

Validation of the Indonesian Version of the Student-Teacher Relationship Scale Using Rasch Analysis

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Abstract

This study aims to evaluate the structural validity of the Indonesian version of the Student-Teacher Relationship Scale (STRS) using Rasch Model analysis. While STRS has been validated in several countries, validation in the Indonesian context with a large sample and using Rasch analysis remains limited. The data for this study involved 1,927 junior and senior high school students in Indonesia. The analysis technique used was the Rasch Model with Winsteps, assessing unidimensionality, local dependency, misfit items, and differential item functioning (DIF). The results indicate that STRS-ID demonstrates excellent reliability, with person reliability (0.96), item reliability (0.99), and a Cronbach's Alpha of 0.97. Unidimensionality was achieved with 57.7% of the raw variance explained. However, several misfit items were identified, with ZSTD values falling outside the range of -2.0 to +2.0, as well as DIF on some items by gender, age, and region. This study suggests that revisions are needed for problematic items to improve the measurement accuracy and effectiveness of STRS-ID in the Indonesian context. The contribution of this research lies in providing a psychometrically valid tool for measuring the student-teacher relationship in Indonesia and offering recommendations for refining items that do not meet the expected thresholds.

Keywords: DIF, rasch model, relationship scale, reliability, unidimensionality, structural validity, student-teacher misfit items

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INTRODUCTION

Since its introduction by John Bowlby in 1969, attachment theory has garnered significant academic attention, particularly regarding its application to student-teacher relationships. Numerous efforts have been made to assess these relationships, including the development of the Student-Teacher Relationship Scale (STRS). This scale, initially developed by Pianta & Nimetz (2001), was designed to evaluate the closeness between teachers and students from preschool through third grade. The scale identifies three key dimensions of attachment: closeness, conflict, and dependency (Vahidi et al., 2022). Over time, several scholars have reassessed and validated STRS in various cultural contexts. For example, examined teacher-student relationships in the Netherlands, adding additional items to the dependency dimension for students aged 3-12 years. Other studies have explored STRS in diverse settings, including Finland (Yang et al., 2021), Greece (Tsigilis et al., 2018), India (Yadav et al., 2022), China (Vatou et al., 2025), Brazil (Mendes-Sousa et al., 2025), France (Courbet et al., 2025), and Spain (Garcia-Rodriguez et al., 2026). However, much of this research has focused primarily on teacher perspectives in elementary education contexts.

This highlights a significant gap in research, specifically the need for further examination of this instrument from students' perspectives, particularly in middle school contexts. Additionally, while there is growing interest in student-teacher relationships, few studies have validated appropriate measurement tools for the Indonesian context. Given the diversity of Indonesia's population and education system, it is critical to test the validity of STRS within the context of Indonesian middle school culture. Indonesia, as an archipelagic country with the world's fourth-largest population (>275 million) and diverse ethnicities and cultures across its regions, requires particular attention in educational research (Afifuddin et al., 2025; Mariyono, 2024).

Therefore, the primary aim of this study is to adapt and validate the STRS developed Koomen et al (2012) through Rasch Model analysis, using a sample of Indonesian middle school students. This study will evaluate the scale across variables such as age, gender, and ethnicity, shifting the perspective from the teacher's to the student's. Fundamental analyses will include examining misfit items, internal consistency, unidimensionality, local dependency, item and person measures, item bias through DIF analysis, and rating scale diagnostics. Another important goal is to popularize and disseminate STRS-ID throughout Indonesia, establishing it as a reliable tool for measuring student-teacher relationships. This will allow teachers to gain a deeper understanding of the importance of fostering positive relationships with their students (Schneider, 2022).

Student-teacher relationships have been shown to influence behavioral, emotional, and cognitive engagement (Kang et al., 2023). Positive teacher-student relationships enhance students' behavioral engagement, with those experiencing close relationships with their teachers exhibiting greater engagement (Briebe-Fuenzalida & Pérez-Salas, 2025; Kim et al., 2023). Conversely, conflict in these relationships can hinder engagement, especially in students with oppositional behaviors (Valdebenito et al., 2022). Emotional engagement is also closely tied to the quality of teacher-student relationships. Supportive teacher-student interactions lead to higher emotional engagement (Chen et al., 2025; Wang, 2023), whereas negative relationships, particularly those marked by conflict, adversely affect it (Engels et al., 2021).



In terms of cognitive engagement, the quality of teacher-student interactions plays a significant role. Teachers who employ motivating pedagogical practices and provide socio-emotional support tend to foster greater cognitive engagement (Longakit et al., 2025). Furthermore, positive teacher-student relationships have been found to predict improvements in academic performance, with students who feel close to their teachers showing the most significant progress over time (Shen et al., 2024a). Negative relationships, on the other hand, can diminish engagement and exacerbate issues such as school dropout, particularly for students with special needs (Pérez-Salas et al., 2021).

Research suggests that the impact of teacher-student relationships on engagement may vary by gender, with boys' cognitive engagement being more sensitive to positive and negative teacher interactions (Abren et al., 2025). The quality of teacher-student relationships is crucial for enhancing engagement across all dimensions—behavioral, emotional, and cognitive. Therefore, fostering strong teacher-student relationships is essential for student success, particularly in secondary education (Lai et al., 2026).

