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VALIDITY ANALYSIS OF LEARNERS' SELF-EFFICACY INSTRUMENT USING RASCH MODEL

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ABSTRACT

The issue of items that are not independent, not linear, do not have value accuracy and missing data errors, thus the research aims to test the analysis of the construct validity of the self-efficacy instrument, the research uses a quantitative approach with a cross sectional survey design, then the validity analysis uses the Rasch model with the Winsteps version 3.73 application. The results of this study are (1) all items of the Self-efficacy revealing instrument meet the standard criteria as a measuring instrument. (2) Cronbach Alpha as a measure of the interaction between the person and the item as a whole, has a value that is included in the good category. (3) Person Reliability as an indicator of the constancy of respondents' answers, the results of its value are included in the sufficient category. While (4) Item Reliability as an indicator of the quality of items on the instrument, its value is included in the excellent category. (5) The average difficulty level of items is below the ability of junior high school students, so it is easy to understand. The instrument can be used as a need assessment for students in measuring self-efficacy ability curately.

Keywords: self-efficacy, validity, reliability, Rasch model.

INTRODUCTION

Self-efficacy refers to an individual's perspective and belief that they have the skills and can effectively succeed in performing certain actions (Wang & Neihart, 2015). Self-efficacy is an important aspect of knowledge in individuals because it can influence individuals in determining the actions to be taken (Bandura & Bandura, 2010). Self-efficacy can have a positive impact on students, with self-efficacy owned by students, it will make it easier for them to make decisions and make choices to act while increasing self-confidence (Bandura, 1982).

Self-efficacy plays an important role in learners' engagement in classroom learning (Joo, 2000).In addition, self-efficacy can create a positive self- concept, the high confidence of learners makes them more actively involved in doing their tasks and their performance increases which is shown in aspects of behaviour, cognition, and motivation, so that it can increase their self-confidence (Vance, 2017).

Learners who have high self-efficacy will see various problems as challenging and become a task that must be mastered; actively involve themselves in tasks and

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responsibilities; have a strong commitment in carrying out a job; and if they experience downturns and feel disappointed, they will quickly bounce back (Sullivan, 2006). Meanwhile, students who have low self-efficacy believe that they do not have the ability to succeed, tend to be easily frustrated and their performance is reduced (Stankov et al., 2012), and fail to develop their potential in the social environment (Bandura & Locke, 2003). The low self-efficacy of learners makes it difficult for them to improve their competence in life in a social environment. Low self-efficacy in learners can encourage disgraceful behavior such as cheating behaviour. The results of the study state that self-efficacy has a negative effect on students' actions in cheating (Arafah et al., 2020).

Self-efficacy is influenced by various factors, including gender, cultural factors, external incentive factors, individual role factors in the environment and self-knowledge, and the nature of the task at hand (Mattingly & Jr, 2013). Factors from the nature and tasks faced are often the main factors that can assess the level of individual self-efficacy because the level of difficulty of the task at hand has an influence on how individuals assess their abilities. If the task at hand has a difficult level, then individuals assess themselves as having low abilities. And vice versa.

Learners' self-efficacy needs to be developed so that learners can develop optimally. The first step in the effort to develop students' self-efficacy is to conduct an assessment. Using one of the measuring instruments, so that the instrument is accurate, a significant construct analysis is needed, the construct of Bandura's self efficacy theory scale. Then to test the validity level of the instrument can use two methods, namely Classical Test Theory (CTT) and Item Response Theory (IRT). Classical test theory (CTT) is used to determine item errors in an instrument measurement, the item measurement error model is examined based on the correlation coefficient (Petrillo, 2015). However, classical test theory has weaknesses, the limitations of classical test theory are, (1) the results of parameter estimation are highly dependent on the characteristics of the respondent (group dependent). Of course, this has implications for the level of difficulty of the question items. if the instrument is tested on a group of respondents who have high abilities, the level of difficulty of the question items will decrease. Conversely, if the instrument is tested on a group of respondents who have low ability, the level of difficulty of the question will be high. (2) the results of estimating the ability of respondents depend on the characteristics of the items (item dependent). This will cause a low estimation of the respondent's ability if the question tested exceeds his ability. Vice versa, the estimation of respondents' abilities will be high if the questions tested are lower than their abilities.

