit	Acceptable Fit
X2/df	1.28	$\chi 2$ /df ≤ 3	$\chi 2$ /df ≤ 5
RMSEA	0.017	0 ≤ RMSEA ≤0.05	0.05 ≤ RMSEA ≤0.10
IFI	0.991	0.95 ≤ IFI <1.00	0.90 ≤ IFI <0.95
TLI	0.99	0.90 ≤ TLI <1.00	0.85 ≤ TLI <0.90
CFI	0.991	0.95 ≤ CFI <1.00	0.90 ≤ CFI <0.95
SRMR	0.02	0 ≤ RMSEA ≤0.05	0.05 ≤ RMSEA ≤0.10
Note.$\chi 2$, Chi-Square; df, Degrees of Freedom; CFI, Comparative Fit Index; TLI, Tucker-Lewis Index; IFI, Incremental Fit Index; RMSEA, Root Mean Square Error of Approximation			

3.5. Corrections between Teacher Support Types

For the first sample, Pearson correlation analyses were conducted to assess the associations among the teacher support types included in the finalized 21-item scale. As demonstrated in Table 10, the results revealed positive associations among types that were theoretically aligned. These results indicate that the teacher support scale demonstrates good criterion validity.

Table 10: Correlations between Teacher Support Types.

	Teacher Emotional Support	Teacher Informational Support	Teacher Appraisal Support	Teacher Instrumental Support	Teacher Support
Teacher Emotional support	1	.584**	.577**	.587**	.854**
Teacher Informational support	.584**	1	.555**	.610**	.829**
Teacher Appraisal support	.577**	.555**	1	.593**	.757**
Teacher Instrumental support	.587**	.610**	.593**	1	.859**
Teacher support	.854**	.829**	.757**	.859**	1

3.6. Convergent validity

Convergent validity was examined by correlating the four types of teacher support with the dimensions of school engagement using data from the first sample. As shown in Table 11, all correlations were positive and fell within the medium range (0.30–0.49). Emotional support was moderately associated with emotional (r = 0.367), behavioral (r = .381), cognitive (r = 0.394), and social engagement (r = 0.393). Informational support showed similar patterns, with correlations of .380, .390, .344, and .407 respectively. Appraisal support correlated moderately with the four dimensions (0.397, 0.391, 0.385, 0.395), and instrumental support also demonstrated consistent associations (0.357, 0.368, 0.395, 0.364).

Table 11: Correlations between TSS-CASSS and School Engagement Scale.

	Teacher Emotional Support	Teacher Informational Support	Teacher Appraisal Support	Teacher Instrumental Support
Emotional engagement	0.367**	0.380**	0.397**	0.357**
Behavioral engagement	0.381**	0.390**	0.391**	0.368**
Cognitive engagement	0.394**	0.344**	0.385**	0.395**
Social engagement	0.393**	0.407**	0.395**	0.364**

3.7. Reliability

To determine the reliability of the 21-item adapted instrument, internal consistency, test–retest, and split-half reliability analyses were conducted. The overall Cronbach's alpha was 0.94, and the four subscales showed strong internal consistency, with coefficients of 0.91, 0.88, 0.81, and 0.88, respectively. Test–retest reliability was examined in a subsample of 71 students, yielding coefficients of 0.84, 0.71, 0.77, and 0.71 for the four dimensions, and 0.93 for the total scale, demonstrating high temporal stability. Split-half reliability ranged from 0.66 to 0.82 across the subscales. In conclusion, as shown in Table 12, all reliability estimates lie between 0.66 and 0.88, indicating that the scale demonstrates acceptable reliability.

Table 12: Reliability Coefficients of Teacher Support Types.

Teacher Support Type	No.of Items	Cronbach's α (N_1=938)		Test-retest (N_2=71)	Split Half (N_1=938)
Teacher Emotional support (Temo)	7	0.91	0.94	0.84	0.82
Teacher Informational support (Tinf)	5	0.88		0.71	0.78
Teacher Appraisal support (Tapp)	3	0.81		0.77	0.66
Teacher Instrumental support (Tins)	6	0.88		0.71	0.80

4. Discussion

This research focused on the instrument modification and measurement evaluation of Teacher Support Subscale of CASSS in a Chinese adolescent population in rural China. Reliability is the degree of stability and consistency of the results obtained from an instrument (Yang et al., 2022). The Chinese version of the CASSS Teacher Support Subscale demonstrated very strong internal reliability with a Cronbach's alpha of 0.94, which is consistent with those reported from the United States, where the original scale showed an alpha of 0.94 (Kanerva, 2022; Mastuti, Fajrianthi & Andriani, 2022), as well as those reported in Japan where all four dimensions of teacher support demonstrated alpha values above 0.90 (Shinkawa et al., 2023). Further analysis of the four specific dimensions of teacher support in the Chinese version showed strong internal reliability in all subdomains. The Emotional Support dimension had an alpha coefficient of 907 and the informational Support had 0.876. The teacher appraisal support and instrumental support were found to be 0.807 and 0.882, respectively, with both findings showing alpha values. Such results are consistent with prior cross-cultural validation researches. For instance, Shinkawa et al. (2023) also validated such high levels of reliability in the same four support dimensions in Japan, which confirms the cross-cultural robustness of the CASSS structure; Similarly, in Romania, Chiş et al. (2017) reported an alpha of 0.91 for the Teacher Support frequency score, which further demonstrates the internal consistency of the subscale in different cultural settings. In summary, the Chinese adaptation of the CASSS Teacher Support subscale demonstrates strong psychometric reliability and is closely consistent with the results of other cultural settings, such as the United States, Japan and Romania. The consistent cross-national results suggest that the four-dimensional model of teacher support that incorporates emotional, informational, appraisal and instrumental support is theoretically well-founded and empirically supported. The Chinese Teacher Support subscale proves to be a reliable tool in

the measurement of perceived teacher support by students, which has a strong internal consistency and a stable factor structure; Nevertheless, further investigation is warranted to examine its longitudinal stability and measurement invariance across different demographic groups within the Chinese context.