Despite extensive research on student-teacher relationships, a significant gap persists in the development of valid measurement tools tailored to diverse cultural and educational contexts, particularly in Indonesia. The adoption of Rasch Model analysis in this study is crucial as it provides a more sophisticated approach than classical models, allowing for the assessment of item fit, scale dimensionality, and differential item functioning (DIF), which is particularly important in multicultural settings such as Indonesia (Khine, 2020; Packham et al., 2022). The theoretical contribution of this study lies in the development and validation of a culturally appropriate tool for measuring student-teacher relationships, while its practical contribution will assist teachers and policymakers in better understanding and fostering effective student-teacher relationships within the context of Indonesian education.

This research is particularly relevant and important because it addresses the need for a validated instrument that accounts for Indonesia's unique cultural and educational landscape. By validating the STRS-ID, this study aims to provide a reliable tool applicable across various educational settings throughout Indonesia, contributing to the overall enhancement of student engagement and academic success.

METHOD

Design, Procedure, and Participants

This study employed a cross-sectional design to evaluate the internal construct validity of the STRS-ID. A purposive sampling approach was used, with data collected from 30 secondary schools across Indonesia, ensuring broad geographical representation by including schools from Western Indonesia (10), Central Indonesia (26), and Eastern Indonesia (4). Data were collected via Google Forms and distributed to each school via WhatsApp messages. Participants were first informed about the study's objectives and assured of the confidentiality of all personal information through a consent form. Of the 30 schools involved, we initially gathered responses from 1,927 students who signed the consent form and provided their personal details. However, 3 students chose not to proceed with the survey, and the remaining participants completed the full survey. The final sample consisted of 1,374 junior high school students (71.41%) and 550 senior high school students (28.59%), aged between 12 and 17 years.



Table 1.
 Participants Characteristic

Variable	n (%) Respondent before Screening	n (%) Respondent after Screening
Sex		
Male	938 (48,75%)	569 (47,69%)
Female	986 (51,25%)	624 (52,31%)
Age (year)		
12-13	688 (35,76%)	415 (34,79%)
14-15	806 (41,89%)	500 (41,91%)
16-17	430 (22,35%)	278 (23,30%)
Class		
7	437 (22,83%)	261 (21,88%)
8	487 (25,44%)	300 (25,15%)
9	440 (22,99%)	272 (22,80%)
10	252 (13,17%)	167 (14,00%)
11	170 (8,88%)	115 (9,64%)
12	128 (6,69%)	78 (6,54%)
Region		
West Indonesia	574 (29,83%)	351 (29,42%)
Center Indonesia	1185 (61,59%)	745 (62,45%)
East Indonesia	165 (8,58%)	97 (8,13%)
Education		
Junior High School	1374 (71,41%)	833 (69,82%)
Senior High School	550 (28,59%)	360 (30,18%)
N	1924	1193
	Did not respond = 3	

Adaptation of the Student-Teacher Relationship Scale in Indonesia (STRS-ID)

The adaptation process of the Student-Teacher Relationship Scale (STRS) (Koomen et al., 2012) to its Indonesian version (STRS-ID) begins with a needs analysis, translation, expert panel revisions, pilot testing, psychometric analysis, and finalization of the instrument. The adaptation process for STRS followed the procedure outlined by Beaton et al (2000). STRS, originally consisting of 28 items written in Dutch and later translated into English, was then translated from English into Indonesian by two independent bilingual translators. The translation was then back-translated into English by two different independent translators who were blind to the original instrument to ensure that the back-translation maintained construct, cultural, and linguistic equivalence with the original STRS instrument.

Following the translation, content validity testing was conducted by a panel of four experts in education and language. This expert panel assessed whether the translated instrument was appropriate for the Indonesian context and whether its structure remained relevant. Based on the feedback received, item revisions were made, and the revised version was submitted back to the experts for final approval. After this, STRS-ID was distributed to 10 representative subjects to assess the clarity of language and the



appropriateness of wording. The feedback from this pilot test was then used to further refine the design.

Once revisions were made, STRS-ID underwent psychometric analysis, including reliability and validity tests and Rasch analysis to ensure the instrument's quality. Finally, the refined STRS-ID instrument was prepared for finalization, which involved making final revisions and preparing it for use in broader research.

Data Analysis and Statistics

Sociodemographic characteristics of the respondents were analyzed descriptively. Rasch analysis was employed to evaluate how well the observed responses to STRS-ID items fit the Rasch measurement model. The Winsteps software (version 5.1.5.1) was used for data analysis, following the procedures recommended by (Boone et al., 2014), and in alignment with the manuals Linacre (2023).

The Rasch analysis criteria used in this study are outlined below, reflecting the depth of understanding of Rasch methodology. Internal consistency, reliability, and separation indices. This assesses how well the items correlate with one another. A reliability value of >0.70 indicates good internal consistency, similar to the Cronbach α value, with person and item reliability also considered. The separation indices determine whether the items can distinguish different levels of student-teacher relationships. A person separation index >1.5 logits is considered acceptable. Misfit items are identified when items in STRS-ID do not function consistently, suggesting that respondents may misunderstand them. The acceptable range for Outfit Mean Square (MNSQ) is $0.5 < \text{MNSQ} < 1.5$, indicating that the data align with the Rasch model.

