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Item response analysis of the academic self-efficacy scale (TASES) Indonesian version with GPCM

Luh Bella Elistya Widiana[1], Ananta Yudiarso[2], Foebe Imantaka Iswahyudi[3], Rangga Saputra[4]

[1,2,3,4] Faculty of Psychology Surabaya University, Surabaya,
Jalan Raya Kali Rungkut, Surabaya, Jawa timur, 60293, Indonesia
ananta@staff.ubaya.ac.id

Abstract

There have been many studies developed to measure student self-efficacy. One of the instruments developed is the academic self-efficacy scale (TASES) designed by Sagone & Caroli (2014). The TASES instrument has four dimensions, namely, self-engagement, self-oriented decision making, others-oriented problem solving, and interpersonal climate. There were 30 items in the original version, but after being analyzed only 28 items remained. When adapted and validated in the Indonesian version, the remaining items are 25 items. This study aims to analyze item responses using the 2PL generalized partial credit model (GPCM) method. The participants involved in the research were 242 college students aged 18-25 years who were migrating outside the city or outside the island to pursue higher education. The results show that there are six items that have low discriminatory power (<0.4) so that they need to be revised (i9, i11, i24, i25, and i28) or eliminated (i12 and i24). In addition, the value of Cronbach's alpha on the interpersonal climate dimension is <0.7 so that it can be said to have poor consistency in measuring the self-efficacy of overseas students.
Keywords: College Students; GPCM; IRT; self-efficacy

Abstrak

Telah banyak penelitian yang dikembangkan untuk mengukur efikasi diri mahasiswa. Salah satu instrumen yang dikembangkan adalah skala efikasi diri akademik (TASES) yang dirancang oleh Sagone & Caroli (2014). Instrumen TASES memiliki empat dimensi, yaitu, keterlibatan diri, pengambilan keputusan yang berorientasi pada diri sendiri, pemecahan masalah yang berorientasi pada orang lain, dan iklim interpersonal. Terdapat 30 item dalam versi aslinya, namun setelah dianalisis hanya tersisa 28 item. Ketika diadaptasi dan divalidasi dalam versi bahasa Indonesia, item yang tersisa menjadi 25 item. Penelitian ini bertujuan untuk menganalisis respons aitem dengan menggunakan metode generalized partial credit model (GPCM) 2PL. Partisipan yang terlibat dalam penelitian ini adalah 242 mahasiswa berusia 18-25 tahun yang merantau ke luar kota atau luar pulau untuk menempuh pendidikan tinggi. Hasil penelitian menunjukkan bahwa terdapat enam aitem yang memiliki daya diskriminasi yang rendah (<0,4) sehingga perlu direvisi (i9, i11, i24, i25, dan i28) atau dieliminasi (i12 dan i24). Selain itu, nilai cronbach's alpha pada dimensi iklim interpersonal adalah < 0,7 sehingga dapat dikatakan memiliki konsistensi yang kurang baik dalam mengukur efikasi diri mahasiswa rantau.
Kata kunci: Mahasiswa; GPCM; IRT; Efikasi Diri

✉Corresponding author: Luh Bella Elistya Widiana
Email Address: ananta@staff.ubaya.ac.id (Jalan Raya Kali Rungkut, Surabaya, Jawa timur, 60293, Indonesia)
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INTRODUCTION

College student academic achievement in tertiary institutions is influenced by students' self-efficacy (Barrows et al., 2013; Suryani et al., 2020). The more college students have confidence that they will do the task well, then this belief can help college students to do the assignments or exams given to the fullest, and vice versa. As a result, college students who have high self-efficacy tend to try to overcome the problems they face because they are confident in their abilities (Ghufron & Suminta, 2013). College students who have high self-efficacy are not only able to make decisions for individual assignments, but also for group assignments, so they are able to contribute to groups (Narotama & Rustika, 2019). This self-efficacy helps college students to make decisions regarding the daily

challenges they face, both simple and complex.

Anxiety can occur when individuals have low self-efficacy (Permana et al., 2016). This is because college students tend to doubt their abilities so they see a task as a threat. College students' lack of confidence in their abilities can even make them commit fraudulent actions, such as cheating during exams (Kusrieni, 2014; Lestari & Lestari, 2017). Self-efficacy contributes 21.3% to cheating behavior and contributes 33% to anxiety (Kusrieni, 2014; Permana et al., 2016). In addition, low self-efficacy is associated with a lack of ability to make decisions (Dewi, 2017).