In an effort to overcome the weaknesses of classical test theory, experts developed a measurement model that has no attachment to the sample which became known as item response theory (IRT). Rasch model is based on item response theory (IRT), Rasch model is a versatile and highly effective way to test the psychometric quality of instruments and tests, while allowing for further validity testing, calibration, and improvement (Polat et al., 2022). The advantages of the Rasch model from classical test theory, namely (1) has the ability to predict missing data predictions based on structured response patterns. The results of statistical analysis with this model are much more accurate in research; (2) Rasch model is able to produce standard error measurement values on instruments, this will increase the accuracy of item suitability calculations (Taufiq et al., 2021).

Previous research on the development of self-efficacy instruments has been conducted by experts to measure general self-efficacy. The instruments developed include the General Self-Efficacy Scale (GSES) developed by Sherer, et al in 1982. Generalised Self-efficacy Scale (GSE)

developed by Schwarzer & Jerusalem in 1995, General Self-Efficacy Scale 12 (GSES-12) developed by Bosscher & Smit in 1998, Self-Efficacy Questionnaire for Children (SEQ-C) developed by Muris in 2001, this instrument measures self-efficacy in children and students (Drummond, 1997).

Previous researchers have adapted the GSES-12 instrument into the Indonesian version. The result is that there are still some items that have sentences that are less precise, the items are corrected and construct validity is carried out using the Bayesian Confirmatory Factor Analysis method. After being tested again, the GSES-12 instrument that has been adapted to the Indonesian version is better and able to measure undimentionality (Frolik, 2001)

Previous studies that tested the validity and reliability of self-efficacy instruments using rach model analysis include the following. (1) The results of the Rasch model analysis of the Indonesian version of the GSES-12 instrument conducted show that this instrument has good psychometric characteristics. The data used fit the partial credit model (PCM) analysis compared to the rating scale model (RSM). All assumptions from the application of Rasch mode analysis have been met and all items fit the model. (2) the results of the Rasch analysis model of the Malaysian version of the SEQ-C instrument obtained a good reliability value, this proves that the SEQ-C instrument produces valid and reliable scores when measuring self-efficacy in Malaysia.

From the results of these studies, there are still few studies measuring the validity and reliability of self-efficacy instruments using the Rasch model analysis approach. Whereas rach model analysis is an effective method for testing the accuracy of the validity and reliability of self-efficacy instruments. This is a consideration for researchers to test the validity of students' self-efficacy instruments in order to produce instruments with items that are able to reveal each aspect of self-efficacy.

METHODOLOGY

The approach employed in this study is a quantitative one, utilizing a cross-sectional survey design. The research targeted junior high school students in West Java. To determine the sample for the study, a simple random sampling technique was applied. The final sample consisted of 47 male and 54 female students. The instrument used in this study was a self-efficacy scale. The data is analysed using the Rasch model with the help of the Winstep version 3.73 application. The aspects that will be analysed, namely: the instrument will be analysed for its level of unidimensionality, this aims to test whether the instrument developed can measure all aspects of self-efficacy; the instrument will be analysed for its items, this aims to determine the level of difficulty of the items, the level of suitability of the items, and the diagnostic rating scale; and the entire instrument will be analysed to determine the level of validity and reliability of the instrument.

RESULT AND DISCUSSION

Undimentionality

Undimentionality analysis identifies the dimensions measured in the instrument. This analysis examines the value of raw variance explained by measures and unexplained variance in 1st to 5th contrast of residuals. Undimentionality of its characteristics can be measured if the value of raw variance explained by measures > 20% (Andrich, 2010) with the terms of the general category of interpretation as follows. It is said (1) sufficient if the value is 20-40%, (2) good if the value is 40-60%, and (3) very good if the value is > 60% and if the unexplained variance in 1st to 5th contrast of residuals all have a value < 15%. In detail the value of undimensionality can be seen in table 2. Based on the results in table 2, describing the raw variance explained by measures has a value of 31.8% which is included in the sufficient category. This shows that the requirements for the value of raw variance explained by measures below 20% have been met (Sumintono & Widhiarsono, 2014).

