

# Instrument Development of Determinants of Students Academic Performance Using Rasch Model Analysis

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## Abstract

This study aims to develop an instrument to determine students' academic performance. In this case, a quantitative design was used, with a random sampling technique utilized in selecting 415 students from the University of Muhammadiyah Malang. Data analysis was also carried out using Rasch Model. Based on the fit item criteria analysis, 5 misfit elements were each observed for the Mean and Standard Deviation logit and MNSQ (Mean Square) outfit. This indicated that the most difficult and easiest questions were numbers 47 and 10, respectively. For regional and school origins, the items containing differential function questions were 2 and 9, respectively. The reliability of the measuring instrument, item, and person was also 83, 98, and 79. In addition, only 7 of the 67 utilized items did not meet the required criteria and the remaining were completely accepted.

**Keywords:** instrument, Rasch, academic performance

## Abstrak

Penelitian ini bertujuan mengembangkan instrumen determinan kinerja akademik pada mahasiswa. Desain penelitian menggunakan kuantitatif, melalui teknik random sampling diperoleh subjek berjumlah 415 mahasiswa Universitas Muhammadiyah Malang. Analisis data menggunakan *Rasch Model*. Hasil analisis kriteria item Fit berdasarkan jumlah logit item dari *Mean* dan Standar Deviasi terdapat 5 item *misfit*, demikian pula berdasarkan nilai *outfit Mean Square* (MNSQ) terdapat 5 item yang *misfit*. Item paling sulit terdapat pada nomor 47 sedangkan paling mudah nomor 10. Item yang mengandung *differential item function* berdasarkan asal daerah sebanyak 2 item dan berdasarkan asal sekolah sebanyak 9 item. Reliabilitas alat ukur sebesar .83, reliabilitas item .98, dan reliabilitas *person* .79. Dari 67 item terdapat 7 item yang tidak memenuhi kriteria dan 60 item yang diterima.

**Kata Kunci:** instrumen, Rasch, kinerja akademik

## Introduction

The achievement of high academic performance is part of the problems encountered by students at all institutional levels. This performance is often associated with academic achievement, due to its high consideration and requirement in the labor sector. Although it is not always prioritized, the achievement index is still one of the prerequisites in selecting employees in various agencies and companies. This shows the natural tendencies of, students to always strive toward the acquisition of high performance. However, the achievement of academic performance is often difficult due to the significant challenges encountered.

In the educational sector, academic problems commonly cause stress and

unpleasant conditions for some students, for example, the number of assignments being performed. According to Feldman (1999), stress emphasized the response accumulated from unpleasant and difficult situations. The occurrence of this condition in students' performances is often based on the transformation of similar activities or features within a specific period, including the maintenance of good learning outcomes and adjustments to a new social environment (Towbes & Cohen, 1996). Pathirana et al. (2016) also found that stress reduced student achievement in academic activities, regarding the failure of examinations and the tasks to be completed at a similar time.

Performance is defined as an individual's observable and measurable behavior in a

specific activity or situation (Simpson & Weiner, 1989). In an educational perception, academic performance is also defined as the ability to effectively learn and obtain facts, as well as orally and orthographically communicate the knowledge acquired from learning outcomes (Nyagosia, 2011). Furthermore, the identification of academic achievement determinants is one of the methods used to predict and assess a person's success in teaching and learning activities (Farooq et al., 2011). Even the colleges or universities with the best accreditation need to cooperate with the entire learning community, to improve academic performance standards. This achievement increase is expected to have a positive impact in future, including the reduction and elevation of college dropouts and graduations, respectively (Sle, 2016).

The improvement of student academic achievement is specifically inseparable from the various influential factors considered by several educators. This shows that academic achievement is influenced by both internal and external factors. In this case, the internal factors affecting academic performance include self-efficacy (Akram & Ghazanfar, 2014; Lane & Lane, 2001), self-esteem (Iniama, 2004; Arshad et al., 2015), psychological well-being (Turashvili & Japaridze, 2012; Esteve, 2008), and procrastination (Lakshminarayan et al., 2012). Meanwhile, the influential external factors include family and friends (Crosnoe et al., 2004).