Test-retest reliability of Teacher Support Scale among the Chinese rural adolescent version was studied using a sample size of 71 individuals in a six-month interval. The findings showed that there is strong temporal stability, with reliability coefficients of 0.842 for emotional support, 0.705 for informational support, 0.767 for appraisal support, 0.708 for instrumental support and 0.932 for the overall scale ($p < 001$). The findings are consistent with prior international validations of the CASSS Teacher Support subscale. The Japanese version showed high test-retest coefficients from 0.74 to 0.87 over a 3-week period, indicating short-term reliability across support types (Shinkawa et al., 2023). The Finnish validation also confirmed the consistency of the Teacher Support subscale for both primary and lower-secondary students, although it focused more on structural validity than on long-term stability (Kanerva, 2022). The Indonesian version showed a high internal reliability (*Cronbach's α* > 0.90), but no test-retest data was provided to draw conclusions about temporal reliability (Mastuti et al., 2022). In addition, the original developers of the CASSS, Malecki and Demaray, reported test-retest reliability coefficients greater than 0.80 over a two-week interval, which established a standard for stability in Western samples. Compared with these studies, the present results validate the robustness of the adapted scale over a longer period of time and expand the applicability of the CASSS framework for rural, collectivist, and boarding school settings in China. The temporal stability in this study is of importance in educational psychology because consistent perceptions of teacher support contribute to students' emotional well-being, persistence, and school involvement. The high reliability coefficients support the use of the Chinese version of the Teacher Support subscale in longitudinal research and educational assessments. Future research may use longitudinal measurement invariance analysis and other advanced modeling techniques to further investigate the stability and generalizability of perceived teacher support over longer periods of time. In conclusion, the research suggests that teacher support, especially in the form of emotional and informational dimensions, is a key protective factor in adolescent development; Future research should continue to examine the associations across a range of populations and cultural setting.

5. Limitations

There are several limitations in this study. First, the use of a cross-sectional study and exclusively self-reported data from adolescents may introduce response biases, such as social desirability and possible inaccuracies in recall, which may impact the robustness of the findings. Using multiple methods of assessment, such as teacher or parent ratings, behavioral observations, or longitudinal designs, would help to minimize potential bias and give clearer insight into teacher support among adolescents.

A second limitation is the sample characteristics. The sample was collected from one provincial region in China, limiting the regional, cultural and socioeconomic representation. Although the sample size was sufficient for the psychometric analyses, studies with larger and more heterogeneous samples from various provinces would increase the generalizability and the stability of the results. The present results also

indicate gender and regional patterns that seem to reflect broader features of the Chinese context. Given the high levels of geographical and cultural diversity in the country, future research will benefit from the inclusion of adolescents from a broader range of locations to better capture developmental differences across regions.

Another limitation is that the study only examined a limited number of variables. Additional contextual and psychological factors such as parent-child relationships, school climate, or mental health indicators may play important roles in shaping the perceptions of teacher support among adolescents and should be considered in future investigations. Inclusion of these factors would enable researchers to test a more comprehensive model and examine potential mediating or moderating mechanisms.

Finally, the analyses were based on classical measurement theory. Although this approach provides valuable information about the reliability and validity of the scale, future research could employ more advanced psychometric techniques, such as item response theory or longitudinal measurement invariance testing, to gain a deeper insight into the functioning of the Teacher Support Subscale across different subgroups and developmental periods.

6. Conclusion

Following its translation and validation, the revised scale for adolescents in Rural China demonstrates strong psychometric properties. Its practical significance lies in its applicability within educational psychology to assess perceived teacher support in boarding school contexts, thereby informing evidence-based interventions aimed at enhancing teacher-student relationships, student adjustment, and school engagement.

6.1. CRediT Authorship Contribution Statement

Yu Xiaoyu: Data curation, Formal analysis, Investigation, Writing-original draft, Validation, Visualization. Melissa Ng Lee Yen Abdullah: Project administration, Resources, Writing-review & editing, Conceptualization, Methodology.

6.2. Ethics Approval

All human-participant procedures were carried out following the ethical guidelines approved by the Human Research Ethics Committee of North China University of Science and Technology (Ref. No. 2023-012).

6.3. Funding Statement

This research was carried out without financial assistance from government bodies, private organizations, or nonprofit institutions.

6.4. Declaration of Competing Interest

The authors declare that no conflicts of interest are associated with the conduct, authorship, or publication of this study.The authors state that they have no financial or personal conflicts of interest that could have influenced the work reported in this manuscript. Furthermore, the authors do not hold any editorial positions such as Editorial Board Member, Editor in Chief, Associate Editor, or Guest Editor at the

journal to which this manuscript was submitted, and they were not involved in its review process or publication decision.

6.5. Acknowledgments

We sincerely thank all students who voluntarily participated in this study, as well as the three junior middle schools in Xiangyang, Hubei Province, for their support in facilitating the data collection process.

6.6. Data Availability

The datasets used and analyzed of this study available from the corresponding author on reasonable request.

6.7. Statement of Artificial Intelligence (AI) Use

The authors declare that no AI assisted technologies were used during any in the preparation of this article.

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