Unidimensionality measures how well the items in STRS-ID assess the same underlying construct. Principal component analysis was used, with approximately 40% of the variance explained. Local dependency, which indicates that responses to one item may depend on responses to others, was assessed, a person-item residual correlation of >0.7 suggests local dependency. Rating Scale Diagnostic. This criterion assesses whether respondents can distinguish among the STRS-ID measurement categories. The response values should follow a sequential pattern, aligned with the probability of the modeled category (Pallant & Tennant, 2007). Measurement Invariance or Differential Item Functioning (DIF). DIF assesses whether responses to STRS-ID items are biased based on group characteristics, such as gender, age, grade, educational level, and regional area within Indonesia. An item is considered to have DIF if the item's DIF probability is <0.05 , with a DIF contrast of >0.64 logits. Item and Person Measure. This measure evaluates a person's abilities and the difficulty of the items. A Wright map is used for this assessment.

Ethical Considerations

In accordance with ethical guidelines, informed consent was obtained from all participants and their legal guardians. Participants were assured of the confidentiality of their responses and the voluntary nature of their participation. The study adhered to ethical standards in research, ensuring that all personal information was securely handled and anonymized.



RESULTS AND DISCUSSION

Results

This study included 1,927 respondents; after excluding misfit responses, 1,193 were retained. Table 2 presents the demographic characteristics of respondents before and after screening. After screening at the junior high school level, the average proportion of respondents was 69.82%, with those from Indonesia's central region accounting for 62.45%, the highest among categories. Meanwhile, female respondents comprised 52.31%, those aged 14-15 constituted 41.91%, and respondents in grade 8 comprised 25.15%.

Overall summary statistics Rasch measurement model (reliability and separation, misfit)

The summary statistics for the Rasch measurement model after STRS-ID screening are shown in Table 3. The person reliability index (0.96) and item reliability index (0.99) indicate exceptional consistency for persons and items. The Cronbach's alpha coefficient (α) of 0.97 demonstrates excellent internal consistency, suggesting that STRS-ID can be considered a reliable scale.

Based on the Person Separation Index of 4.77, it is evident that both persons and items in the STRS-ID domain can differentiate various levels of student-teacher relationships. The stratification of values within the Separation Index can also be calculated using the following formula (Sumintono & Widhiarso, 2014):

$$H = \frac{[(4 \times \text{Separation}) + 1]}{3}$$

With a Person Separation value of 4.77, we calculate

$$H = \frac{[(4 \times 4,77) + 1]}{3} = 6,69, \text{ rounded to } 7$$

This indicates the presence of 7 distinct respondent groups. For the Item Separation value of 11.15, we calculate:

$$H = \frac{[(4 \times 11,15) + 1]}{3} = 15,20, \text{ rounded to } 16$$

This means there are 16 item distributions distinguishing item difficulty levels. The Mean Person value obtained is 0.72 logits, which is greater than 0.0, indicating that respondents in STRS-ID tend to agree on various items on average. In the Infit MNSQ and Outfit MNSQ tables, Person values (1.04 & 1.02) and Item values (0.98 & 1.02) are within the acceptable range of $0.5 < \text{MNSQ} < 1.5$, suggesting a good fit (Boone et al., 2014). In the Infit ZSTD and Outfit ZSTD tables, Person values (0.03 & -0.04) fall within the acceptable range of $-2.0 < \text{ZSTD} < 2.0$, indicating a good fit. However, Item values (-4.11 & -4.16) are outside this range, suggesting they are not well-fitting. As described above, the analysis results in Table 2 indicate that STRS-ID can be considered reliable for measuring student-teacher relationships across various respondents and items.



Table 2.
 Person & and Item Summary Statistics (After Removal of Misfit Responses)

	After identifying misfit respondents (n=1193)	
	Person (n=1193)	Item (i=28)
Cronbach's alpha (α)	.97	
Reliability index (μ)	.96	.99
Separation index	4.77	11.15
Mean measure	.72	.00
Max measure	3.37	1.13
Min measure	-2.98	-.60
Spread	1.43	.49
Standard deviation	1.43	.50
Infit		
MNSQ	1.04	.98
ZSTD	.03	-4.11
Outfit		
MNSQ	1.02	1.02
ZSTD	-.04	-4.16

Unidimensionality and Local Dependency

The Rasch analysis in Table 3 shows that STRS-ID achieved a raw variance measurement value of 57.7% (38.2 in Eigenvalue units). This indicates that the unidimensionality requirement of >20% is met. A raw variance measure exceeding >40% signifies a good category. Another finding in Table 4a is that the instrument's ideal unexplained raw variance value should not exceed >15%. For the first contrast (4.5%; 2.9 in Eigenvalue units) through the fifth contrast (1.8%; 1.1 in Eigenvalue units), values below <15% were achieved. These findings indicate that the unidimensional assumption for the STRS-ID instrument has been met.

Table 3.
 Standardized Residual Variance using Dimensionality Analysis

Standardized variance raw residual variance in Eigenvalue units	Empirical Expected (%)	In Eigenvalue units
Total raw variance in observations	100 %	66,2529
Raw variance explained by measures	57,7 %	38,2529
Raw variance explained by persons	34,8 %	23,0717
Raw Variance explained by items	22,9 %	15,1812
Raw unexplained variance (Total)	42,3 %	28,0000
Unexplained variance in 1 st contrast	4,5 %	2,9701
Unexplained variance in 2 nd contrast	3,4 %	2,2269
Unexplained variance in 3 rd contrast	2,3 %	1,5180
Unexplained variance in 4 th contrast	2,2 %	1,4443
Unexplained variance in 5 th contrast	1,8%	1,1837



