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# Adaptation of the ARS-30 Academic Resilience Scale for Indonesian Junior High School Students Utilizing the Rasch Model

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## Abstract

*The objective of this study was to adapt and validate the Academic Resilience Scale-30 (ARS-30) in alignment with Indonesia's educational norms using Rasch model analysis. The adaptation process considered collective classroom dynamics, ethnic and linguistic diversity, and the relevance of the national language to ensure both cultural and pedagogical appropriateness. The procedure involved obtaining permission from the original developer, forward and backward translation by certified professionals, expert panel evaluations, readability testing with junior high school students, and field validation with the intended population. The final sample consisted of 399 junior high school students aged 12 to 15 years from Surabaya, encompassing Javanese, Madurese, Arabic, Chinese, and other native ethnic groups, with 214 females and 185 males. Following item-fit evaluation, four items were removed, resulting in a refined 26-item version of the scale. Rasch analysis confirmed its strong psychometric properties, with item reliability at 0.99, person reliability at 0.88, and internal consistency (Cronbach's alpha) at 0.91. The scale also demonstrated unidimensionality, with 40.6% of the variance explained by the primary Rasch dimension. Minimal differential item functioning (DIF) was detected across gender, ethnicity, income level, school aspirations, and living arrangements, indicating fair measurement across demographic groups. These results support the Indonesian ARS-30 as a valid and reliable tool for assessing academic resilience in junior high school students, with further research encouraged to deepen cultural responsiveness through qualitative approaches and to evaluate its relevance across broader educational levels and diverse learner populations.*

**Keywords:** Academic Resilience; Adaptation; ARS 30; Rasch Model; Junior High School

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## Introduction

Resilience is generally defined as an individual's capacity to endure and cope with adversity, be it challenges, pressures, difficulties, or high-risk situations, with the ability to recover and return to a more normal state (Egeland et al., 1993; Grotberg, 2003; Kaplan, 2005; Luthar, 2015; Smith et al., 2010). Resilience is an individual's response to bounce back after experiencing a series of difficulties by showing changes in thoughts and behavior (Rutter, 1987). The development of theories on resilience has undergone four distinct phases (Masten, 2007). The initial phase involved the identification of resilient qualities, the subsequent phase focused on the uncovering of resilience processes, the third phase centered on the promotion of resilience through prevention and intervention and the final phase concentrated on the dynamics of adaptation and change. In the fourth wave, the concept of resilience can vary in various contexts and areas of life, including in the context of the educational environment (Troy et al., 2023; Wortsman et al., 2024).

In educational settings, the term "resilience" is more commonly known as "academic resilience." In accordance with this overarching definition, academic resilience is a distinct manifestation of general resilience, with a particular focus on an individual's capacity to persevere and adapt in a constructive manner when confronted with challenges, stresses, or difficulties inherent to academic environments. While general resilience encompasses coping in various aspects of life, academic resilience emphasizes adaptations that are more focused on the learning environment, such as completing difficult assignments, managing exam pressure, or dealing with academic failure (Cassidy, 2016; Martin & Marsh, 2006; Troy et al., 2023; Yang & Wang, 2022). Consequently, academic resilience can be considered a manifestation of general resilience applied in the field of education.

The concept of academic resilience is significantly influenced by cultural factors, including coping mechanisms, problem-solving strategies, and students' responses to academic challenges (Martin & Marsh, 2008; Skinner et al., 2013). Previous research shows that in Asian countries such as China and Malaysia, students' learning experiences are influenced by a collective culture that emphasizes group harmony, family support and social connectedness (Kuldas et al., 2015; Li, 2017). In these cultures, students frequently depend on collective efforts, such as collaboration with peers, and guidance from family or community to cope with academic pressures (Sandoval-Hernández & Białowolski, 2016; Theron & Liebenberg, 2015). Conversely, in Western countries with individualistic cultures, such as the United Kingdom and the United States, students are expected to prioritize personal achievement, independence, and individual problem-solving skills (Cui et al., 2023). These cultural variations underscore the necessity of a context-specific approach to the study and support of academic resilience, ensuring that interventions are congruent with students' cultural values and life experiences.

To date, the measurement of academic resilience has been initiated and carried out in Western countries influenced by individualistic cultures, one such example being the ARS 30 resilience scale developed by Cassidy (Cassidy, 2016; Cassidy et al., 2023). This scale has been used in countries such as the UK (Cassidy et al., 2023), Spain (Trigueros et al., 2020) and Turkey (Aliyev et al., 2021). Beginning in 2022-2023, there have been adaptation efforts in Asian countries with a collective culture, such as China, which represents the East Asian region (Cui et al., 2023). However, the adaptation of this scale to other Asian regions, such as Southeast Asia, remains limited.

One of the largest countries in Southeast Asia that could potentially accommodate the implementation of ARS 30 is Indonesia. The country is an archipelago and is adjacent to other Southeast Asian countries, including Singapore, Malaysia, Thailand, Philippines, Brunei Darussalam and Timor-Leste. This geographic location has resulted in a high degree of ethnical and linguistic diversity within the Indonesian population (Nurman et al., 2022; Schefold, 1998). Indonesia is also known for its popular collective cultural value of gotong royong, which can be translated as mutual cooperation (Lukiyanto & Wijayaningtyas, 2020; Slikkerveer, 2019). In the academic context, the value of gotong royong, or Indonesian "collective action", helps students to draw strength from collective bonds when facing challenges or difficulties (Muslihati et al., 2022; Rachmawati et al., 2021; Shirleyana et al., 2023; Wahyuni et al., 2019). These distinctive characteristics underscore the necessity of adapting academic resilience measurement tools, such as the ARS 30, to align with the Indonesian cultural context. The adaptation of the ARS 30 in Indonesia is of particular significance, given that Indonesian is the unified language spoken by all ethnic groups in the country.

The present study focuses on the adaptation of Ars 30 in Indonesia, with a particular emphasis on junior high school students between the ages of 12 and 15. In accordance with the principles of developmental psychology, this age group is believed to be undergoing a pivotal phase, characterized by the transition to the formal operational stage of thought, which enables the capacity for abstract thinking (Piaget, 1983). Furthermore, they are navigating a period of identity exploration, often accompanied by a sense of uncertainty regarding their roles and responsibilities. Academic success in this stage is a significant factor in the development of a positive self-identity (Erikson, 1994). The notion of academic resilience is pivotal in this context, as it facilitates the navigation of academic challenges and fosters confidence, thereby preparing them for the transition to high school and the subsequent long-term career planning. The Indonesian junior high school phase is of particular significance in this context, as it necessitates the adaptation and validation of the ARS 30 academic resilience scale, which has been specifically designed for this age group.