An internal factor affecting academic performance is self-efficacy, whose high individual possession often leads to a very strong self-confidence and belief in achieving great learning outcomes (Akram et al., 2014). Besides this, self-esteem is also a factor influencing academic performance. This indicates that individuals with high self-esteem commonly have effective cognitive and coping strategies, to manage their potential in completing well-obtained tasks (Chouikrat, 2013). Psychological well-being is another factor affecting academic performance, whose high individual influence

leads to the possession of life goals, self-development orientation, and good coping strategies (Turashvili & Japaridze, 2012). Meanwhile, procrastination is a factor negatively related to this performance. This is because students with low levels of procrastination are able to manage time to complete and obtain coursework according to a predetermined schedule (Lakshminarayan et al., 2012).

Irrespective of these internal determinants, some influential external factors are still observed, including parental and peer group support. This was in line with Akomolafe and Adesua (2016) and Ezzarouki (2016), where the positive support obtained from parents and peer groups significantly improved individual academic performance. Based on the results, the importance of conducting related experiments on the factors determining student academic achievement was observed. Before the performance of these experiments, the preparation of the appropriate measuring instruments is very necessary. Therefore, this study aims to develop an instrument for determining student academic performance, using the Rasch model analysis. This emphasizes the identification, adoption, serial combination, and analysis of several instruments related to the determinants of academic performance, using Rasch Model. The results are expected to enrich the psychometrics analysis and provide instruments for other subsequent future reports, especially in higher education.

The measuring instrument prepared is the student's academic achievement scale, which consists of 19 items (DuPaul et al., 1991). In this case, self-efficacy is developed using the GSES (General Self-Efficacy Scale) coined by Sherer et al. (1982). For academic stress, the Student-Life Stress Inventory-Reversed (SLSI) proposed by Gadzella (2005) is used, subsequently producing a Cronbach alpha value of .93. Furthermore, the PWS (Psychological Well-Being Scale) and IPS (Irrational Procrastination Scale) proposed by Ryff (1989) and Shaw & Zhang (2021) are used for psychological well-being and

procrastination, respectively. In this case, the development of these measuring instruments is thoroughly compiled, regarding the observed determinants. These instruments represent the determinants of student learning achievement, leading to the derivation of 67 items using Rasch analysis.

The development of these tools was obtained from the originators of the academic performance theory, Simpson and Weiner (1989), and tested through several studies. According to Simpson and Weiner (1989), performance was a behavioral construct observed and measured in specific situations. In educational perception, this was defined as the observed and measured behavior of students in learning situations. Nyagosia (2011) also showed that academic performance was the ability to effectively learn and obtain facts, as well as orally and orthographically communicate the knowledge gained from learning outcomes.

Several studies have also shown that various factors affect academic performance, such as Akram and Ghazanfar (2014). This proved that self-efficacy was the strongest factor influencing a person's academic performance. It was also defined as a person's assessment and belief in organizing and carrying out tasks/responsibilities through all the challenges encountered (Bandura, 2006). Based on Yildirim and Ilhan (2010), self-efficacy was measured through three indicators, namely initiative, persistence, and effort. The initiative emphasizes the possession of high individual curiosity toward the following, (1) Understanding new developments, (2) Boldly confronting difficulties, (3) Solving problems, and (4) Understanding goal composition. Persistence also shows that individuals are persistent toward goal achievement, optimally utilize their abilities, and do not easily quit. However, effort prioritizes cautious and effective individualistic planning and performance. Self-efficacy was measured using the GSES (General Self-Efficacy Scale) developed by Sherer et al. (1982) and adopted by Imam (2007). During the development

phase, this scale contained 23 items, which were subsequently reduced to 17 valid elements with a Cronbach's alpha value of .85 after the adoption stage.

Self-esteem is part of the self-concept construct containing a subjective evaluation of values as an individual (Donnellan et al., 2011). This is defined as a person's assessment of abilities, beliefs, skills, and personalities (Rosenberg, 1965). It also plays an important role in mediating cognitive skills with academic performance. In this case, the students with high cognitive skills and self-esteem often experience academic performance improvement (Cid-Sillero et al., 2020). Irrespective of these conditions, self-esteem still has both good and bad effects on academic performance and success, due to the existence of individualistic thought processes, emotions, desires, values, and goals (Harris, 2009). This was in line with Iniyama (2004) and Arshad et al. (2015), where students with high self-esteem achieved great learning and academic performance, due to the possession of worth, confidence, self-regulation, as well as the abilities to effectively perform and evaluate their jobs and personalities. Self-esteem was measured through the RSES (Rosenberg Self-Esteem Scale), which contained 10 statement items as a Likert scale. This was supported by Gómez-Lugo et al. (2016), where RSES produced a Cronbach's omission of .83, indicating that the validity and reliability of the instrument were good and considered for global utilization.