Table 4.
 Local Dependency in Item Correlation

ITEM	ITEM	Correlation
Upper		
27	28	0,534247
7	28	0,478785
7	27	0,467615
9	11	0,40452
Bottom		
6	10	-0,29346
5	10	-0,30311
9	10	-0,44936
10	11	-0,48109

We also observed the assumption of local dependencies between items in STRS-ID (Table 4). We observed four item correlations with values $>+0.40$ (Item D27 vs. C28; Item D7 vs. C28; Item D7 vs. D27; Item CF9 vs. CF11). The highest correlation ($+0.53 < +0.70$) was found between Item D27 “*Saya selalu berupaya mendapatkan perhatian dari guru-guru di kelas ini*” (I always try to get the teachers' attention in this class) and Item C28 “*Guru-guru di kelas ini memberikan rasa aman*” (The teachers in this class provide a sense of security). Items D27 (Dependency Factor) and C28 (Closeness Factor) share similar characteristics within the interrelated latent variables. Using the residual correlation standard for the STRS-ID items, with values not exceeding $+0.70$, we conclude that local dependencies do not significantly affect any item.

Rating Scale Diagnostic and Response Thresholds

Table 5 on Observed Average and Andrich Threshold shows the logit values for each response option, ranging from a low logit for the minimum score option to a high logit for the maximum score option. This finding indicates the respondents' ability to distinguish among various choices on the 5-point Likert scale in the STRS-ID responses. The observation level associated with the Andrich Threshold also changes progressively, starting from NONE, moving towards negative logits (-2.32), and continuing to increase until reaching a positive logit (2.35 logits). These results confirm that the provided response options are valid and do not confuse respondents.



Table 5.
 Item Threshold and Fit Indices of Response Format 5-Point Likert

Category Level	Observed Count (%)	Observed Average	Infit MNSQ	Outfit MNSQ	Andrich Threshold
1 (Definitely does not apply)	6	-1.70	1.44	1.59	None
2 (Does not really apply)	15	-0.93	0.79	0.85	-2.32
3 (Neutral, not sure)	29	0.41	0.82	0.75	-0.86
4 (Applies somewhat)	32	1.38	0.99	1.06	0.82
5 (Definitely applies).	18	2.20	1.07	1.13	2.35

In Figure 1, we visualize the information presented in Table 5 to clarify the response category options provided by the Relative Measure Curve model or Item Characteristic Curve Model (ICC). Figure 1 illustrates that the score categories, marked by cross points on the measured latent variable, exhibit an arched pattern similar to the indicated category probabilities. At the endpoints of each category interval (green lines and red lines), the Rasch threshold points are indicated, where both patterns remain within the ideal model line category but are slightly vulnerable to misfit responses.

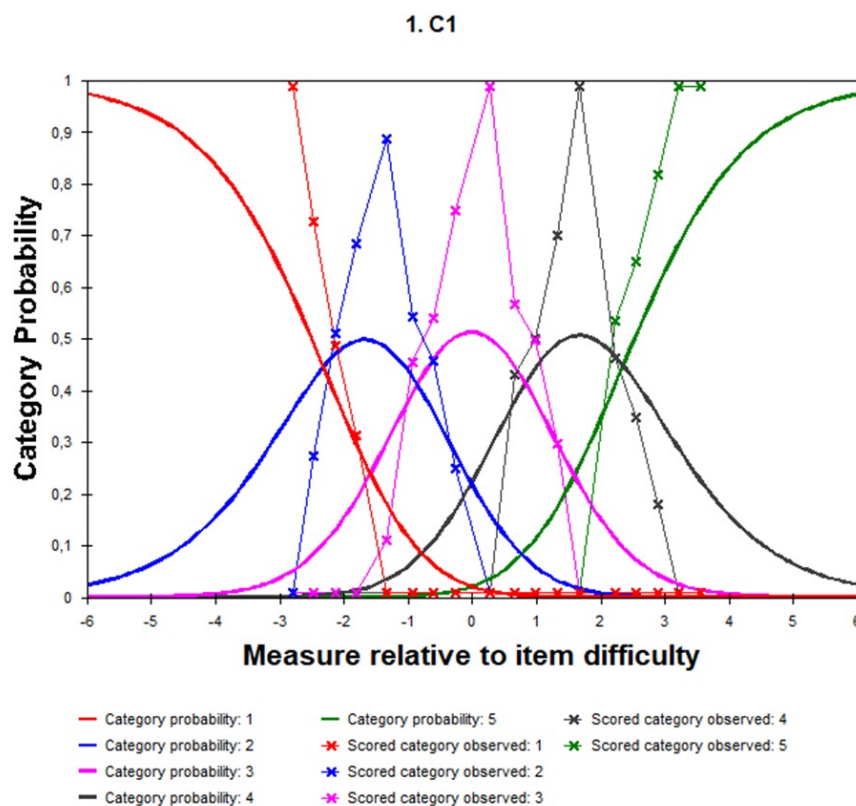


Figure 1. After Scoring the response options into a 5-point Likert, the Initial Pcategory Probability curve for STRS-ID.



Item Measure, Person Measure, and Wright Map

Table 6 presents the Item statistical measurements for STRS-ID, including the measurement logits (Measure), item measurement accuracy (Model S.E.), Item fit in terms of Misfit and Outfit (MNSQ & ZSTD), and item discrimination (Pt. Measure Corr). The item entries are coded with C for closeness, CF for conflict, and D for dependence. The numeric code in each item entry denotes the item number. For example, item number 1 is coded as C1, item number 2 as CF2, and item number 7 as D7.