To achieve a comprehensive understanding of academic resilience as a qualitative phenomenon in social sciences and psychology, it is imperative to utilize psychological scale assessments (Andrich & Pedler, 2019; Cassidy et al., 2023; Guyon et al., 2017). Evaluating these events does not emphasize identifying correct or incorrect responses, necessitating a new measurement approach compared to standard test theory (Prieto et al., 2003a; Zhang et al., 2023). To assess the relationship between an item's characteristics and the respondent's competence, an item response theory (IRT) methodology is required (Zhang et al., 2023). Mathematician George Rasch developed the IRT approach; therefore, it is often referred to as the Rasch model approach (Bond & Fox, 2007; Folastri et al., 2023; Rangka et al., 2023). The Rasch model is an efficient technique for generating

accurate measurements in educational research due to its ability to convert ordinal responses into interval-level data (Aminah et al., 2024; Planinic et al., 2019; Ramdani et al., 2021).

The objective of this study was to adapt and validate the Academic Resilience Scale 30 (ARS-30) in accordance with the prevailing educational norms in Indonesia using Rasch model analysis. This adaptation considers the collective culture in Indonesia, which possesses unique characteristics compared to other collective cultures, such as China. Indonesia has a more complex number of ethnicities and regional languages than China (Pepinsky et al., 2024). In addition, Indonesia upholds a variety of religious values, including Islam, Christianity, Hinduism and Buddhism, which emphasize harmony in diversity (Pangalila & Rumbay, 2024). This stands in contrast to China, which is characterized by its more structured collective culture, influenced by traditions such as Confucianism (Wang & Liu, 2010). The combination of ethnic diversity, language, and religious values in Indonesia provides a unique challenge and opportunity in the adaptation process of the ARS-30 instrument. The instrument's ability to reflect the complex social and cultural context of the Indonesian educational environment is of paramount importance.

## Methods

### *Participant*

The present study involved 399 junior high school students from Surabaya, Indonesia, one of the country's most populous and culturally diverse cities. Surabaya provides a rich sociocultural context where students from various ethnic, economic, and educational backgrounds converge, making it an ideal setting for exploring academic resilience (Shirleyana et al., 2018). The demographic profile of the participants is summarized in Table 1, reflecting the heterogeneity of the sample across gender, ethnicity, socioeconomic status, educational aspirations, and family backgrounds.

In terms of gender distribution, the sample comprised 214 female and 185 male students. The ethnic composition of the participants was predominantly Javanese (348 students), followed by Madurese (37), Arab descent (9), other native ethnic groups (3), and Chinese (2). This ethnic diversity reflects the multicultural makeup of Surabaya as one of Indonesia's major urban centers. Regarding socioeconomic background, the majority of students (241) came from low-income families, while 112 reported coming from middle-income households, and 19 were from high-income families. A small portion (27 students) indicated that their family had no steady income. These economic variations offer insight into how financial backgrounds intersect with students' educational aspirations. When asked about their intended educational pathway after junior high school, most students (271) planned to attend general high schools, while others aimed for vocational schools (120), boarding schools (7), and one student indicated not planning to continue formal education.

The data on family structure showed that the majority of students (343) lived in intact families with both parents. Other students reported family conditions such as divorced parents (19), deceased father (29), deceased mother (6), or having lost both parents (2). In terms of living arrangements, 367 students lived with both parents, 23 with relatives, 5 with their mother, and 4 with their father. Parental education levels varied widely: 184 parents had completed senior high school, 108 held undergraduate degrees, 25 held diplomas, 40 had completed junior high school, 31 had elementary school education, and 11 held postgraduate qualifications. This range illustrates the differing levels of academic exposure and home learning environments among participants.

In conclusion, the participants in this study represent a rich demographic spectrum, showcasing diversity in gender, ethnicity, economic background, educational pathways, and familial settings. This enhances the generalizability of the findings and underscores the robustness of the Academic Resilience Scale (ARS-30) in assessing student resilience within the culturally dynamic setting of urban Indonesia.

**Tab. 1**. Respondent Characteristics (I=26, N=399)

| | | Total | M | S.E* | Reliability** |
|---|---|---|---|---|---|
| *Gender* | | | | | |
| | Female | 214 | 2.17 | 0.33 | 0.90 |
| | Male | 185 | 2.22 | 0.34 | 0.90 |
| *Ethnicity* | | | | | |
| | Javanese | 348 | 2.16 | 0.06 | 0.90 |
| | Madurese | 37 | 2.40 | 0.20 | 0.90 |
| | Arab | 9 | 2.21 | 0.43 | 0.88 |
| | Other natives | 3 | 2.77 | 0.81 | 0.77 |
| | Chinese | 2 | 1.91 | 0.61 | 0.79 |
| *Income family* | | | | | |
| | Low Income | 241 | 2.24 | 0.07 | 0.89 |
| | Middle Income | 112 | 2.15 | 0.11 | 0.91 |
| | High Income | 19 | 1.91 | 0.24 | 0.91 |
| | No Steady Income | 27 | 2.18 | 0.23 | 0.92 |
| *Choice of school after junior high school* | | | | | |
| | High School | 271 | 2.21 | 0.07 | 0.90 |
| | Vocational School | 120 | 2.16 | 0.09 | 0.91 |
| | Boarding School | 7 | 2.33 | 0.29 | 0.84 |
| | Not Schooling | 1 | 1.03 | - | 0.00 |
| *Parent relationship status* | | | | | |
| | Intact family | 343 | 2.19 | 0.06 | 0.90 |
| | Divorced | 19 | 1.90 | 0.20 | 0.87 |
| | Orphaned (Mother) | 6 | 2.95 | 0.46 | 0.85 |
| | Orphaned (Father) | 29 | 2.17 | 0.22 | 0.91 |
| | Orphaned (Both Parents) | 2 | 2.98 | 0.13 | 0.00 |
| *Living Place* | | | | | |
| | With father | 4 | 2.79 | 0.80 | 0.91 |
| | With mother | 5 | 2.50 | 0.44 | 0.85 |
| | Both parents | 367 | 2.19 | 0.06 | 0.90 |
| | With relative | 23 | 2.14 | 0.23 | 0.91 |
| *Education Level of parents* | | | | | |
| | Postgraduate | 11 | 2.17 | 0.46 | 0.93 |
| | Graduate | 108 | 2.26 | 0.12 | 0.91 |
| | Diploma | 25 | 2.21 | 0.19 | 0.88 |
| | Senior High School | 184 | 2.16 | 0.07 | 0.89 |
| | Junior High School | 40 | 2.17 | 0.15 | 0.87 |
| | Elementary School | 31 | 2.21 | 0.20 | 0.89 |