While the value of unexplained variance in 1st to 5th contrast of residual, is described as

follows: (1) unexplained variance in 1st contrast of residual value of 10.2%; (2) unexplained variance in 2nd contrast of residual value of 8.9%; (3) unexplained variance in 3rd contrast of residual value of 7.3%; (4) unexplained variance in 4th contrast of residual value of 6.5%; and (5) unexplained variance in 5th contrast of residual value of 6.1%. It can be seen that the unexplained variance value of the instrument runs from 6.1%-10.2%. From these results, it shows that the value position is in a very good category because the magnitude is from 15%. So it can be interpreted that the construct of the instrument used is very deep to measure the self-efficacy of students as a whole. The research findings show that the self-efficacy instrument focuses more on Bandura's social cognitive theory which reveals about the behaviour and mechanistic aspects of individual perspective organisms (People, 2017). So that the instrument has a tendency to the social cognitive model reveals the relationship between personal factors (cognitive, affective and biological processes), a person's behaviour, and environmental conditions that continuously interact and influence each other which is often called a reciprocal triangle relationship. The interaction between personal factors and behaviour reflects the impact of a person's thoughts, feelings and beliefs on himself or his behaviour, while the interaction between environmental influences and personal factors reflects the impact of social influences (modelling, learning and persuasion) in terms of expectations, beliefs and emotions of others on his characteristics (Bandura & Locke, 2003).

Table. 2
Undimentionality of the Learners' Self-efficacy Instrument

No.	Description	Value 2
1..	Total raw variance in observations	100.0%
2.	Raw variance explained by measures	31.8%
3.	Raw variance explained by persons	14.6%
4.	Raw Variance explained by items	17.2%
5.	Raw unexplained variance (total)	68.2%
6.	Unexplained variance in 1st contrast	10.2%
7.	Unexplained variance in 2nd contrast	8.9%
8.	Unexplained variance in 3rd contrast	7.3%
9.	Unexplained variance in 4th contrast	6.5%
10	Unexplained variance in 5th contrasts	6.1%

Item Analysis Results

Item analysis includes measuring item difficulty (item measure), and measuring item fit (item fit).

Item Difficulty Level

The level of difficulty of the items can be analysed based on the table item measure order winsteps application. The research findings describe the SD (standard deviation) value as 0.78. This SD value when combined together with the average logit value, the item difficulty level will be classified into the very difficult category if > +1 SD, the difficult category if the value is 0.0 logit + 1 SD, the easy category if the value is 0.0 logit -1 SD, and the very easy category if the value < -1 SD (Andrich, 2010). Therefore, the terms of the value limit to categorise the difficulty of the item, namely (1) the very difficult category is >0.78, (2) the difficult category is 0.0-0.78, (3) the easy category is 0.0-(-0.78), and (4) the very easy category is <-0.78.

From looking at the logit values in table 3, the level of suitability of the items has been arranged in order according to the level of difficulty of the items. Starting from very difficult items to very easy items. From these results (1) in the very difficult category there are two items, namely items 2 and 13. The aspects measured are the ability to face challenges as a task that must be mastered, and the belief in being able to adapt in various situations. (2) in the difficult category there are six items, namely, items 12, 1, 3, 7, 6, 4. The aspects measured are the ability to face challenges as a task that must be mastered, the belief in being able to do tasks with difficult

levels, the belief in being able to work hard, persevere, and persevere, and being able to endure difficulties. (3) in the easy category there are two items, namely items 11 and 9. The aspects measured are the belief in being able to adapt to solve problems in various situations, and the belief in being able to work hard, persevere, and persevere. (4) in the very easy category there are three, namely items 5, 8, 10. The aspects measured are confidence in being able to endure difficulties, confidence in being able to work hard, persevere, and persevere, and confidence in being able to solve problems in various situations.

Table. 3
Item Measure Order Level of Suitability of Student Self-efficay Instrument Items

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE
2	201	101	1.33
13	217	101	.89
12	225	101	.66
1	236	101	.34
7	236	101	.34
3	238	101	.28
6	239	101	.25
4	246	101	.03
11	252	101	-.17
9	261	101	-.50
5	269	101	-.83
8	275	101	-1.11
10	282	101	-1.51
MEAN	244.4	101.0	.00
S.D.	22.4	.0	.78

The research findings are consistent that self-efficacy also affects an individual's mindset and emotional reactions. Individuals who have low self-efficacy will perceive a condition as more difficult than it actually is, so they will tend to experience stress, depression and not be able to find the best way to solve the problems experienced. High self-efficacy, on the other hand, will help create a sense of calm in the face of academic tasks and difficult conditions. Ultimately, self-efficacy is a powerful determinant and predictor of the level of achievement that individuals will achieve (Logan, 2014).

Item Suitability Level

The level of item fit uses items that function normally to measure self-efficacy so that there is no misunderstanding on the part of students on the items. In detail the item fit order can be seen in table 4.