In Table 6, the most difficult Item (1.33 logits) across all respondent groups is the Item coded as CF2. Meanwhile, the easiest items (-0.60 logits) are coded as C10 and C3. Items C1, C6, D7, CF9, C13, CF14, D15, CF17, CF18, CF19, CF21, CF22, C24, D25, C26, and C28 have Outfit MNSQ values between $0.5 < \text{MNSQ} < 1.5$, while the remainder fall outside this range. Generally, values close to the $0.5 < \text{MNSQ} < 1.5$ range can be considered acceptable, indicating a good fit, with only a few items slightly outside the acceptable Outfit threshold.

In the Model S.E. column, the proposed standard errors in this study are < 0.5 , whereas the standard error value in Table 6 (0.04) directly indicates the fit of the measured items. This suggests that each Item in the STRS-ID instrument is reliable and precise for measuring student-teacher relationships.

The Pt. Measure Corr column also shows no negative values, with most values falling within the threshold of $0.4 < \text{Pt. Measure Corr} < 0.85$ (Sumintono & Widhiarso, 2014). The absence of negative values indicates that the STRS-ID meets acceptable criteria, while some items outside the threshold may be considered. Basically, the items in STRS-ID have local dependencies, so they do not affect the primary value of measurement accuracy.

Table 6.
 Summary Item Measure (I=28)

Entry Item	Total Score	Total Count	Measure	Model S.E.	Infit		Outfit		Pt. Measure Corr.
					MNSQ	ZSTD	MNSQ	ZSTD	
CF2	3325	1193	1.13	.04	.75	-6.71	.78	-5.85	.84
CF20	3369	1193	1.07	.04	.77	-6.36	.78	-5.98	.85
CF19	3592	1193	.73	.04	1.09	2.23	1.08	2.02	.72
CF17	3611	1193	.70	.04	1.17	4.07	1.16	3.95	.69
CF14	3636	1193	.67	.04	1.18	4.33	1.17	4.16	.70
CF9	3650	1193	.65	.04	1.12	2.91	1.11	2.74	.71
C4-	3828	1193	.38	.04	6.96	9.91	7.97	9.91	-.82
D7	4081	1193	.00	.04	.46	-9.90	.47	-9.90	.86
D15	4094	1193	-.02	.04	.48	-9.90	.49	-9.90	.87
D25	4121	1193	-.07	.04	.47	-9.90	.49	-9.90	.87
CF18	4127	1193	-.08	.04	1.21	5.13	1.25	5.89	.69
C13	4137	1193	-.09	.04	.48	-9.90	.49	-9.90	.89
C28	4147	1193	-.11	.04	.47	-9.90	.49	-9.90	.89
C6	4151	1193	-.11	.04	.47	-9.90	.49	-9.90	.89
CF11	4153	1193	-.12	.04	.53	-9.90	.56	-9.90	.82
C26	4160	1193	-.13	.04	.43	-9.90	.45	-9.90	.90
CF16	4163	1193	-.13	.04	.53	-9.90	.55	-9.90	.83
C23	4165	1193	-.13	.04	.49	-9.90	.51	-9.90	.89



C5	4170	1193	-.14	.04	.50	-9.90	.51	-9.90	.88
C24	4186	1193	-.17	.04	.48	-9.90	.50	-9.90	.89
C1	4194	1193	-.18	.04	.46	-9.90	.48	-9.90	.89
CF21	4386	1193	-.48	.04	1.04	.95	1.00	-.06	.78
D27	4405	1193	-.52	.04	.94	-1.49	.94	-1.49	.73
CF22	4413	1193	-.53	.04	1.07	1.70	1.03	.77	.77
D8	4426	1193	-.55	.04	.96	-1.03	.95	-1.20	.75
D12	4444	1193	-.58	.04	.96	-.93	.95	-1.28	.76
C3	4454	1193	-.60	.04	.97	-.83	.96	-1.01	.75
C10	4455	1193	-.60	.04	.99	-.22	.98	-.46	.75

Table 7 presents the Person measurement statistics. Based on the Rasch calculations, the top seven respondents start at entry number 265, and the bottom eight respondents start at entry number 1892. Table 7 also provides the same data points as Table 6. For instance, respondent number 265 (3.37 logits with S.E.= 0.37) indicates the highest level of student-teacher relationship among respondents. In contrast, the lowest response is from respondent 1600 (-2.77 logits with S.E. = 0.31), suggesting a lower level of student-teacher relationship than other respondents or students involved.

Table 7.
 Summary of Person Measure (n=1193)

Person Entry Number	Total Score	Total Count	JMLE Measure	Model S.E.	Infit		Outfit		Pt. Measure Corr.
					MNSQ	ZSTD	MNSQ	ZSTD	
265	131	28	3.37	.37	1.61	1.70	1.46	1.29	.22
377	130	28	3.24	.36	1.62	1.79	1.50	1.45	.09
109	129	28	3.11	.34	2.11	2.94	1.90	2.41	.21
666	129	28	3.11	.34	1.51	1.57	1.31	1.02	.42
1507	129	28	3.11	.34	2.27	3.26	2.07	2.75	.03
1512	129	28	3.11	.34	2.18	3.09	1.97	2.55	.13
240	128	28	3.00	.33	1.36	1.21	1.26	.90	.24
1892	44	28	-2.59	.30	1.64	2.13	1.77	2.40	.15
899	43	28	-2.68	.30	2.13	3.32	2.44	3.84	-.12
960	43	28	-2.68	.30	2.10	3.24	2.30	3.54	.15
1632	43	28	-2.68	.30	1.61	2.03	1.85	2.54	-.24
1702	43	28	-2.68	.30	2.15	3.35	2.36	3.67	.08
1894	42	28	-2.77	.31	1.42	1.45	1.61	1.91	.15
10	41	28	-2.87	.32	1.24	.89	1.42	1.37	.26
1600	40	28	-2.98	.33	1.53	1.68	1.86	2.35	-.11