** S.E = Standard Error of Measure; ** Reliability is based on Rasch analysis.*

*Instrument*

The Academic Resilience Scale (ARS-30) is a measurement tool developed by Simon Cassidy to identify students' level of academic resilience in the face of academic challenges and failures (Cassidy, 2016; Cassidy et al., 2023). Academic resilience refers to an individual's ability to remain academically successful despite facing obstacles such as failure, criticism, or pressure from the academic environment. The ARS-30 comprises 30 statements designed to evaluate students' responses to challenging academic situations, such as receiving poor grades or criticism from lecturers. Each statement is measured using a five-point Likert scale, ranging from 1 (Strongly Agree) to 5 (Strongly Disagree), with higher total scores indicating greater academic resilience. The scale is widely used to assess academic resilience across a variety of educational contexts due to its proven validity and reliability.

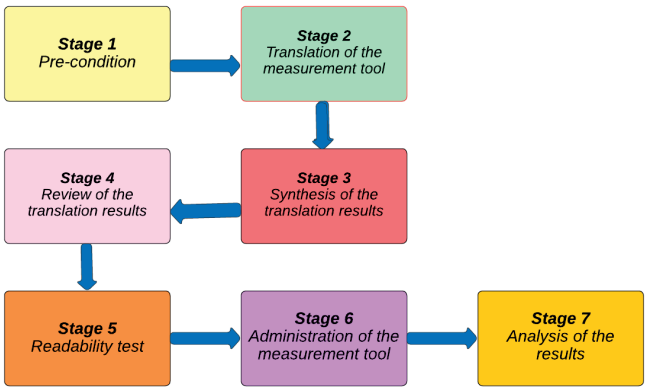
The ARS-30 comprises three primary dimensions that reflect significant aspects of academic resilience: perseverance, reflecting and adaptive help-seeking, and negative affect and emotional response. The Perseverance dimension quantifies students' capacity to persevere and strive for improvement in the face of setbacks. This dimension comprises 14 items, with theoretical scores ranging from 14 to 70. An illustrative statement from this dimension is, "I would work harder." The reflecting and adaptive help-seeking dimension encompasses students' capacity to introspectively assess their strengths and weaknesses and proactively seek assistance. This dimension comprises nine items, with theoretical scores ranging from 9 to 45, as illustrated by the statement, "I would try to think about my strengths and weaknesses to help me work better." Concurrently, the "negative affect and emotional response" dimension gauges the extent of negative affect and emotional response exhibited by students when confronted with academic challenges. This dimension comprises seven items, with theoretical scores ranging from 7 to 35, as illustrated by the statement, "I would feel like everything was ruined and was going wrong. The collective analysis of these three dimensions offers a comprehensive perspective on an individual's level of academic resilience in the face of adversity.

The administration procedure of the ARS-30 commences with the provision of the instrument to participants, which is preceded by the reading of an academic scenario in the form of a situation of failure in an important task accompanied by critical feedback from the instructor. Participants were asked to imagine themselves in the situation and respond to 30 statements using a 5-point Likert scale, ranging from 'Strongly Agree' to 'Strongly Disagree'. Subsequent to the collection of responses, a scoring procedure was implemented, entailing the implementation of reverse scoring on specific items, wherein a score of "5" was transformed to "1," and vice versa. Thereafter, the total score was determined by aggregating all items post-reverse scoring adjustment, while the score for each subscale was derived by summing the items corresponding to the dimensional distribution. The results of the data analysis were then used to identify the participants' level of academic resilience, where higher scores indicate greater resilience, while low scores may indicate the need for further interventions to help students deal with academic challenges.

*Procedure*

The adaption process for the measurement instrument complied with the ITC Guidelines for the Large-Scale Assessment of Linguistically and Culturally Diverse Populations (Commission, 2019). Figure 1 illustrates the adaption process.

**Fig. 1**. Adaptation procedure




*Stage 1: Precondition*. At this juncture, the researcher emailed Simon Cassidy, the creator of the ARS-30 measurement instrument, to secure authorization for the adaptation of the ARS-30 (Cassidy, 2016). On February 27, 2023, the researcher obtained written permission to modify the ARS-30 for Indonesia.

*Stage 2: Translation of the measurement tool*. The ARS-30, originally an English-language measurement tool, was initially translated into Indonesian by two translators legally certified by the Ministry of Education in Indonesia.

*Stage 3: Synthesis of the translation results*. The researcher synthesized the translation data from the second stage to identify differences between the two versions. Upon completion of the synthesis process, the items were back-translated from Indonesian to English to guarantee consistency between the adapted and original items. The outcome was then reviewed before the initiation of the next phase.

*Stage 4: Review of the translation results.* The synthesis outcomes from the third stage were presented for expert evaluation. The chosen specialists were those whose research concentrated on educational psychology or school counseling.

*Stage 5: Readability test*. A readability assessment was performed on the completed items of the ARS-30 measurement tool, following the expert judgment approach. This examination included five junior high school students from State Junior High School 55 in Surabaya. This test evaluated the participants' understanding of the instructions and items. Based on this evaluation's results, a detailed Likert scale specification was advised for the ARS-30 assessment tool. This description should elucidate that the scores span from 1 to 5, indicating a very affirmative answer to a strongly negative response.

*Stage 6: Administration of the measurement tool.* At this juncture, the scale was developed and disseminated to participants who fulfilled the study criteria. The ARS-30 scale is included in the Appendix and in the supplemental materials.

*Stage 7: Analysis of the results*.

