The Analysis of Self-Concept Scale in Engineering Faculty: A Rasch Model Analysis

Jahju Hartanti*
Guidance and Counseling Program
Faculty of Education
Universitas PGRI Adi Buana
Surabaya, East Java—Indonesia
jahjuhartanti789@gmail.com*

Lucky Nindi R. Marfu’i
Guidance and Counseling Program
Education and Social Science Faculty
Universitas Indraprasta PGRI
East Jakarta, Indonesia
riandika.lucky29@gmail.com

Abstract—Self-concept is a way of how we perceive ourselves in terms of physical or individual’s characteristics regarding the strengths and weaknesses. Self-concept needs to be measured by an instrument that needs to be identified the reliability to measure the college student’s self-concept. Engineering students are often faced with practical lectures and rarely have a dominant social world because of their daily activities are often spent to interacting with lab tools and materials. This article is going to discuss about the result of instrument’s item analysis in the form of self-concept scale given to the engineering faculty college students. The analysis includes; difficulty level analysis, item distribution, instrument’s consistency, consistency of the item on measuring self-concept, consistency of the engineering students in answering the items, and overall reliability using RASCH analysis model. This is conducted to evaluate the existing self-concept scale, so that the instrument’s performance can be developed. Method used in this research is literature study and quantitative descriptive. In this method, evaluation and instrument identification in the form of developed self-concept scale has been conducted. The self-concept scale used has reliability in the moderate category, consistency of student’s in answering and item’s reliability is in high category, the average engineering student answered the question below the question’s difficulty level. It can be concluded that average items in self-concept scale is difficult to be comprehend by students and less able to measure student’s self-concept and the difficulty level need to be simplified. This can be performed by re-testing the instruments to the same students to test the reliability through re-test.

Keywords—self-concept, engineering faculty, adolescent, RASCH Model Analysis

I. INTRODUCTION

Students in engineering faculty known as active and creative students in practicum fields with machines and often work in the fields. This fact makes engineering students considered less socializing with world of friendship and known as tactical in solving personal problems. Self-concept is part of the self-adjustment and self-esteem [1]. Moreover, self-concept is the result of social interaction in the environment [2]. Based on that statement, engineering student’s self-concept according to their socialization result during in the university need to be identified to recognize their ability to adapt in their social environment as well.

Self-concept is a variable related to self-esteem. However, self-concept and self-esteem are separate factors with unique associations for self-adjustment numbers in respondents. Self-concept is part of the realm of affection or feeling which is the determinant of the value of behavior and individual psychological adjustment [1] Self-concept influences the development of individual interests and decision making [2] Self-concept refers to one's thinking in evaluating himself and giving an assessment of himself. Self-hatred, self-neglect, and self-blame include negative self-concept [3] Self-concept will affect individual academic achievement, when a teenager has a high self-concept, he will have good academic achievement [4,5] Good achievements will lead to a good career too. A good career will provide a positive self-image so that the individual will be more highly actualized.

The self-concept of adolescents is not affected by age and gender. Antisocial adolescents have negative and autonomous self-concepts. Teenagers who are autonomous means that women have hatred compared to other groups. The results showed that normal adolescents will have a self-concept that is not chaotic, so negative self-concept is only possessed by adolescents who have an antisocial lifestyle [6]. Students who get special treatment in inclusive schools will reduce the student’s self-concept. In regular classroom conditioning in learning it is necessary to apply social interaction that develops students 'self-concepts and does not cause mild interference with students' self-concept [7].

Self-concept is individual’s self-image, whether in form of physical, social, or psychological that becomes expectation of their self in the future and will form interactions with their environment and personal experience [8] This statement explains that the primacy of self-concept in daily life determines the future. If the students in engineering faculty often practice with tools or innanimate objects such as machines, etc. How will their self-concept going to be?

This become a big question in social science. It is actually not easy to make judgement on a problem with only common sense, but in this study, one if the goal is to measure the ability of engineering faculty college student’s self-concept variable. In addition, in this article will be described the evaluation result of self-concept scale that the researcher used to measure the self-concept of engineering s
students in terms of difficulty level, consistency, and self-concept scale measurement.