The importance of self-efficacy will help college students, especially overseas college students, to adjust to a new environment (Fitri & Kustanti, 2020). Overseas college students who have low self-efficacy tend to have difficulty meeting the demands given in lectures and in everyday life. This is due to the tendency of overseas college students to hesitate in participating in activities in class and on campus. If overseas college students constantly feel unsure about themselves, academic achievement will decrease so that it can result in overseas college students dropping out of college (Lidiawati et al., 2020).

Previous research has validated self-efficacy instruments, namely the academic self-efficacy scales (TASES) (Darmayanti et al., 2021; Sagone & Caroli, 2014) using confirmatory factor analysis (CFA). Therefore, researchers wanted to test TASES response analysis using other techniques on different participants, specifically overseas college students using generalized partial credit model (GPCM). Self-efficacy is important to measure in overseas college students because if individuals are not confident in their abilities, it will have an impact on the adaptation process and reduce academic achievement (Dewi, 2017; Kusrieni, 2014; Lestari & Lestari, 2017; Permana et al., 2016). Furthermore, an analysis using the GPCM method is needed to determine the differential power of each item so that one can see what should be measured. GPCM makes it possible to model complex item discrimination patterns, which take into account the participant's ability to respond to each of the available item answer choices (Muraki, 1997).

METHOD

Participants

The participants used in this study were overseas college students aged 18-25 years. The sample specified in this study was 242 college students who migrated out of town or outside the island to pursue higher education.

Research procedure

The researcher uses a measurement tool that has been adapted by (Darmayanti et al. (2021) which refers to the steps of Beaton et al. (2000). First, the instrument was translated from English into Indonesian using three translators, i.e. one translator who is fluent in English but has minimal knowledge of the scale and two translators who are fluent in English and understand the concept of self-efficacy in an academic context. Second, synthesizing the translation by discussing with the translators

to obtain a mutual agreement regarding the meaning of the existing items. Third, translating back into English involved two college students so that the researcher was able to see the item's ability to represent the content according to the original version. Fourth, using a committee of experts to consolidate all versions of the questionnaire and develop items according to the initial concept of the instrument before being tested. Fifth, retrieve and analyze data using the Indonesian version of item prior to finalization according to psychometric rules. Finally, submit research results to developers or coordinating committees for assessing adaptation processes, such as lecturers and researchers in the field of psychology in Indonesia.

The research procedure carried out was that the researcher distributed questionnaires using accidental (convenience) sampling techniques to make it easier for researchers to contact participants according to the criteria. The researcher will ask for information about the participant's demographic data, such as name, initials, age, gender, place of origin, where they are migrating now, with whom the participant lives overseas, and an active telephone number. In addition, participants are expected to be able to fill in 28 items from the TASES instrument given on a scale of 1 (not sure at all) – 7 (very sure) (Sagone & Caroli, 2014). The four dimensions measured are self-engagement ("I can keep my attention while the lecturer is teaching in class"), self-oriented decision making ("I can react sufficiently in the face of a failure"), other-oriented problem solving ("I able to express doubts and uncertainties about the material presented by the lecturer"), and interpersonal climate ("I am able to build good relationships with my college friends"). There is one unfavorable item, namely item number 24.

Data analysis

Data analysis was performed using the generalized partial credit model (GPCM). GPCM is one of the measurement models in item response theory (IRT) which is used to measure the abilities or latent characteristics of individuals based on their answers to a number of items (Muraki, 1997). GPCM makes it possible to model complex item discrimination patterns, which take into account the respondent's ability to respond to each of the available item answer choices (Muraki, 1997). The categories used to determine discriminatory power are ≥ 4 (good items); 0.3 – 0.39 (item accepted but requires revision); 0.2 – 0.29 (items need to be revised); ≤ 0.19 (items not used or dropped) (Taib & Yusoff, 2014).

RESULT AND DISCUSSION

Akaike Information Criterion (AIC) is used to select the most appropriate model for each subtest on the item to be analyzed. Several models will be compared and then selected based on the smallest AIC value. The smallest AIC value means that it has a smaller possibility of bias in the data processing (Anderson et al., 1998).