The Indonesian version of the ARS-30 scale was assessed for psychometric quality using the Rasch model, first introduced by George Rasch in 1960 (Bond & Fox, 2007). This model is part of item response theory (IRT), which explores the relationship between item characteristics and the abilities of the individuals responding to them (Cavanagh & Waugh, 2011). Rasch analysis not only provides fit statistics to assess the extent to which items accurately represent the subject group as a whole, but also creates a hierarchical measurement framework to score items and assess the fit of subjects within groups (Prieto et al., 2003b). This approach overcomes the limitations that often arise when raw total scores are used (Ekstrand et al., 2022; Pendrill, 2019).

According to Rangka et al., 2023, the proposed and measurement ARS 30 in Indonesian version via Rasch analysis are described in the following anaclasis. Firstly, the overall fit was assessed to determine the extent to which the data met the criteria of the Rasch model. In this process, the infit and mean square (MNSQ) values were used as the main indicators to assess the fit of participants' responses to the model predictions. The MNSQ statistic is used to determine the extent to which participants' responses fit the predictions of the Rasch model. The Infit MNSQ focuses on response patterns to items that are close to the participant's ability level, while the Outfit MNSQ detects unusual responses, such as random errors or biases in item comprehension. Ideal MNSQ scores typically fall in the range of 0.5 to 1.5, with scores below 1.0 indicating more consistent response patterns, and scores above 1.0 indicating

Second, the reliability of measurement stability and the ability of items in the ARS 30 domain to discriminate between different levels of academic resilience were measured using internal consistency reliability and separation indices. Excellent internal consistency (>0.70) characterizes an acceptable reliability score. In contrast, the requirement for an acceptable individual separation index is a logit value greater than 1.5.

The third, unidimensionality testing is a fundamental principle of the Rasch model. The purpose of this test is to ensure that the instrument measures only one main attribute or construct, such as academic resilience on the ARS-30 scale. Validation was performed by principal component analysis (PCA) of the residuals, which aims to test whether the explained variance is dominated by one main dimension. The results of this procedure demonstrated the unidimensionality of the instrument, ensuring that the interpretation of the data was precise and focused, without the influence of unnecessary dimensions. This finding serves to strengthen the structural validity of the scale in question, ensuring that the interpretation of the results accurately reflects the construct in question (Chou & Wang, 2010; Schreiber, 2021).

The fourth of the research process involved the utilization of Wright maps to facilitate a more profound comprehension of the correlation between individual aptitude and item complexity. This map visualizes the distribution of items and respondents on the same scale, thereby enabling an assessment of the fit between respondent ability and item difficulty. By examining this distribution, researchers can assess whether the items in the scale effectively cover the full range of respondent ability, thus ensuring balanced and representative measurement coverage (Bond & Fox, 2007). Wright's map thus emerges as a pivotal instrument for ensuring the optimal functioning of the scale in measuring its intended attributes.

The fifth step in the process is the undertaking of a Differential Item Functioning (DIF) analysis. DIF is an analysis within the Rasch model that is used to determine whether an item on a scale performs differently across subgroups of respondents, such as gender, ethnicity or other demographic groups. The analysis identifies potential bias where respondents from different subgroups have different likelihoods of responding to an item, despite having the same level of characteristics. This analysis is of paramount importance in ensuring measurement fairness and averting misinterpretation due to item bias (Linacre, 2016). The DIF analysis will also look at the demographic background of the subjects, including: gender, ethnicity, economic status, school choice after junior high school, parental status, choice of residence, and parental education level.

The Rasch model analysis steps were conducted using Winstep software version 5.15, which has been specifically designed to support various aspects of Rasch analysis in an integrated manner. It includes functions for evaluating model fit, unidimensionality, item difficulty, and differential item functioning (DIF) analysis, and it also provides visualizations such as Wright maps, which simplify the interpretation of results by displaying the graphical relationship between respondent ability and item difficulty. Furthermore, the tool enables researchers to assess measurement consistency through Infit and Outfit Mean Square (MNSQ) statistics. Consequently, Winstep is a relevant and efficient tool to ensure scales meet rigorous psychometric standards and produce valid and reliable measurement results (Linacre, 2016). Meanwhile, to ensure data transparency and uphold methodology integrity, our data analysis and results are publicly accessible through the Supplementary Materials link.

## Results

*Summary statistics of Rasch measurement model*

This study employed the Rasch measurement model to evaluate the psychometric properties of the Indonesian adaptation of the Academic Resilience Scale (ARS-30). Based on data from 399 junior high school students and a refined scale of 26 items, the analysis demonstrated strong person reliability (0.88) and exceptionally high item reliability (0.99), indicating that the scale consistently distinguishes among respondents' resilience levels and that the item hierarchy is stable across samples. The separation indices further support this, with person separation at 2.77 and item separation at 9.84, suggesting that the instrument can differentiate approximately three levels of student resilience and exhibits excellent item calibration.

In addition, the mean person ability of 2.19 logits, relative to the average item difficulty anchored at 0.00 logits, indicates that the students generally exhibited higher academic resilience than the average level required by the scale items. The scale

also showed high internal consistency, reflected in a Cronbach's alpha of 0.91. The Rasch model explained 40.6% of the raw variance, supporting the assumption of unidimensionality and confirming the structural validity of the ARS-30 as a reliable and valid tool for assessing academic resilience in the Indonesian context.

The findings of the Rasch analysis of the Indonesian version of the ARS-30 scale are summarized in table 2.

**Tab. 2**. Summary statistics of Items and Person and Item (I=26, N=399)

| | Reliability | Separation Index | Mean* | Cronbach's alpha | Raw Variance explained by measures** |
|---|---|---|---|---|---|
| Person | 0.88 | 2.77 | 2.19 | 0.91 | 40,6 % |
| Item | 0.99 | 9.84 | 0.00 | | |

** Measure in Logit; ** Computed via Principal Component Analysis*

*Unidimensionality*

The unidimensionality of the Academic Resilience Scale (ARS-30) was assessed based on the proportion of raw variance explained by the Rasch measures, as shown in Table 2. The analysis revealed that 40.6% of the total variance was explained by the primary Rasch dimension, which exceeds the recommended minimum threshold of 40% for unidimensionality (Bond & Fox, 2007), indicating that the ARS-30 items predominantly measure one underlying construct. This finding suggests that the majority of the variance in the students' responses is accounted for by a single latent construct "academic resilience" supporting the assumption that the ARS-30 is a unidimensional scale. Thus, the scale demonstrates sufficient structural validity to be considered a reliable tool for measuring academic resilience among junior high school students in Indonesia.