Table 4.
Item Fit Order Level of Suitability of Learner Self-efficacy Instrument Items

OUTFIT		PT-MEASURE		EXACT MATCH		Item
MNSQ	ZSTD	CORR.	EXP.	OBS%	EXP%	
1.20	1.2	A .54	.47	58.4	64.0	11
1.02	.1	B .44	.40	74.3	75.3	8
1.18	1.3	C .60	.49	51.5	58.8	3
1.22	1.6	D .30	.50	53.5	58.7	1
1.21	1.4	E .15	.48	52.5	61.8	4
1.05	.4	F .58	.49	52.5	58.7	6
1.12	1.0	G .44	.51	61.4	57.0	12
.72	-1.0	f .52	.36	84.2	80.3	10
.83	-.8	e .54	.42	72.3	72.1	5
.84	-.9	d .48	.45	71.3	68.1	9
.73	-2.4	c .31	.51	69.3	56.4	13
.69	-2.5	b .55	.50	65.3	58.7	7
.69	-2.8	a .63	.52	66.3	56.8	2
.96	-.3			64.1	63.6	
.21	1.5			9.8	7.6	

Items were analysed using the winsteps application on the item fit order table. Analysed based on the table in the OUTFIT MNSQ, OUTFIT ZSTD, and POINT MEASURE CORRELATION columns. (Boone, et al, 2014) have made criteria for analysing the suitability of item fit, namely (1) based on the OUTFIT MNSQ value > 0.5 and < 1.5, if the closer to 1, the better the quality; (2) based on the OUTFIT ZSTD value > (-2.0) and < (+2.0), if the closer to 0, the better; (3) based on the Point measure correlation value must be > 0.4 and < 0.85.

An item can be analysed as fit if out of the 3 criteria, 1 criterion can be met. The 13 items

after being analysed show fit or function normally to measure self-efficacy because they have met the minimum criteria of item fit.

Diagnostic Rating Scale

Diagnosis is carried out to test whether students understand the differences in answer choices in self-efficacy variables 1, 2, and 3. In detail, the rating scale can be seen in table 5.

Table 5. *Learner Self-efficacy Instrument Rating Scale*

Observed Count	%	Obsvd Avrge	Andrich Threshold	Category Measure	
124	9	-.04	None	(-2.27)	1
514	39	.77	-1.10	.00	2
675	51	1.97	1.10	(2.27)	3

The difference in answers is understood by respondents if the observed average and Andrich threshold values increase according to the level, in detail the Andrich threshold value in the winsteps rating scale.

The items are appropriate because there is an increase along with the alternative answer choices from 1, 2, and 3. Therefore, the results of the analysis state that the level of the self-efficacy instrument is in accordance with the actual or real conditions of learner behaviour. There are three assumptions that can be evaluated using the Rasch model, related to the use of diagnostic rating scales in self-efficacy instruments (Chen & Gully, 2001), namely (1) each number is arranged in order to represent the aspect being studied. This means that each number that ranks higher should interpret a higher level of self-efficacy; (2) individuals who experience an increase in self-efficacy should show relevant responses. This means that when filling out the instrument respondents can distinguish the different levels contained in the instrument; (3) minimising idiosyncratic categories such as redundant choice categories, or the use of ambiguous terminology, this can help respondents understand the instrument items.

Instrument Analysis

Instrument analysis can be examined using the information in the winsteps summary statistic table. The complete instrument analysis can be seen in table 6.

Person measure shows the average of all learners' scores in working on the items of the instrument to reveal learners' self-efficacy. When the mean person score is greater than the mean item score, which is 0.00 logit, this identifies that learners have greater ability than the difficulty level of the instrument items as a whole (Muslihin et al., 2022).The Cronbach Alpha value, describes the overall reciprocal relationship between the person and the items (Andrich, 1978; Lidinillah et al., 2020).The value obtained is 0.72 based on this value including the good category. Furthermore, person reliability is worth 0.67, this value is a parameter for the determination of respondents' answers, based on this value, the person level is in the moderate category, this is because respondents are less serious about filling out the instrument. While Item Reliability is valued at 0.93 as a parameter of the superior quality of the items contained in the instrument, based on the results of this value, item reliability is included in the special category.