Table 1. Recapitulation of AIC values

Subtest TASES	AIC			Selected IRT Model
	Rasch	IRT 1PL	IRT 2PL	
Self-engagement	5000.38	4997.12	4954.89	2PL

Subtest TASES	AIC			Selected IRT Model
	Rasch	IRT 1PL	IRT 2PL	
Self-oriented decision making	4790.81	4792.77	4704.36	2PL
Others-oriented problem solving	5467.80	5437.71	5371.11	2PL
Interpersonal climate	5407.72	5265.75	5130.97	2PL
TASES	20654.19	20523.40	20119.58	2PL

Based on table 1, it shows that the 2PL model has the smallest AIC value of all subtests, so the 2PL model will be used to assess the overall quality of TASES items. The 2PL parameter can be used to see the differential power of an item.

Table 2. Recapitulation of different discriminant per items

No.	Dimension	Items	Discriminant
1.	*Self-engagement (SE)*	I1	0.91
		I2	1.12
		I6	1.45
		I7	0.89
		I9	0.33
		I16	1.19
		I22	0.91
2.	*Self-oriented decision making (DM)*	I3	0.57
		I13	1.79
		I17	0.53
		I18	1.93
		I19	0.64
		I20	2.14
		I21	1.13
3.	*Others-oriented problem solving (PS)*	I4	0.93
		I8	0.64
		I10	1.72
		I11	0.38
		I14	1.39
		I25	0.24
		I26	0.47
4.	*Interpersonal climate (IC)*	I5	0.68
		I12	0.03
		I15	1.47
		I23	0.77
		I24	0.02
		I27	1.13
		I28	0.30

Based on table 2, there are six items that need to be revised, namely items i9, i11, i25, i12, i24, and i28. This item has a discriminating power of less than 0.4 so it needs to be revised because it indicates a bad item. The self-engagement dimension has a Cronbach's alpha value of 0.807 when all of these items are used. However, if item i9 which has a discriminant power of <0.4 is eliminated, the Cronbach's alpha value increases significantly to 0.822. This indicates that item i9 needs to be revised if it is still to be maintained so that the discriminant power of the item increases. In the previous validation journal, the items that were aborted were i12, i24, and i25 (Darmayanti et al., 2021), so that there was a concordance with respect to items that had poor discriminatory power.

The second dimension, self-oriented decision making, has a Cronbach's alpha value of 0.839. All items on these dimensions can be used because they have a discriminant value > 0.4. The others-oriented problem-solving dimension has a Cronbach's alpha value of 0.775, but the Cronbach's alpha value will increase if item i11 (α = 0.777) and item i25 (α = 0.783) are excluded. The interpersonal climate dimension has a Cronbach's alpha value of 0.521, but if item i12 (α = 0.543) and item i24 (α = 0.635) are excluded then the Cronbach's alpha value will increase. Even though the discriminant value of item i28 needs to be considered, if the item is dropped it will not increase the value of Cronbach's alpha. The interpersonal climate dimension has poor consistency in measuring the self-efficacy of college students who are migrating (α < 0.7) (Cronbach, 1951).

Overall the Cronbach's alpha value on the TASES instrument which has been validated in the Indonesian version (α = 0.893) (Darmayanti et al., 2021) has a greater Cronbach's alpha value (α = 0.894) but the difference is not significant. When compared to the original version, there is a significant difference between the Cronbach's alpha value of the original version (α = 0.880) (Sagone & Caroli, 2014) and the Indonesian version (α = 0.894). This means that the Indonesian version of TASES has good consistency (α ≥ 0.7) (Cronbach, 1951) in measuring the self-efficacy of college students who migrate outside the city or outside the island to study.