*Diagnostic rating scale*

A diagnostic analysis of the five-point Likert rating scale used in the ARS-30 was conducted to assess the effectiveness of each response category within the Rasch framework. As shown in Table 3, the observed average measures increased monotonically from 0.30 logits for "Strongly Disagree" to 3.12 logits for "Strongly Agree," indicating that higher response options reflect higher levels of academic resilience. The Andrich thresholds also advanced in the expected order, ranging from –1.88 to 2.19, confirming that the response categories are ordered and function hierarchically as intended. These patterns demonstrate that respondents were able to differentiate meaningfully among the response options, and that the scale aligns well with the underlying latent trait.

Furthermore, the fit statistics support the appropriate functioning of the rating scale. Most infit and outfit mean square values fall within the acceptable range of 0.5 to 1.5. Slightly elevated outfit values for the lowest categories 1.41 for "Strongly Disagree" and 1.44 for "Disagree"—may be attributed to their relatively low frequency of use, particularly "Strongly Disagree," which was selected by only 0.5% of respondents. Despite this, the overall pattern of category usage, ordering, and fit supports the conclusion that the rating scale is psychometrically sound and suitable for capturing variations in academic resilience among junior high school students.

**Tab. 3**. Item threshold and fit indices of the response format (I=26, N=399)

| Category | Andrich Threshold | Observed Average | Observed Count (%) | Infit | Outfit |
|---|---|---|---|---|---|
| Strongly Disagree | NONE | 0.30 | 47 | 1.32 | 1.41 |
| Disagree | -1.88 | 0.70 | 338 | 1.33 | 1.44 |
| slightly agree | -0.92 | 0.97 | 1661 | 0.99 | 0.98 |
| Agree | 0.60 | 1.76 | 3729 | 0.96 | 0.78 |
| Strongly Agree | 2.19 | 3.12 | 4599 | 0.94 | 0.95 |

*Item Measure, Fit Indices, and Precision Measurement*

The original version of the Academic Resilience Scale (ARS-30) consisted of 30 items. However, after conducting a misfit item analysis using the Rasch measurement model, four items "Items 5, 10, 19, and 29" were identified as misfitting based on their infit and outfit mean square values, standardized

**Tab. 4**. Summary of the Item Measure (I=26, N=399)

| Item | Total Score | Measure | S.E Measure | Infit | | Outfit | | Pt. Measure Corr. |
|---|---|---|---|---|---|---|---|---|
| | | | | MNSQ | ZSTD | MNSQ | ZSTD | |
| Item 21 | 1436 | 1.29 | 0.07 | 1.08 | 1.13 | 1.09 | 1.27 | 0.49 |
| Item 17 | 1479 | 1.1 | 0.07 | 1.28 | 3.75 | 1.31 | 4.0 | 0.5 |
| Item 6 | 1511 | 0.96 | 0.07 | 1.56 | 6.87 | 1.56 | 6.73 | 0.43 |
| Item 24 | 1521 | 0.91 | 0.07 | 0.89 | -1.59 | 0.94 | -0.84 | 0.52 |
| Item 23 | 1563 | 0.72 | 0.07 | 1.09 | 1.28 | 1.07 | 0.89 | 0.55 |
| Item 12 | 1572 | 0.67 | 0.07 | 1.37 | 4.64 | 1.42 | 5.03 | 0.49 |
| Item 27 | 1594 | 0.57 | 0.07 | 0.79 | -3.09 | 0.86 | -1.98 | 0.58 |
| Item 13 | 1602 | 0.53 | 0.07 | 0.7 | -4.7 | 0.74 | -3.75 | 0.63 |
| Item 20 | 1609 | 0.49 | 0.07 | 0.55 | -7.52 | 0.61 | -5.93 | 0.67 |
| Item 14 | 1613 | 0.47 | 0.07 | 1.49 | 6.01 | 1.51 | 5.8 | 0.46 |
| Item 26 | 1619 | 0.44 | 0.07 | 1.12 | 1.64 | 1.16 | 1.96 | 0.53 |
| Item 25 | 1644 | 0.31 | 0.07 | 0.78 | -3.35 | 0.75 | -3.48 | 0.61 |
| Item 4 | 1663 | 0.21 | 0.07 | 0.77 | -3.39 | 0.8 | -2.6 | 0.6 |
| Item 18 | 1683 | 0.09 | 0.08 | 0.81 | -2.73 | 0.8 | -2.66 | 0.63 |

| Item | Total Score | Measure | S.E Measure | Infit | | Outfit | | Pt. Measure Corr. |
|---|---|---|---|---|---|---|---|---|
| | | | | MNSQ | ZSTD | MNSQ | ZSTD | |
| **Item 7** | 1685 | 0.08 | 0.08 | 1.54 | 6.38 | 1.53 | 5.6 | 0.47 |
| **Item 8** | 1699 | 0 | 0.08 | 0.6 | -6.25 | 0.59 | -5.67 | 0.69 |
| **Item 28** | 1713 | -0.08 | 0.08 | 1.35 | 4.32 | 1.38 | 3.95 | 0.44 |
| **Item 9** | 1733 | -0.21 | 0.08 | 0.95 | -0.65 | 0.86 | -1.67 | 0.59 |
| **Item2** | 1761 | -0.39 | 0.08 | 0.83 | -2.31 | 0.77 | -2.61 | 0.58 |
| **Item 16** | 1787 | -0.57 | 0.09 | 0.73 | -3.76 | 0.68 | -3.6 | 0.63 |
| **Item 22** | 1788 | -0.58 | 0.09 | 0.88 | -1.52 | 0.78 | -2.3 | 0.58 |
| **Item 11** | 1812 | -0.77 | 0.09 | 0.74 | -3.5 | 0.66 | -3.56 | 0.62 |
| **Item 30** | 1827 | -0.89 | 0.09 | 0.89 | -1.36 | 0.79 | -1.92 | 0.54 |
| **Item 1** | 1838 | -0.99 | 0.09 | 1.7 | 6.88 | 1.3 | 2.31 | 0.41 |
| **Item 3** | 1926 | -2.05 | 0.13 | 0.87 | -1.13 | 0.64 | -2.06 | 0.43 |
| **Item 15** | 1939 | -2.29 | 0.14 | 1.08 | 0.63 | 0.71 | -1.36 | 0.37 |

residuals, and low point-measure correlations. These items showed significant deviations from model expectations or demonstrated poor discriminatory power, and were therefore removed from the final scale.