II. MATERIALS AND METHODS

This study was conducted at the engineering faculty of University of PGRI Adi Buana (UNIPA), Surabaya – Indonesia. This study was conducted on students with age range of 18-21 years old or in adolescent category. This study used a quantitative approach with evaluation method to identify the self-concept scale performance that used to identify UNIPA engineering student’s self-concept level.

The data analysis technique uses RASCH model analysis. RASCH model analysis is a modern analysis theory developed by B. Sumintono and W. Widhiarso recently. RASCH model analysis has several advantages, one of them is to identify the instrument’s ability to measure a variable accurately [10]. RASCH model analysis is capable to identify item’s difficulty level with its distribution, respondents consistency in answering, item’s reliability, and respondent’s reliability on answering the question. In addition, this analysis can be used to identify the respondent’s ability to answer the questions that have been presented.

III. RESULTS AND DISCUSSION

The discussion of result will be divided into four analyzes which will be explained in detail as follows:

A. Test of Reliability

Data analysis showed the reliability of overall self-concept scale in moderate category with reliability coefficient of 0.67. The reliability analysis result using RASCH model analysis overall can be seen in the following figure.

![Fig. 1. Test of Reliability](image1)

In figure 1 can be seen the student’s consistency in answering all self-concept scale’s item is very high which has the reliability coefficient of 0.89 and item’s consistency on the respondent’s answer is really high with coefficient 0.99. It can be concluded from the analyzes above that the instrument has low ability to measure self-concept because the respondents couldn’t answer the questions according to the difficulty standard level of the questions constructed by Elisa Margania [11].

B. Item Maps

Self-concept scale has item distribution with high and low difficulty level according to RASCH model analysis which illustrated by the map items as follows.

![Fig. 2. Item Maps](image2)
Based on the picture above, the question that has the highest difficulty level is the question number 50, 20, 24, up to number 52. Whereas the question that includes the easiest question to answer is question number 31, 01, 32, up to number 41. On figure 2, there is a hash sign (in the blue box) to reflect the position of the respondent on answering self-concept scale item constructed by Elisa [11].

In that box, the hash sign are not parallel with the item's distribution, so it can be concluded that the self-concept scale items still cannot be used to measure engineering faculty college students' self-concept. In other words, this instrument still has a low measuring performance category when applied to engineering faculty college students in UNIPA. This can also prove that when this instrument applied to the engineering faculty student is not appropriate, therefore, it needs further testing with different subject groups to identify the usefulness of the self-concept scale developed by Elisa.

C. The Analysis of Students Ability

The next data analysis aims to identify the respondent’s ability through self-concept score that has been achieved, through the figure of the answer’s consistency from the following skalogram.

![Fig. 3. Scalogram of Self-Concept Engineering Students](image-url)
In the scalogram above, it can be seen that students who have the top three self-concept score are respondents number 36, 38 and 184. While students who has the lowest three self-concept score are respondents number 142, 002, and 196.

The scalogram above can be used to identify the respondent’s answer, whether they answered consistently or not. In the score pattern obtained by respondents illustrated on the scalogram shows the seriousness of respondents in answering. For example the answer shown by respondent number 036 has a consistent score of 3 and 4 from question number 1 to 52, so the respondent answers the statement on the scale of self-concept seriously and can certainly not cheat or be influenced by friends, whether in answering the difficult question or the easy one.

D. Item Fit

Some statements are considered difficult or easy by analyzing fit items which validity can be seen in the following figure.

![Fig. 4. Item Measure](image-url)
In the figure above shows some items that have been captured, it can be identified with the item norms of discrimination between 0.4 and 0.85 or 0.4 < Pt Measure Corr > 0.85. To find out whether an item is clear and does not create confusion as well as misconception for the students, Outfit MNSQ (0.5 < MNSQ > 1.5) and Outfit ZSTD (-2.0 < ZSTD > 2.0) should be considered as well as norm on Pt. Measure Corr [10].