Based on the procedure for determining the distribution parameters of Item difficulty and Person response, we present the Wright Person-Item Rasch Map shown in Figure 2. We have also customized the display of the STRS-ID Wright Map according to the item difficulty and ease levels and the distribution of respondents' responses to the items using colour coding. The coloured lines in Figure 2 compare Person responses to Item distribution patterns. This approach considers logit values within the exact interval for the Person and Item models (Boone et al., 2014). For example, Respondent 265 (3.37 logits) has a stronger relationship with their teacher compared to Respondent 377 (3.24



logits), and Item CF2 (1.13 logits) is more challenging than Item CF20 (1.07 logits). Using this method, we can compare Items and Persons such that Respondent 265 is more likely to respond "definitely applies" to Item CF2 than Respondent 377. In contrast, for Item CF20, Respondent 377 would respond "definitely applies," whereas Respondent 265 would indicate "neutral."

On the right side (Item Measure) of the central vertical line, the green boxes indicate items with high difficulty levels (CF2= 1.13 logits) – “*Di kelas ini saya dan guru sering berselisih paham*” (In this class, the teacher and I often have disagreements), while the yellow boxes represent items with low difficulty levels (C10= -0.60 logits) – “*Saya senang memuji guru-guru di kelas ini*” (I am happy to praise the teachers in this class). On the left side (Person Measure) of the central vertical line, dark blue to light blue colour codes represent the distribution of Person responses across items. Dark blue (at the bottom) indicates the lowest JMLE Measure (Respondent 1600= -2.98 logits), and light blue (at the top) indicates the highest JMLE Measure (Respondent 265= 3.37 logits).

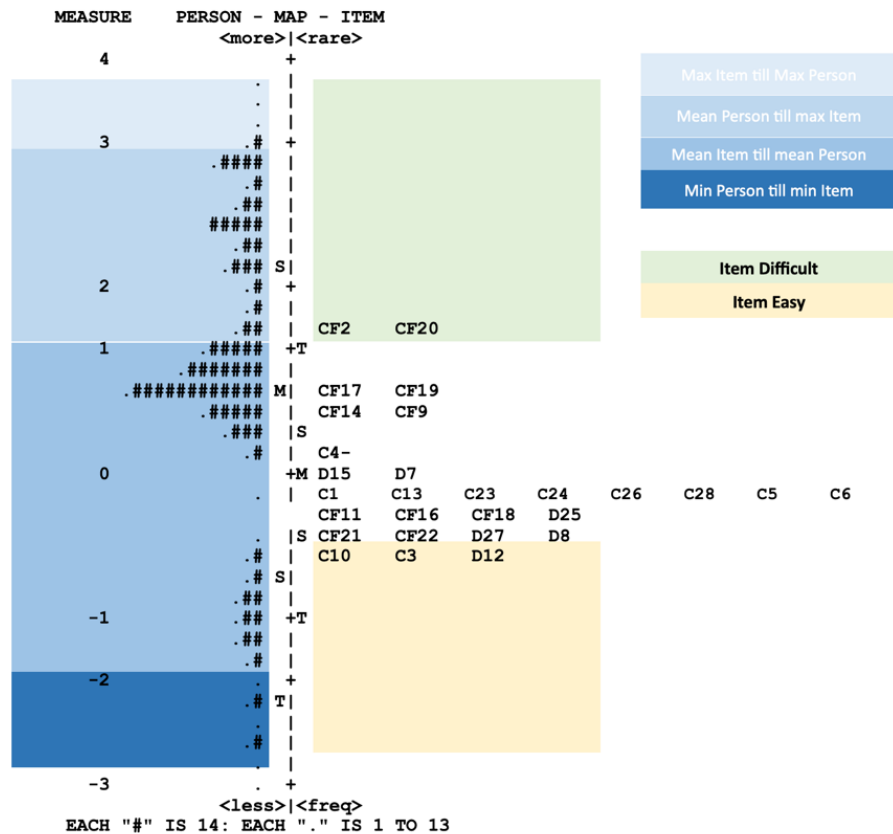


Figure 2. Wright Person-Item Rasch Map for STRS-ID

Note. In Fig. 2, Wright's map directly compares two measures on a single Rasch logit “central boundary line”. On the left side, M: represents the mean of persons; S: represents one standard deviation from the mean of persons; T: represents two standard deviations from the mean of persons. On the right side, M represents the mean of items; S represents one standard deviation from the mean of items; T represents two standard deviations from the mean of items. Meanwhile, the symbol “#” represents 14 persons, and “.” represents 1–13 persons.