As a result, 26 items were retained, as presented in Table 4. These items were then subjected to further analysis by evaluating Item Measure, Fit Indices (infit and outfit mean square), and Precision Measurement (standard error). This step aimed to confirm that each item was well-targeted to the latent trait of academic resilience, fit the Rasch model, and provided precise estimates of item difficulty.4.

The results indicated that all 26 items met the acceptable range of infit and outfit MNSQ values (0.5–1.5), supporting their overall fit to the Rasch model. In addition, the point-measure correlations were consistently positive, reflecting adequate discriminative power across items. The standard errors of measurement were low across items (mostly < 0.10), suggesting precise estimations of item difficulty. Furthermore, the PCA of residuals confirmed the unidimensionality of the scale, with 40.6% of variance explained by the main construct and no significant secondary dimension.

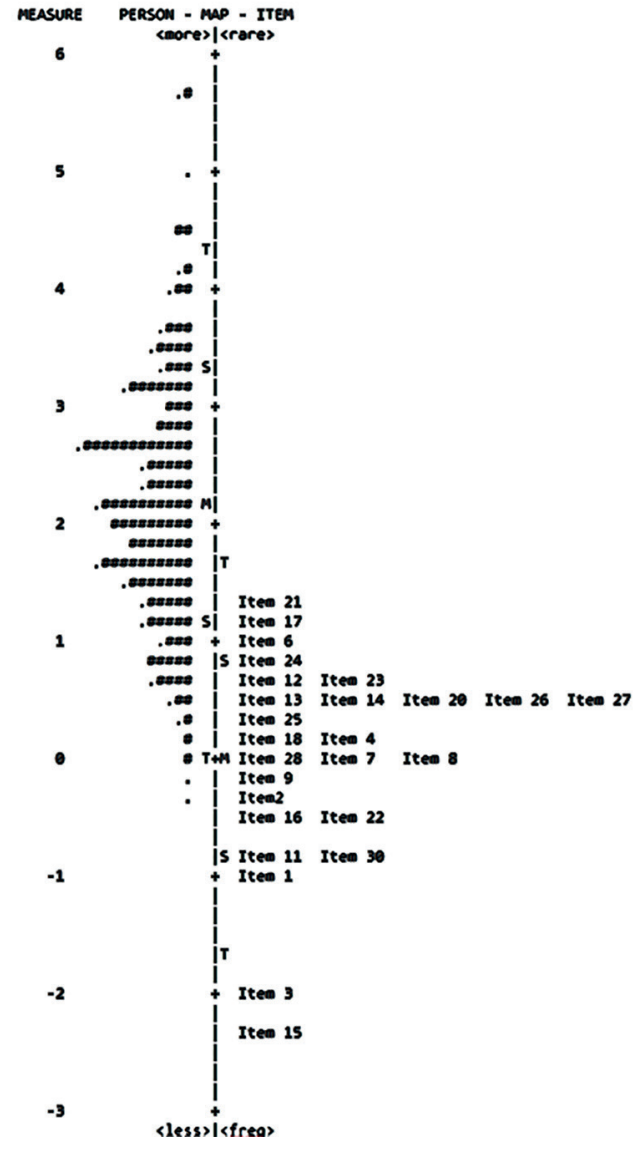
However, a few items such as Item 14 (Outfit MNSQ = 1.51), Item 12 (Outfit MNSQ = 1.42), and Item 17 (Outfit MNSQ = 1.31) approached the upper threshold for acceptable misfit. While still within statistically tolerable bounds, these items may be revisited in future studies for potential refinement or wording revision, especially if supported by qualitative evidence of ambiguity or content redundancy. In summary, the analysis provides strong empirical support for the psychometric soundness of the 26-item version of ARS-30. The scale demonstrates satisfactory measurement precision, model fit, and construct validity, making it suitable for use in assessing academic resilience among junior high school students in Indonesia.

### *The Wright Map*

To assess how well the retained items of the ARS-30 align with the academic resilience levels of the respondents, a Wright Map was constructed using the Rasch measurement model. This map visually displays the distribution of student abilities alongside the estimated difficulty of each item, allowing for a direct comparison on the same logit scale. The Wright Map serves as a diagnostic tool to evaluate item targeting and coverage across the latent trait. The results of this analysis are illustrated in Figure 2.

As shown in Figure 2, the distribution of student abilities is well aligned with the range of item difficulties. Most

**Fig. 2.** Indonesian version of the ARS-30 item-person Wright Map (I=26, N=399)



students are clustered between +1 and +3 logits, while the items span a range from –2.5 to +2.0 logits. Higher-difficulty items such as Item 21 and Item 17 are positioned toward the upper logit levels, whereas lower-difficulty items such as Item 3 and Item 15 fall near the bottom. The average student ability is above the item mean (0.0 logits), suggesting that the items are generally suitable for assessing students with moderate to high levels of academic resilience. Overall, the Wright Map confirms that the 26 retained items are well-targeted and provide balanced coverage across the continuum of academic resilience

*The DIF Analysis*

To evaluate the fairness of the ARS-30 instrument across different student subgroups, a Differential Item Functioning (DIF) analysis was conducted using the Rasch model. This analysis aimed to detect whether any items functioned differently among groups with equivalent levels of academic resilience. The groups analyzed included gender, ethnicity, family income, school choice after junior high school, parental relationship status, living arrangements, and parental education level.

The findings of this analysis are essential in determining whether the instrument maintains construct validity and item-level neutrality across diverse demographic contexts. The results of the DIF analysis are presented in Table 5, which lists the items that exhibited statistically significant DIF ($p < 0.05$) across the subgroup comparisons.

As presented in Table 5, the DIF analysis identified several items with statistically significant differences in functioning across specific demographic subgroups. In terms of gender, seven items (Items 1, 3, 6, 14, 22, 23, and 28) demonstrated significant DIF, suggesting that male and female students may perceive or respond differently to certain emotionally laden or self-regulatory statements. This reflects potential gender-based differences in coping strategies or emotional regulation within the academic setting. Two items (Items 1 and 5) showed DIF across ethnic groups, indicating that cultural interpretations may influence how students understand or endorse statements about academic disengagement or changing career plans. Regarding socioeconomic background, four items (Items 6, 7, 10, and 14) showed DIF among students from different income levels, implying that financial context might affect how students conceptualize academic difficulties and recovery.