The occurrence of stress often emphasizes a mismatch between environmental demands and an individual's ability to meet them. In the academic sector, especially in universities, students are commonly required to encounter various difficulties, perform many assignments, and carry out tests or exams with a high time limit (Smith et al., 2000). This enables the accumulation of stress, which affects students' academic performance. These were in line with Pathirana et al. (2016), where low academic performance was caused by high stressors during lectures, changes in the

educational system, lifestyle management, campus social adjustments, and several standard-level achievements. All these stressful events were always encountered toward graduating from a specific institution with good grades. Academic stress was measured using the SLSI (Student-Life Stress Inventory-Reversed) proposed by Gadzella (2005), which had a Cronbach's alpha value of .93. This scale contained 53 items with the following two subscales, (1) stressors, and (2) stressor reactions. On the stressor subscale, 5 categories were observed, namely frustration, conflict, pressure, change, and self-imposed. On the subscale of reactions to stressors, 4 categories were observed in the stressor reactions subscale, namely physiological, emotional, behavioral, and cognitive appraisals.

Psychological well-being is the full achievement of one's mental potential. This is a state when individuals have the following characteristics, (1) Accept their possessed strengths and weaknesses, (2) Possess a life purpose, (3) Develop positive relationships with others, (4) Become independent, (5) Control the environment, and (6) Continuously develop personally (Ryff, 2007). The theoretical background of this analysis emphasizes the theory of Positive Psychology by Seligman (2008), where happiness motivated the success of various human functions. This indicated that several features were likely to change towards the reflection of more self-knowledge and personal development effectiveness. These features included the following, (1) Coping strategies, (2) A directional perception, (3) The importance of present and past life (life purpose), (4) Sustainable development feeling, (5) New experience opportunities, and (6) Realization of potential. The positive impact of psychological well-being allows students to pursue their life goals and continuously develop toward academic performance achievement. This factor was measured using the Ryff Psychological Well-Being Scale (RPWBS), which was initiated and retested by Ryff (1989) and Amalia &

Fitriana (2015), respectively, with a Cronbach's alpha value of .845. The scale also contained 42 items with 6 factors, namely autonomy, environmental mastery, personal growth, positive relationships, life goals, and self-acceptance.

Procrastination is an unnecessary behavior, regarding the delay of activities even when plans are designed toward the completion of tasks. This behavior is known to cause emotional discomfort, such as anxiety (Ferrari et al., 1995). It was also measured using the Academic Procrastination Scale (APS) proposed by McCloskey and Scielzo (2015).

According to Shahzad et al. (2015), academic performance increased because parents provided support and guided students toward the achievement of better education qualities. This indicated that parental support was measured using the Perceived Social Support-Family Scale (PSS-Fa) proposed and revised by Procidano and Heller (1983) and Basol (2008), respectively, with a Cronbach's alpha value of .93. In addition, the PSS-Fa scale contained 20 items. The influence of peer groups is also an external factor for student academic performance, due to being very important for social development. In this case, peer communication significantly improves during adolescence, with relationships becoming more intense than in other stages (Papalia et al., 2004). Peer group influence was measured using the Perceived Social Support-Friend Scale (PSS-Fr) coined by Procidano and Heller (1983), with a Cronbach's alpha value of .93. This PSS-Fr scale subsequently consisted of 20 items.

In measuring Psychology, two instruments were adopted, namely classical and modern test theories. Classical test theory is the forerunner instrument subsequently developed into the modern analysis (Crocker et al., 2008). This theory emphasizes the raw value of exam performance and shows a person's abilities. It also explains descriptive statistics, the difficulty level of the discrimination index, as well as the correlation between the numbered items and

the weight of scores. Furthermore, classical test theory has a limitation, which stated that the results obtained and tests performed by some individuals are incomparable when 2 different types of analysis are provided to 2 unrelated groups. Another criticism of this theory is the reliability obtained, based on the assumption that the test and the analytical expert are considered appropriate. This leads to the normalization of the empirical data obtained when calculating the reliability coefficient. These were in line with Sivakumar et al. (2005), where the main weakness of the classical test theory was reliability, whose results emphasized the sample (sample bound). This proved that the addition of samples was able to increase the reliability value when reliance was low. Classical test theory is also limited to the range of available scores, scoring rubrics, as well as a balance of positive and negative correlations. Due to the limitations of this theory, the modern test concept emerged.