Measurement Invariance or Differential Item Functioning (DIF)

Bias detection in items is displayed in DIF, indicating potential measurement bias for an item with a probability value of <0.05 . DIF is analyzed by gender, age, grade, educational level, and regional areas within Indonesia. Age groups are divided into six categories (12, 13, 14, 15, 16, 17 years), grades are also divided into six groups (7, 8, 9, 10, 11, 12), educational level into two groups (Junior High School & Senior High School), while regional areas are divided into three groups (West Indonesia, Central Indonesia, East Indonesia).

DIF probability measurements for gender revealed bias in Item CF19 (prob 0.0425 < 0.05) – “*Guru-guru di kelas ini membuat emosi saya tidak stabil*” (The teachers in this class make my emotions unstable) and Item CF18 (prob 0,0176 $< 0,05$) – “*Belajar dengan guru-guru di kelas ini terasa membosankan*” (Learning with the teachers in this class feels boring). In the age group, DIF was found in Item C4 (prob 0.0121 < 0.05) – “*Saya tidak nyaman jika ada guru di kelas ini yang terlalu perhatian atau terlalu dekat dengan saya*” (I feel uncomfortable if any teacher in this class is too attentive or too close to me). For the regional areas group, DIF was identified in Item C4 (prob 0,0003 $< 0,05$), Item CF14 (prob 0,0400 $< 0,05$) – “*Saya merasa guru di kelas ini sering memberikan kritik dan hukuman kepada saya*” (I feel that the teachers in this class often give me criticism and punishment), and Item D8 (prob 0,0207 $< 0,05$) – “*Saya berupaya agar guru-guru di kelas ini selalu membantu saya*” (I try to ensure that the teachers in this class always help me). Meanwhile, in the grade-level and educational-level groups, we did not find any DIF with Prob $<0,05$.

Our DIF analysis results require careful interpretation. For example, if an item exhibits DIF, does that mean the item is biased toward a particular group? Boone et al. (2014) emphasized that DIF on an item does not necessarily indicate bias across respondent groups. According to Boone et al., items with DIF in the above groups may indicate specific mechanisms that influence DIF in other items across groups. Consequently, Linacre (2009) suggests evaluating the “Effect size” strength using an estimated “DIF Contrast” >0.64 logits to determine whether there is a clear difference between group responses to an item flagged for DIF in that group. Items with a DIF Contrast below this threshold can be retained and are believed not to compromise measurement accuracy. The results of the contrast analysis are presented in Table 8.

Table 8.
 Results of DIF Contrast Analysis on STRS-ID Items

Groups	Item				
	C4	D8	CF14	CF18	CF19
Gender					
Male				0,19	0,16
Female				-0,19	-0,16
Ages					
12 – 13, 14, 15, 16, 17	-0,53				
	-0,33				
	-0,44				
	-0,37				
	-0,30				
13 – 12, 14, 15, 16, 17	0,53				
	0,20				



	0,09		
	0,17		
	0,23		
14 – 12, 13, 15, 16, 17	0,33		
	-0,20		
	-0,10		
	-0,03		
	0,04		
15 – 12, 13, 14, 16, 17	0,44		
	-0,09		
	0,10		
	0,07		
	0,14		
16 – 12, 13, 14, 15, 17	0,37		
	-0,17		
	0,03		
	-0,07		
	0,07		
17 - 12, 13, 14, 15, 16	0,30		
	-0,23		
	-0,04		
	-0,14		
	-0,07		
Regional Areas			
West Indonesia – Central & East Indonesia	0,28 & -0,16	0,21 & -0,09	-0,15 & 0,17
Central Indonesia – West & East Indonesia	-0,28 & -0,43	-0,21 & -0,30	0,15 & 0,32
East Indonesia – West & Central Indonesia	0,16 & 0,43	0,09 & 0,30	-0,17 & 0,32

Discussion

In this study, we encountered challenges with the large number of respondents, but our overall findings indicate that STRS-ID has excellent person and item reliabilities. The Cronbach's Alpha value is excellent, indicating that the internal consistency of STRS-ID is solid. However, some values did not fit the ideal model, such as the ZSTD for item measurement, which still falls outside the ideal standard. On the other hand, person-fit indices show that both the MNSQ outfit and infit are within the acceptable range. Furthermore, for the diagnostic rating scale, STRS-ID, using a 5-point Likert scale (ranging from "Definitely does not apply" to "Definitely applies"), was statistically classified as non-disturbing for respondents (Khalid et al., 2023; Silva Diaz et al., 2022).

The results of the unidimensionality test, which exceeded 40%, indicate a good fit, with the variance contrast below 15%. These values align with the criteria for a well-functioning unidimensional instrument (Packham et al., 2022). Additionally, we observed



some degree of local dependence, with several items showing high correlations yet remaining below the +0.70 threshold, as presented in Table 4b (Abdullaev et al., 2023). For instance, Item D27 “*Saya selalu berupaya mendapatkan perhatian dari guru-guru di kelas ini*” (I always try to get the teachers' attention in this class) and Item C28 “*Guru-guru di kelas ini memberikan rasa aman*” (The teachers in this class provide a sense of security) showed the highest correlation among other items. These two items share common themes of closeness and dependency, which are linked in the theoretical framework. According to Wilhelmsen et al (2022), closeness (C) between students and teachers influences the development of dependency (D) behaviors. Students with a high level of closeness to their teachers tend to exhibit more assertive attachment behaviors, which may be reflected in the interrelationship of these items.