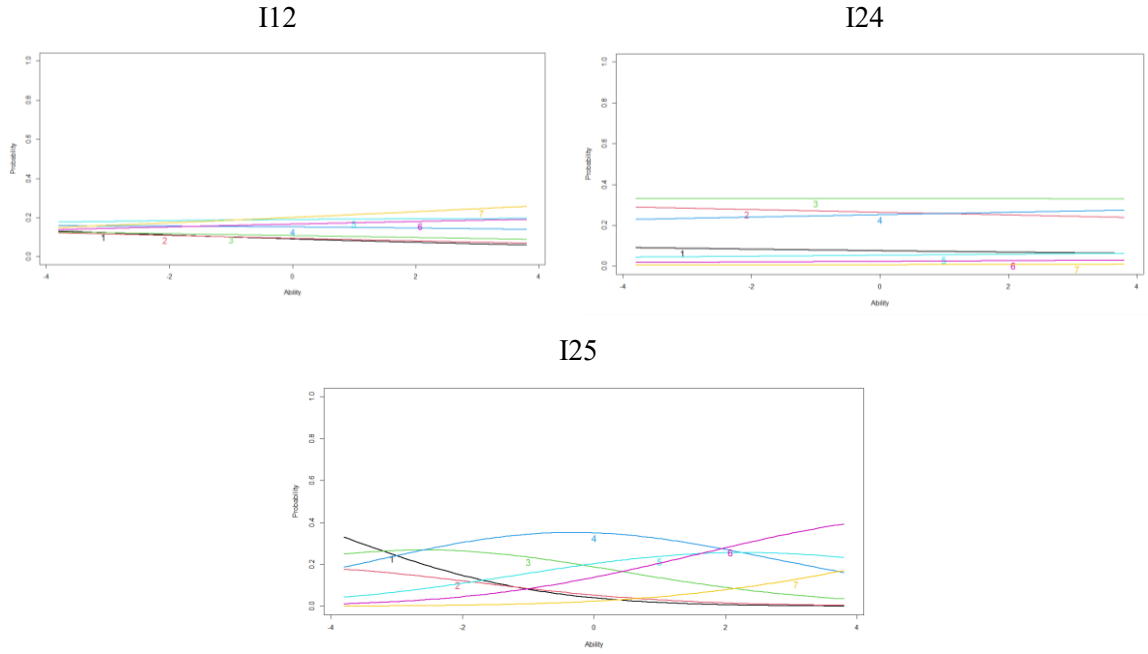

Figure 1. ICC for the lowest discriminant value

Based on picture 1, there are three items that have ICC graphs that do not have peaks, namely items i12, i24, and i25. That is, these items are less able to distinguish the self-efficacy of overseas college students (Baker & Kim, 2017). Items i12 and i24 need to be eliminated according to the established category standards (Taib & Yusoff, 2014). However, i25 can still be considered for use if it has been revised so that it has good discriminating value.

Based on the context of the TASES instrument, self-engagement is college student involvement

in attending lectures or learning (Sagone & Caroli, 2014). Self-engagement is important in the lecture process because it will determine student academic achievement and minimize the possibility of dropping out (Truta et al., 2018). Motivation plays an important role in getting individuals involved in the learning process so that the information obtained will be more meaningful for the individuals themselves (Skinner et al., 2008). In addition, self-esteem also plays an important role because it relates to an individual's view of self-worth so that it will affect the individual's ability to complete educational assignments (Acosta-Gonzaga, 2023).

Self-oriented decision making refers to individual reactions to difficulties encountered during lectures by considering alternative opinions of others or defending personal opinions (Sagone & Caroli, 2014). College students who are able to make decisions independently will more easily adapt to their environment (Hou et al., 2014). Self-oriented decision making is influenced by locus of control, namely the feeling that college students have control over their ability to cope with lecture assignments (Ulas & Yildirim, 2019). This control can come from within or outside, it's just that if outside control dominates too much it will cause college students to be very dependent on the environment in making decisions.

Others-oriented problem solving is related to the role of other people's involvement in solving problems experienced in lectures (Sagone & Caroli, 2014). College students have obstacles in undergoing lectures so that problem solving abilities are needed to achieve academic achievement. Individuals need to establish relationships with the people around them so that when college students are confused about the coursework given, college students can ask friends or lecturers. Good relationships with other people and social support will make it easier for individuals to solve academic problems so they don't get stressed easily (Fasihi Harandi et al., 2017; Kalaitzaki et al., 2021).

Finally, interpersonal climate refers to the way individuals work together with their friends in group tasks or activities (Sagone & Caroli, 2014). When working with others in completing assignments, college students are trained to coordinate and communicate with others. Related to the previous explanation, self-efficacy involves complex dimensions. Self-efficacy will ultimately have an impact on academic success and even career success in the future, so standard instruments are needed to determine college student self-efficacy. Future research is expected to be able to validate in different contexts related to the TASES instrument. Then, the interpersonal climate dimension which has a Cronbach's alpha value <0.7 needs to be corrected and re-analyzed if it is still to be used as part of the TASES dimension.

CONCLUSION

There are 30 items on the original version of the academic self-efficacy scale (TASES) which are divided into four dimensions. Then, two items on the original scale were eliminated so that the remaining items were 28 items. The Indonesian version of the TASES instrument uses 28 items from four different dimensions to be analyzed again after being adapted. The results of item response analysis

on overseas college students showed that there were six items that had low discriminatory power (<0.4) so that they needed to be revised (i9, i11, i24, i25, and i28) or eliminated (i12 and i24).

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