IRT (Item Response Theory) is the general framework of a mathematical function model, which specifically describes the interaction between a person and an item (Sumintono & Widiarso, 2014). This framework does not depend on a specific sample, indicating that the measurements performed are more precise and the goods are calibrated. It also consists of three logistic models, namely (1) One parameter (Rasch Model), often presented with item difficulty statistics, (2) Two parameters, presented with item difficulty and differentiation statistics, and (3) Three parameters, presented with difficulty, differential power, and pseudo-guess statistics. The reason for using the Rasch model is that the results are more accurate and not sample-bound or sample-dependent. Therefore, this study aims to develop an instrument for determining student academic performance. This instrument is used to determine the most dominant factors in improving students' academic achievement. The measurement of this dominant factor is also arranged based on a separate norm.

## Methods

This is a quantitative experiment, whose data and analysis emphasize numbers and statistical representation. It is also known as the discovery method, due to the establishment and development of new science and technology (Sugiyono, 2011). In this report, a measuring instrument was developed by initially evaluating literature, to obtain the dominant factors influencing students' academic performance. From this review, several influential factors were observed as determinants of academic performance, which subsequently developed the measuring instrument

### Operational Definition

Firstly, student academic performance is the ability to learn, relate the lessons, as well as orally and orthographically communicate the knowledge gained from learning outcomes. This emphasized student achievement, as indicated by the AI (achievement index). Secondly, self-efficacy is a person's assessment and belief in organizing and executing tasks/responsibilities through all the challenges encountered. Thirdly, self-esteem is the extent to which a person provides personal assessment information. Fourthly, academic stress is a condition where a person experiences pressure caused by various sources of the difficulty. Fifthly, psychological well-being is the complete achievement of one's mental potential. It is also a state when individuals exhibit the following, (1) Accept their strengths and weaknesses, (2) Possess a life purpose, (3) Develop positive relationships with others, (4) Become independent individuals, (5) Control the environment, and (6) Continuously develop personally. Sixthly, procrastination is an unnecessary behavior, which causes delays in activities even when a plan is scheduled for task completion. Seventhly, parental support includes the following, (1) Good or authoritative (democratic) parenting style, (2) Parental education level, (3) Parental involvement to

motivate and assist children in homework performance, and (4) The economic status of parents to meet educational needs. Eighthly, peer influence is the extent to which a person judges that others affect their lives.

### Study Subject

The subjects are the new students of the University of Muhammadiyah Malang, Indonesia. These participants were selected through a random sampling technique, with the number of samples emphasizing the utilized linear scale, namely logit (logarithmic odds unit). Stability  $\pm .23$  logit is also observed as the best obtainable measure (Sumintomo & Widiarso, 2014). Various reports have shown that a change in one logit scale is associated with an increase of one level. In this present measurement, the logit is  $.23$ , indicating that the minimum number of samples (Linacre, 1994) is 250. These criteria were subsequently met by 415 new students. Based on gender, as well as school and regional origins, the demographic data for the subjects are presented in Table 1

### Instrument

A scale developed by several experts was used as a determinant instrument for student academic performance. This contained 67 items, which reflected 7 factors, namely self-efficacy, self-esteem, academic stress, psychological well-being, procrastination, parental support, and peer influence. Examples of the items on self-efficacy are as follows, (1) "When I see someone I want to meet, I choose to approach that person rather than wait for him to come", and (2) "It is difficult for me to make new friends". For academic stress, the following examples were observed, (23) "Many encounter unresolved conflicts", and (24) "Forced to attend uninteresting lectures".

### Study Procedure

Based to Crocker et al. (2008) the steps of developing a measuring instrument are as follows, (1) Identification of the purpose of measuring psychological construction; (2) Operationalization of concepts, indicators, and behaviours, (3) Scaling and selection of

stimulus formats, (4) Writing items, (5) Item analysis, (6) Arrange items, (7) Reliability test, (8) Instrument validation, and (9) Final format compilation.