We also observed other correlations within the C and D codes, identifying both positive and negative relationships across items. For example, Item D7 “*Saya merasa sedih jika nanti tidak diajar lagi oleh guru-guru di kelas ini*” (I feel sad if I am no longer taught by the teachers in this class) and Item C28 “*Guru-guru di kelas ini memberikan rasa aman*” (The teachers in this class provide a sense of security) highlight a complex relationship. When students feel secure with their teachers, their sadness about leaving them increases. Conversely, if teachers fail to provide a sense of security, students may be more eager to part with them, as seen in Item D7 (Virat et al., 2026).

In the CF (Conflict) category, Item CF9 “*Guru-guru di kelas ini membuat saya cepat emosi*” (The teachers in this class make me feel easily irritated) and Item CF11 “*Guru-guru di kelas ini memperlakukan saya dengan tidak adil*” (The teachers in this class treat me unfairly) exhibited a high correlation. These items suggest that emotional responses, such as irritation, are linked to the perception of unfair treatment by teachers. Our data revealed that 152 students (with a 0.47 PTMA Corr) reported experiencing unfair treatment from teachers, while 128 students (with a 0.41 PTMA Corr) felt that teachers made them quick-tempered. This indicates a significant correlation between the two items, further supporting the link between teacher behavior and students' emotional responses.

While STRS has been widely used in the literature on bias, we identified certain bias issues in STRS-ID. Specifically, in the gender group, we found bias in Items CF18 and CF19, and in the age group, bias was observed in Item C4. Similarly, the regional area group showed bias in Item C4 and CF14. In contrast, no bias was found in the class-group and education-level groups. It is important to interpret these results cautiously, as they may be influenced by factors like literacy and readability. For example, Item C4 “*Saya tidak nyaman jika ada guru di kelas ini yang terlalu perhatian atau terlalu dekat dengan saya*” (I feel uncomfortable if any teacher in this class is too attentive or too close to me) showed bias in both age groups and regional areas. In Western Indonesia, excessive attention from teachers is perceived as unusual and carries a stigma, whereas in Central and Eastern Indonesia, closeness and attention from teachers are viewed as respectful and appreciated by students and their families. This discrepancy reflects cultural differences across regions in Indonesia, where in the East, teachers are often regarded as figures of authority and gratitude, while in the West, the emphasis on professional boundaries is stronger (Allen et al., 2024).

Furthermore, we found that STRS-ID has a mean score in the middle of the scale, suggesting a diversity of student-teacher relationships in Indonesia, ranging from closeness to conflict to dependency. This highlights the need for further attention to these



relationships, as the growing number of conflicts between students, teachers, and even parents during the 2023-2024 period underscores the urgency of addressing these issues (Cornelius-White et al., 2020). Additionally, the social interactions within student-teacher relationships influence students' psychological environments and self-confidence, which are critical to their psychological well-being at school (Kincade et al., 2020).

This study contributes to the existing literature by validating the STRS developed by Koomen et al (2012) and adapting it into STRS-ID, making it culturally appropriate for Indonesia. It also pioneers the study of student-teacher relationships in Indonesia by providing a psychometrically valid tool, STRS-ID. Based on Rasch analysis, although the STRS-ID meets the reliability standards, some items still fall outside the ideal MNSQ range. We recommend that future researchers using STRS-ID in Indonesia report these items and consider revising them, especially those that do not meet acceptable standards. Moreover, due to identified bias in certain items, we suggest that a broader, more diverse respondent base be considered in future studies. In particular, the cultural differences between regions may influence how bias reappears in subsequent research.

The study also highlighted challenges with the overall structure of the items and the response format used by respondents for the closeness, conflict, and dependency indicators of the student-teacher relationship in the STRS-ID. Therefore, a refined measurement tool is necessary to accurately assess and characterize these relationships. We recommend removing or modifying biased and misleading items in the measurement categories to enhance the accuracy of future measurements. Since STRS-ID is designed to assess three aspects of student-teacher relationships, the local dependency observed in some items can be justified without compromising the instrument's accuracy. Finally, our analysis revealed that there is still undue categorization at the STRS-ID measurement threshold. As a result, revisions to certain items are required, and further research is needed to address these issues in future studies. One of the strengths of this study is the involvement of students from diverse cultural backgrounds in Indonesia, which is essential for assessing potential cultural biases when the STRS-ID is used in a broader national context.

Limitations of this study include the use of WhatsApp as a medium for distributing the questionnaire, which may have influenced students' responses compared with paper-based methods. Additionally, while the original STRS was developed in a European context with a sentence structure aimed at teacher respondents, STRS-ID was adapted with a sentence structure directed at student respondents. This may have slightly influenced responses, although the effect was minimal. Lastly, it is important to note that the sample used in this study was drawn from more than 31 schools across Indonesia, and there is no guarantee that STRS-ID will provide the same responses when used with respondents from other countries with similar languages, such as Malaysia and Brunei.

CONCLUSION

This study has evaluated and validated the Indonesian version of the Student-Teacher Relationship Scale (STRS-ID) using the Rasch Model among secondary school students in Indonesia. The Rasch analysis confirmed the reliability of the STRS-ID, offering new psychometric insights into measuring student-teacher relationships, particularly in the Indonesian context. STRS-ID also contributes to the original scale's development by incorporating students' perspectives, making it more culturally appropriate for Indonesia. However, some categorization issues were identified that did



not meet the ideal measurement thresholds. In conclusion, further Rasch validation studies are needed, including modifications to problematic items, to improve the measurement accuracy of the STRS-ID. Additionally, future research should include external validity tests and the development of age-, gender-, and region-based norms.

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