Based on that statement, it can be identified that item that can be used and did not cause misconceptions in measuring engineering student’s self-concept is item number 34, 14, 23, 51, 08, 19, 25, 22, 39, and 52.

IV. DISCUSSION

Self-concept scale reliability has a moderate category of reliability (Fig. 1). This is due to external and internal factors. External factors emerge from used instrument, while internal factors stem from the readiness of the engineering students to work on the self-concept scale. The instrument used have quite a number of items, besides that the quality of the students who work on the self-concept scale doesn’t have the same ability, so they will produce different self-concept score as well (Fig. 3).

Another factor that affects the lower reliability is the self-concept scale has a high level of difficulty items (Fig. 2), while items that can be maintained have a less decent quality of validity (Fig 4). Factor that affect self-concept come from within the individual. One of them is the interpersonal communication skills in expressing identity followed by constructing social contact in social environment [12]. Other than that, factor that influence student’s self-concept can also come from experience, especially interpersonal experience, which emits positive feelings and feeling of worth, and competency in respected area by individuals and others [13]. This makes engineering students answers the self-concept scale in accordance with the showed engineering student’s self-concept result, which is overall in positive category.

The categorization of positive self-concept students as a whole becomes a component in the item analysis of the self-concept scale items used. Items are eliminated because the dominant difficulty level is too easy when applied to students of several faculties. Different ability of the constructed items seems to be not quite decent and makes the reliability at a moderate level. The quality of this scale can be said as not optimal yet, because this scale contains almost all items that have a low point measure correlation value. This is according to the opinion that explains, if the value of PT. Measure is greater than 0.4 and less than 0.85, this instrument is easy to understand and does not cause ambiguity in the subjects [10].

Engineering faculty student’s dominant intelligence is on mechanical intelligence, while self-concept is part of intrapersonal intelligence and social intelligence. This allows the results of the analysis per item discussed in figure number 2 which stated about the analysis of engineering students who can answer on the scale of self-concept. Another possibility that is the cause of the results is not balanced with the analysis of items that are considered as other factors or because the quality factor of the measuring instrument is not decent and has been proven in fig. 4.

Engineering students cannot answer with the standard set as described on the scalogram, because while working, there are some students who lack of concentration in answering, so that this becomes an external factor that affects the results of answers given by students. In addition, the results of these answers are some that are manipulated by students because they have no motivation to answer the scale with too many statements.

These external factors can be referred as lack of concentration and self-confidence in answering items in engineering students. This is in accordance with the results of the study which explains the self-concept of students who are in the low category on the personal dimension of self. In addition, the student's self-concept cannot be measured properly based on the "item map" which is reflected because the ratio of students' ability to answer with difficulty is not directly proportional or balanced.

This becomes the basis the scale of self-concept cannot be generalized because the results are less suitable if applied to engineering students at UNIPA, Surabaya. The self-concept scale needs to be tested on respondents from other faculties. This becomes an alternative to increase the reliability and validity of the scale of self-concept used. In addition, the scale of self-concept can be tested for external validity so that it can be applied to students in other faculties, because it has a high measure ability of student self-concept.

V. CONCLUSION

The conclusion of this study is that all respondents have a positive self-concept. This is indicated by the categorization in the scalogram which shows the respondent's self-concept score dominates in the high category. However, the measuring instruments used were identified as having reliability in the medium category, so the instruments in the form of self-concept scales need to be improved in further. The level of difficulty of the instrument can be seen in Figure 2 which shows items in difficult and easy categories have the same percentage. It can be concluded that the self-concept scale instrument is not suitable for measuring the self-concept of engineering faculty students. This is because the constructed self-concept scale shows that the quality of the items is inconsistent and the level of reliability is still in the moderate category. The recommendation for further study is that it is necessary to re-examine the respondents for improvement of the instrument and if necessary, testing external validity to the student groups in other faculties. So that the scale of self-concept instruments is accurate when applied.

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