### Data Analysis

Data and quantitative item analyses were performed using Rasch Model and Winstep software, respectively. Based on the analytical results, a subsequent test was also carried out to observe the characteristics of the items meeting the criteria. In this case, item analysis emphasized the acquisition of empirical evidence, regarding the validity and reliability of the measuring instrument. The reliability used was Cronbach's Alpha, whose coefficient was obtained through the presentation of a scale only applied once to a group of participants (single trial administration). Based on the informal agreement, the reliability coefficient was very high.

## Results and Discussion

### Result

Based on Table 2, the average value of the participants on the academic performance scale was  $+ .23$ . The average value of more than  $.00$  also indicated the tendency of participants to agree more on various statement items. Moreover, Cronbach's Alpha value obtained was  $.83$ , representing the good category. The values of the person and item reliability were also  $.79$  and  $.98$ , respectively. Based on these results, the participants' answer consistency and instrument item quality were sufficient and special, respectively.

For the average values of participants, the infit and outfit MNSQ were  $1.00$  and  $1.01$ , respectively, where the ideal coefficient was  $1.00$  (the closer to 0, the better) (Sumintono & Widiarso, 2014). The average values of the participants were also  $-.3$  and  $-.4$  for infit and outfit ZSTD, respectively, where the ideal coefficient was  $.0$ . This proved that the quality was becoming better. In addition, the split value was obtained through the equation,  $H = (\{4 \times 1.95\} + 1) / 3 = 2.93$ . From this equation,

the value of 2.93 was approximated to 3, indicating the existence of three participating groups.

The unidimensionality of the measuring instrument is importantly used to evaluate whether the developed tool was able to perform an accurate and appropriate measurement, including academic performance. In this case, the Rasch model used the principal residual component analysis to measure the extent to which the diversity of the instrument performs appropriate evaluation. Based on the analytical results, a raw data variance of 20.9% was obtained. This indicated that the minimum unidimensionality requirement of 20% was met. However, the unexplained variance should ideally not exceed 15%. From these results, one result was also above 10%, namely 12.6%, while the others were below 10%..

The number of logit items from the Mean and SD was  $1.00 + .38 = 1.38$  (Fit item criteria), indicating that the items greater than the criteria were observed as misfits. In this case, the misfit items were numbers 32, 33, 34, 53, and 59. Meanwhile, the criteria accepted for items are the Outfit Mean square (MNSQ) value, for example,  $.5 < \text{MNSQ} < 1$  (Sumintono & Widiarso, 2014). Based on the analytical results, five items had an MNSQ outfit value  $> 1.5$ . These misfit items were numbers 32, 33, 34, 53, and 59. The received Z Standard (ZSTD) outfit value was also  $-2.0 < \text{ZSTD} < +2.0$ , where the misfit items were 32, 33, 34, 53, 59, 22, 35, 21, 60, 2, 45, 30, 40, 43, 55, 49, 10, 24, 26, and 54. When the point measure value correlation (Pt Mean cor) =  $.4 < \text{Pt Measure Corr} < .85$ , all the items were observed to be accepted.

Although the subjects were 415 (Table 1), the rough data still showed 414, indicating the existence of missing data. In this case, item numbers 47 and 10 were the most difficult and easiest questions with logit values of .98 and .66, respectively. The person with code 8911 and logit .98 also indicated that the subjects with high academic performance were more likely to agree.

Meanwhile, the subject with code 921 and a logit value of -1.01 showed the disagreement of many participants.