Educational aspirations after junior high school also contributed to DIF, particularly in Item 7, which was interpreted differently across students planning to attend general, vocational, or boarding schools. Similarly, living arrangement influenced responses to Items 7 and 30, possibly due to varying levels of parental support or autonomy in different household settings. In terms of parental education level, five items (Items 1, 6, 10, 12, and 24) displayed DIF, suggesting that parental academic background may shape students' resilience-related behaviors and expectations. Conversely, no significant DIF was found based on parental relationship status, supporting the measurement stability of the scale across family structure variations.

**Tab. 5**. DIF contrast estimation for item ARS-30 (I = 26, N = 399)

| | Differential Item Function (DIF) | DIF Prob |
|---|---|---|
| *Gender* | | |
| | Item 1 "I would not accept the tutors' feedback" | 0.000 |
| | Item 3 "I would just give up" | 0.034 |
| | Item 6 "I would probably get annoyed" | 0.001 |
| | Item 14 "I would be very disappointed" | 0.000 |
| | Item 22 "I would give myself encouragement" | 0.043 |
| | Item 23 "I would stop myself from panicking" | 0.021 |
| | Item 28 "I would feel like everything was ruined and was going wrong" | 0.002 |
| *Ethnicity* | | |
| | Item 1 "I would not accept the tutors' feedback" | 0.041 |
| | Item 5 "I would change my career plans" | 0.001 |
| *Income family* | | |
| | Item 6 "I would probably get annoyed" | 0.000 |
| | Item 7 "Would begin to think my chances of success at university were poor" | 0.002 |
| | Item 10 "I would see the situation as temporary" | 0.000 |
| | Item 14 "I would be very disappointed" | 0.031 |
| *Choice of school after junior high school* | | |
| | Item 7 "Would begin to think my chances of success at university were poor" | 0.006 |
| *Parent relationship status* | | |
| | No significant DIF detected | - |
| *Living Place* | | |
| | Item 7 "Would begin to think my chances of success at university were poor" | 0.041 |
| | Item 30 "I would look forward to showing that I can improve my grades" | 0.034 |
| *Education Level of parents* | | |
| | Item 1 "I would not accept the tutors' feedback" | 0.031 |
| | Item 6 "I would probably get annoyed" | 0.027 |
| | Item 10 "I would see the situation as temporary" | 0.013 |
| | Item 12 "I would probably get depressed" | 0.025 |
| | Item 24 "I would try different ways to study" | 0.049 |

Although the total number of items exhibiting DIF is limited, the repeated appearance of certain items (e.g., Item 6 and Item 1) across multiple subgroups warrants consideration for future refinement or cognitive testing. Nonetheless, the overall findings suggest that the ARS-30 demonstrates satisfactory fairness and cross-group applicability, making it a valid tool for assessing academic resilience in diverse adolescent populations.

## Discussion

This study was initiated in response to the need for a culturally grounded instrument to assess academic resilience among Indonesian adolescents. In Indonesia's diverse educational landscape characterized by collective values, multi-ethnic classrooms, and varying pathways after junior high school measuring resilience requires tools that are not only psychometrically sound but also socially and culturally contextualized. The adaptation and validation of the Academic Resilience Scale (ARS-30) using the Rasch model provide a strong foundation for both theoretical and applied use of the construct in the Indonesian context.

The Rasch analysis confirmed the structural integrity and psychometric strength of the 26-item Indonesian ARS-30. The scale demonstrated excellent internal consistency (Cronbach's alpha = 0.91), high item reliability (0.99), and strong person reliability (0.88). The item and person separation indices were 9.84 and 2.77, respectively, indicating the instrument's capability to distinguish between item difficulty levels and student abilities. Principal Component Analysis of residuals confirmed the unidimensionality of the scale, with 40.6% of the total variance explained by the Rasch dimension. This finding supports the interpretation that the scale measures a single, cohesive construct academic resilience as perceived by Indonesian junior high school students. It also affirms the scale's structural soundness for use across diverse educational and social contexts.

The Differential Item Functioning (DIF) analysis revealed that while the scale as a whole functioned fairly across demographic groups, several items were interpreted differently by specific subpopulations, offering insights into the socio-cultural variability of resilience expression. In terms of gender, seven items showed significant DIF (Items 1, 3, 6, 14, 22, 23, and 28), particularly those involving emotional regulation or self-perception in academic adversity. For example, Item 1 ("I would not accept the tutors' feedback") was not only the most difficult item but also exhibited gender-based DIF, where male students appeared more likely to endorse rejection of feedback, possibly reflecting divergent cultural attitudes toward authority and self-assertion in high power-distance settings (Amoadu et al., 2024; Özcan & Bulus, 2022).

Differences also emerged across ethnic groups for Items 1 and 5, suggesting that notions of perseverance and career flexibility may vary based on cultural norms and expectations. Students from Arabic and Chinese backgrounds showed distinctive responses, potentially influenced by social norms related to emotional restraint or familial achievement pressure (Ang et al., 2021; Archer et al., 2020; Zhao & Hu, 2024). Furthermore, the analysis identified significant DIF in four items across income categories (Items 6, 7, 10, and 14), as well as in students' school aspirations (Item 7), and living arrangements (Items 7 and 30), indicating that students' daily life contexts may shape their perceptions of resilience and coping mechanisms. Lastly, educational background of parents influenced responses to five items (Items 1, 6, 10, 12, and 24), highlighting the role of home academic culture in shaping students' academic responses.

These item level findings do not undermine the overall validity of the scale; rather, they emphasize the nuanced nature of resilience as a culturally situated construct. They also align with the theoretical foundation laid out in the background: that academic resilience is not purely an internal trait, but one influenced by cultural values, and educational (Li, 2017; Shirleyana et al., 2018). Furthermore, the absence of significant DIF by parental relationship status affirms the scale's stability in measuring resilience across different family structures. While some items revealed sensitivity to specific backgrounds, the limited number and acceptable effect sizes suggest that the ARS-30 remains broadly applicable across Indonesia's heterogeneous student population.

In sum, the Indonesian version of the ARS-30 proves to be both statistically reliable and culturally responsive. It allows educators, counselors, and researchers to better understand and support students' resilience in a way that acknowledges the deeply embedded cultural and contextual factors shaping adolescent development in Indonesia.