Other data in Tables 6 and 7 that can be used, namely INFIT MNSQ and OUTFIT MNSQ in the person and item tables. From the person table, it can be seen that the average values of INFIT MNSQ and OUTFIT MNSQ when translated, are 0.99 and 0.96. Then from the item table the results of the average value of INFIT MNSQ and OUTFIT MNSQ when described, namely 1.03 and 0.96. If the closer to number 1, the better because if it is at number 1 is the ideal result (Adrich, 2010). Therefore, both person and item averages are close to the ideal criteria.

Meanwhile, the INFIT ZSTD and OUTFIT ZSTD average values for persons when described are 0.0 and 0.0. While the INFIT ZSTD and OUTFIT ZSTD values for items when described, are 0.1 and -0.3. The ideal value of ZSTD is 0. If the value is closer to 0, the quality will be better .Therefore, it can be mentioned that the quality of the average person and item is good.

If the separation value is greater, then the superiority of the person and item instruments is ideally better, this is because the instrument

can identify groups of students who have abilities and do not have abilities; and groups of items from the most difficult to the easiest (Sumintono & Widhiarsono, 2015). The separation value can be determined more thoroughly through calculation using the formula H = ((4separation)+1)/3.

Based on the calculation results of the formula, the result of the person separation value is 2.24 then rounded to 2. The separation value for items is 5.32 rounded then rounded to 5. This means that respondents have a variety of abilities that can be classified into 2 groups. The two groups are students with high self-efficacy levels and groups of students with low self-efficacy levels (Putri, Suranata, Lestari, 2021). Meanwhile, the level of item difficulty is spread into 5 groups. The distribution starts with a very easy group to a very difficult group

Table 6.
Summary of Person Statistics

	TOTAL			MODEL	INFIT		OUTFIT	
	SCORE	COUNT	MEASURE	ERROR	MNSQ	ZSTD	MNSQ	ZSTD
MEAN	31.5	13.0	1.31	.54	.99	.0	.96	.0
S.D.	3.9	.0	1.01	.11	.40	1.1	.41	1.1
MAX.	38.0	13.0	3.84	1.04	1.99	2.4	1.97	2.4
MIN.	21.0	13.0	-1.06	.45	.36	-2.4	.37	-2.2

REAL RMSE .58 TRUE SD .83 SEPARATION 1.43 Person RELIABILITY .67
MODEL RMSE .55 TRUE SD .85 SEPARATION 1.55 Person RELIABILITY .71
S.E. OF PERSON MEAN = .10

Table 7.
Summary of Item Statistics

					INFIT		OUTFIT	
	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	MNSQ	ZSTD	MNSQ	ZSTD
MEAN	244.4	101.0	.00	.19	1.03	.1	.96	-.3
S.D.	22.4	.0	.78	.02	.23	1.9	.21	1.5
MAX.	282.0	101.0	1.33	.25	1.33	2.3	1.22	1.6
MIN.	201.0	101.0	-1.51	.17	.67	-3.0	.69	-2.8

REAL RMSE .20 TRUE SD .75 SEPARATION 3.74 Item RELIABILITY .93
MODEL RMSE .19 TRUE SD .75 SEPARATION 3.97 Item RELIABILITY .94
S.E. of Item MEAN = .22

The research findings represent that school situations and conditions will help shape adolescents' self-efficacy. explained that with cognitive maturity, adolescents are more able to interpret and integrate several sources of information about their competence, and have a much more different view of their abilities. Schools have potential influences on adolescent self-efficacy including how teaching is structured, ease or difficulty of learning, feedback on performance, competition, assessment activities, amount and type of teacher attention, and school transitions. For example, rigid teaching structures cause learners to experience failure and learning difficulties. Learning difficulties experienced by learners will result in decreased learner self-efficacy. Classrooms with a lot of competition and social comparison can reduce the self-efficacy of learners who feel underachieving (Andrich, 2003, 2011).

Transitional periods in school can lead to changes in self-efficacy. School transitions bring many changes in teacher and peer group relationships, classes that can affect self-efficacy.

CONCLUSION

Efficacy Revealing Instrument have met the standard criteria as a measuring tool. The Cronbach Alpha value measures the interaction between the person and the item as a whole, including the good category. The Person Reliability value is an indicator of the constancy of the respondent's answer, from this indicator it is included in the sufficient category. While Item Reliability serves as an indicator of the quality of the items on the instrument, based on the criteria met, the reliability of the items on this instrument falls into the very good category. The average level of difficulty of the items is below the ability of junior high school students, based on this, the instrument items are included in the excellent category.

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