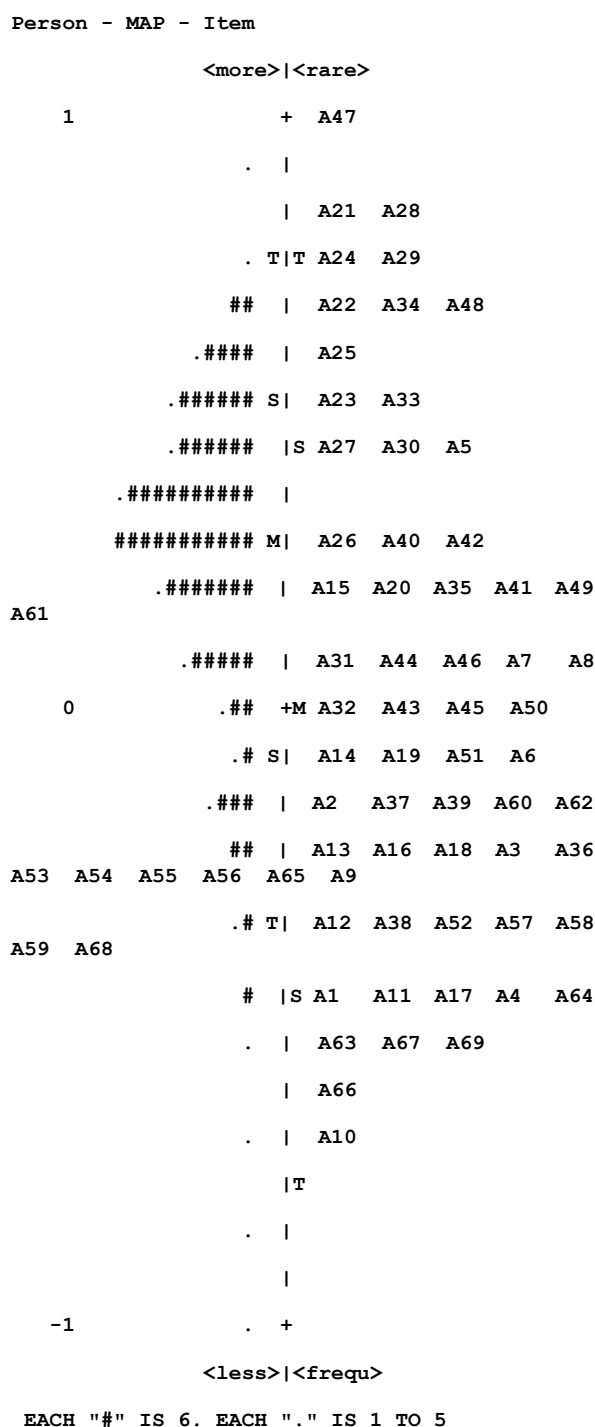


Figure 1. Item and person distribution

Table 1  
*Subject Demographic Data*

Gender	School Origin	Total	Origin	Total
Male	Senior High School	67	Java	64
	Madrasah Aliyah/ Vocational High School	19	Outside Java	22
Female	Senior High School	267	Java	208
	Madrasah Aliyah/ Vocational High School	62	Outside Java	121

Table 2  
*Rasch Analysis Results*

Analysis	Result	Description
Outfit MNSQ	Items 32, 33, 34, 53, and 59 do not meet .5 < MNSQ < 1	5 item misfit
Outfit ZSTD	Item 32, 33, 34, 53, 59, 22, 35, 21, 60, 2, 45, 30, 40, 43, 55, 49, 10, 24, 26, 54 do not meet -2.0 < ZSTD < +20	20 item misfit
Person Measure	+ .23	The average value of respondents
Alpha Cronbach	.83	Good
Person reliability	.79	Good
Item reliability	.98	Good

## Discussion

Using the Rasch Model on 67 items, 5 and 60 questions were declared unfit and fit, respectively. The determination of item fit also used the logit Mean and SD, MNSQ, and point measure correlation (Pt Mean cast). In this analysis, the fit item did not use the standard Z outfit value (ZSTD), due to its sensitivity to the sample. This indicated that 20 items did not fit with a total sample of 415 subjects. These unfit items were the psychological well-being (32, 33, and 34) and parental support (53 and 59) factors, respectively. Furthermore, the most difficult

and easiest items were found in the procrastination (47) and self-efficacy (10) factors, respectively. Self-efficacy allows students to strive in achieving the best learning performance through the observation of actual learning materials and experiences. This emphasizes the imitation of other people's learning methods and social persuasion. Based on these descriptions, self-efficacy is an important cognitive ability possessed by a student, to achieve academic success.

Based on region, the items containing a DIF were found in the psychological well-being factor (33 and 34), which positively influenced academic performance. This showed that higher psychological well-being led to greater academic performance (Turashvili & Japaridze, 2012). These results indicated the students with this factor possess a purpose in life and observe environmental difficulties as unproblematic challenges. This life purpose, as well as the tendency to grow and develop, subsequently helps them overcome daily difficulties. Specific coping strategies such as rational action, are also considered effective responses by students. Meanwhile, the items containing DIF based on school origin were self-efficacy (21), academic stress (26), psychological well-being (37 and 39), procrastination (41), parental support (54 and 59), and peer influence (numbers 60 and 65).