### *Conclusions*

This study successfully validated the Indonesian version of the Academic Resilience Scale (ARS-30) for junior high school students using Rasch model analysis. The refined 26-item scale demonstrated strong internal consistency, with a Cronbach's alpha of 0.91, item reliability of 0.99, and person reliability of 0.88. The high item separation index (9.84) and adequate person separation (2.77) reflect the scale's ability to differentiate both item difficulty and student resilience levels. Furthermore, the unidimensionality of the scale was supported by Principal Component Analysis of residuals, which explained 40.6% of the variance, affirming that the scale captures a single latent construct. Furthermore, the scale exhibited differential item functioning (DIF) in several items across gender, ethnicity, family income, school aspirations, and living arrangements. While these findings do not compromise the validity of the scale, they underscore the need for context-aware interpretation when applying the ARS-30 in diverse populations.

Despite these strong psychometric indicators, two limitations should be noted. First, the sample was drawn from a single urban area—Surabaya—limiting the generalizability of findings to other regions in Indonesia with different educational and cultural contexts. Second, the study relied exclusively on quantitative data through Rasch modeling; while statistically rigorous, it does not reveal how students personally define or experience academic resilience in their everyday lives.

Future research should expand the sampling frame to include students from rural, remote, and culturally distinct areas to evaluate the scale's cross-regional applicability. It is also recommended to incorporate qualitative methods—such as student interviews or teacher observations—to better understand the contextual and cultural nuances underlying students' responses. Longitudinal studies may further explore how resilience develops over time, particularly through educational transitions and under varying social and economic pressures.

**Ethical Approval**

This research received ethical clearance from the Research Ethics Committee of Universitas Negeri Malang, Malang, Indonesia (Ref: 21.08.6/UN32.14.2.8/LT/2024). Prior to data collection, all participants were informed about the nature and purpose of the study and provided written consent for both their involvement and the use of research findings in publication, in accordance with prevailing ethical standards.

**Data Availability Statement**

Data will be made available on request.

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**Conflict of Interests**

The authors declare that they have no conflict of interest.

**Author Contributions**

Eka Erawati: Led the research process, including conceptualization, methodology development, data collection, formal analysis, and software utilization. Responsible for writing the original draft, revising the manuscript, and acquiring funding.

Nur Hidayah: Acted primarily as a supervisor, providing critical guidance on research design and analysis. Contributed to data curation, formal analysis, and manuscript review and editing.

Nur Eva: Served in a supervisory role with a focus on supporting data analysis and offering detailed feedback during the review and editing process.

Henny Indreswari: Provided overall supervision and oversight of the research process. Contributed resources, manuscript review, and critical feedback for improvement.

Harris Shah Abd Hamid: Contributed to resources and data management, assisted with Rasch model analysis, and supported the review and supervision process.

Maria Oktasari: Supported methodology refinement, conducted formal analysis and visualization, and contributed to the review and editing of the final manuscript.

**Supplementary material**

To ensure data transparency and uphold methodology integrity, our data analysis and results are publicly accessible through the Supplementary Materials link.

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## APPENDIX

*Comparison of ARS 30 Resilience Scale Indonesian Version*

| ARS 30 Cassidy Version | ARS 30 Indonesian Version |
|---|---|
| I would not accept the tutors' feedback | *Saya tidak mau menerima saran dan masukan dari para guru* |
| I would use the feedback to improve my work | *Saya akan menggunakan saran dan masukan dari guru untuk meningkatkan Kemampuan saya dalam mengerjakan tugas-tugas* |
| I would just give up | *Saya akan menyerah begitu saja* |
| I would use the situation to motivate myself | *Saya akan menggunakan situasi ini untuk memotivasi diri saya sendiri* |
| I would change my career plans | *Saya akan mengubah rencana karier saya* |
| I would probably get annoyed | *Saya mungkin akan merasa kesal* |
| I would begin to think my chances of success at university were poor | *Saya akan mulai berpikir bahwa peluang saya untuk sukses di sekolah sangat buruk* |
| I would see the situation as a challenge | *Saya akan melihat situasi ini sebagai sebuah tantangan* |
| I would do my best to stop thinking negative thoughts | *Saya akan melakukan yang terbaik untuk berhenti berpikir negatif* |
| I would see the situation as temporary | *Saya melihat situasi ini hanya sementara.* |
| I would work harder | *Saya akan bekerja lebih keras* |
| I would probably get depressed | *Saya mungkin akan tertekan* |
| I would try to think of new solutions | *Saya akan mencoba memikirkan solusi baru* |
| I would be very disappointed | *Saya akan sangat kecewa* |
| I would blame the tutor | *Saya akan menyalahkan guru* |
| I would keep trying | *Saya akan terus mencoba* |
| I would not change my long-term goals and ambitions | *Saya tidak akan mengubah tujuan jangka panjang dan ambisi saya* |
| I would use my past successes to help motivate myself | *Saya akan menggunakan keberhasilan di masa lalu untuk memotivasi diri saya sendiri* |
| I would begin to think my chances of getting the job I want were poor | *Saya akan mulai berpikir bahwa peluang saya untuk mendapatkan pekerjaan yang saya inginkan adalah sulit* |
| I would start to monitor and evaluate my achievements and effort | *Saya akan mulai memantau dan mengevaluasi pencapaian dan usaha saya* |
| I would seek help from my tutors | *Saya akan mencari bantuan dari guru saya* |
| I would give myself encouragement | *Saya akan memberikan semangat pada diri saya sendiri* |
| I would stop myself from panicking | *Saya akan berhenti dari kepanikan* |
| I would try different ways to study | *Saya akan mencoba cara yang berbeda untuk belajar* |
| I would set my own goals for achievement | *Saya akan menetapkan tujuan pencapaian* |
| I would seek encouragement from my family and friends | *Saya akan mencari dukungan dari keluarga dan teman-teman saya* |
| I would try to think more about my strengths and weaknesses to help me work better | *Saya akan mencoba untuk lebih memikirkan kekuatan dan kelemahan saya untuk mengerjakan tugas dengan lebih baik* |
| I would feel like everything was ruined and was going wrong | *Saya akan merasa semuanya hancur dan ada yang tidak beres* |
| I would start to self-impose rewards and punishments depending on my performance | *Saya akan mulai menerapkan penghargaan dan hukuman tergantung pada kinerja saya* |
| I would look forward to showing that I can improve my grades | *Saya berharap dapat menunjukkan bahwa saya bisa meningkatkan nilai saya* |