The different high school climates in each subject also affect a student's personality. This proved that those in a conducive environment had high self-efficacy. These were in line with Meera and Jumana (2015), where an individual with high self-efficacy exhibited academic performance and thinks at an evaluative level.

The experimental subjects were freshmen from various regions and high schools, indicating their possession of different academic pressures. This was in line with Khan (2013), where the high level of stress during the first semester impacted students' learning achievements, due to inadequate experience and task adjustment requirements.



The inability to handle stress due to the demands of many assignments also influenced their final learning outcomes.

Procrastination shows that some students are often confronted with big tasks during lectures, with more assignments responsible for others' anxiousness. This negatively influenced student academic achievement, indicating that higher procrastination led to lower performance goals. The emergence of this unnecessary behaviour motivates the inability of students to learn effectively and communicate the knowledge gained. This was in line with Lakshminarayan et al. (2012), where a negative relationship was observed between procrastination and academic achievement in Indian dental students.

Parental support plays an important role in a child's development, due to being the strongest factor affecting academic performance and success (Akomolafe et al., 2016). In this case, the family is the first and foremost support system with a big role in futuristically shaping the character and social competence of individuals. Parental support also includes the following, (1) Good parenting or authoritative (democratic), (2) Parental education level, (3) Parental involvement to motivate and assist children in homework performance, and (4) The economic status of parents to meet educational needs. This indicates that positive support from parents enables individuals to confront academic challenges. Furthermore, the influence of peer groups positively impacted one's academic performance (Akomolafe & Adesua, 2016). This shows that peer group communication affected students' performance and achievement, due to exploring their feelings and identities, as well as developing and evaluating social skills.

The reliabilities of the measuring instrument, item, and person were .83, .98, and .79, indicating a very good, special, and sufficient categorization, respectively. In this context, the person reliability indicated that the subjects were fairly consistent or not very

diverse, due to being new, obedient, and scared to express themselves.

The rating scale test on the measuring instrument showed that the distance effectiveness and the Andrich Threshold value were less than 1.4 and not sequential, respectively. This indicated that the scale should be simplified from five selections to a smaller value. In this case, students are liable to easily provide answers when the options are not very many with large item values. Since the rating distance was less than 1.4, the subject is capable of being hesitant in providing an option between SD and D (strongly disagree and disagree) or A and SA (agree and strongly agree).

The validity test used an item analysis and distribution of people (Blanc & Rojas, 2018), where the numbers 47 and 10 were the most difficult and easiest questions, respectively. In this case, the two items should not be included in the test series, due to having poor distinguishing power.

Based on the region origin, 2 DIF items were obtained due to their sensitivities to students from a specific area. Meanwhile, 9 DIF items were observed regarding the school origin, indicating their inability to function appropriately. This is because each school has a different teaching system and culture influencing student performance. This was in line with a previous report, where teaching processes in schools affected student achievement (Sacristán-Díaz et al., 2016). In developing this measuring instrument, the advantages emphasized the possession of high reliability, although the weakness prioritized fewer subject variations due to using new students. Therefore, the DIF analysis needs to consider the academic performance of male and female students.

## Conclusion

Based on the Mean and SD logit, the fit criteria contained psychological well-being (32, 33, and 34) and parental support (53 and 59) factors. The criteria for accepted items also emphasized the mean square (MNSQ) outfit value, where five questions have an

MNSQ misfit > 1.5. These misfit items were numbered 32, 33, 34, 53, and 59. Since the point measure correlation value (Pt Mean cor) = .4 < Pt Measure Corr < .85, all items were entirely accepted. Moreover, the most difficult and easiest questions were numbers 47 (procrastination) and 10 (self-efficacy), respectively. Based on the regional origin, 2 DIF items (33 and 34) were found on the psychological well-being factor. Meanwhile, 9 DIF items were observed regarding school origin, namely self-esteem (21), academic stress (26), psychological well-being (37 and 39), procrastination (41), parental support (54 and 59), and peer group (60 and 65) factors. The reliabilities of the measuring instrument, item, and person were also .83, .98, and .79, respectively. Based on these descriptions, 60 fixed items were used in this study.

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