Tuijin Jishu/Journal of Propulsion Technology
ISSN: 1001-4055
Vol. 45 No. 3 (2024)

The Construct Inventory of Self Determination (ISD) Using Application Winsteps: Rasch Model

Marja Sinurat[1], Dadang Suwanda[2], Dodi Suryana[3*], Astri Asih Labibah[4], and Amelia Mohd Noor[5]

[12]*Institute of Goverance of Home Affairs, Indonesia*
[34]*Universitas Pendidikan Indonesia, Indonesia*
[5]*Universiti Pendidikan Sultan Idris, Malaysia*

Abstract:- This study are weaknesses from the classical theory approach in analyzing the validity and reliability of the instrument, which includes the test items which are highly dependent on the characteristics of the subject being tested, the estimated ability of the test participants is highly dependent on the test items being tested, and the information presented is limited to answering right or wrong not paying attention to the pattern of the test takers' answers is the reason for using the theory of the modern Rasch model in analyzing the validity and reliability of self-determination instruments. This study used a quantitative approach with a cross-sectional design with a total of 125 participants. Analysis using the Rasch Model is assisted by Winstep software version 3.73. The results of the self-determination of the instrument through the Rasch model were analyzed based on unimentionality aspects, item analysis (level of item difficulty and item suitability level), as well as instrument analysis. The results stated that the instrument developed had been tested for validity and reliability so that it could be used as a measuring tool to measure the self-determination ability of students who were teenagers.

Keywords*:* Validity, Reliability, Self Determination, Rasch Model, Adolecsent

1. Introduction

Self-determination is seen as a psychological need that must be met to bring about effective psychological functioning and promote psychological health, namely the need for competence, autonomy, and relatedness [1] When this self-determination need cannot be met, it will lead to disappointment in fulfilling one's psychological needs, which can arise, one of which has an impact on social interaction [2].

A person's self-determination needs to be known because often individuals, especially students who are in their teens, feel a lack of motivation when studying because of obstacles, both coming from the students themselves, as well as the environment around the students [3]. The success of achieving self-determination in students is an important aspect in relation to self-regulation [4].

The result Muslihin showed that from 2015 to 2017, several Indonesian University of Education students had a level of self-determination in the external regulation category [5]. As for the levels of self-determination according to there are six levels which include external regulation, integrated regulation, intrinsic regulation, introjected regulation, identified regulation, and amotivation [6].

Research on self-determination is still rare in the field of education with a teenage population. As for some of his research in the field of education, his research subjects are students. Therefore, researchers are trying to fill the research void by conducting research on the analysis of self-determination instruments in adolescents.

Self-determination can be influenced by the presence of control and information [7].The control referred to in this case can be in the form of other people's statements that control which will decrease or increase one's self-

determination. Therefore, according to the statement of when a person has no motivation and cannot manage himself, then that person tends to be weak in making his life choices. That is, the more a person has the inner motivation has self-regulation, the more likely a person is to have self-determination, and vice versa. If a person does not have motivation from within and does not have self-regulation, then the less likely a person is to have self-determination.

As for conducting this research, researchers used a measuring instrument in the form of a self-determination instrument which was developed by taking into account the aspects and levels that exist in the theory of self-determination. Furthermore, before being distributed to students, of course the instrument that has been made by a researcher needs to be tested first whether the instrument is good or not in measuring the level of self-determination. The good instrument is one whose results can be trusted and are able to measure what it is supposed to measure [8], [9]. Therefore, to determine the quality of the instruments that have been compiled, it is necessary to test the validity and reliability of these instruments.

This self-determination instrument was tested and analyzed using modern theoretical techniques of the Rasch model. This instrument was not tested using classical theoretical techniques which is a very simple and easy approach to understanding empirical problem anaysis [10].

This is because, in classical theory, the test items depend heavily on the characteristics of the subject being tested, the estimated ability of the test participants is highly dependent on the test item items being tested, and the information presented is limited to answering correctly or incorrectly regardless of the pattern of the test participants' answers [11].

Meanwhile, the Rasch model is a modern assessment theory that classifies item and person calculations in a data distribution [12]. This model is part of the item response theory [13], which according to Brogden explains that this Rasch model is usually used to measure items and subjects in research. The Rasch model has the advantage of producing a measurement scale with the same intervals to provide accurate and precise information about research subjects and the quality of the answers given by research subjects [14].

The Rasch model provides a detailed description of the structure of the instrument scale being measured [15]. This Rasch model is based on two main principles, namely the ability of the subject to a question and the ability to state the relationship that occurs between the ability of the subject in a question to other abilities. In addition, according to [16]this Rasch model has the advantage of being able to provide accurate information when testing an instrument.

Based on these considerations, the researcher wants to know the quality of the test instrument that will be used to test the level of self-determination of students who are teenagers using the Rasch model approach. The tool or software used in this research is Winstep version 3.73 software. Winstep software is a computational tool for the Rasch model to analyze scores generated from test instruments [17].

2. Methods

Research Design

This study uses a quantitative research method with a cross-sectional research design. This instrument is distributed within one week once

Participants

The subjects of this study were students of Senior High School Bandung, Indonesia who were around 16-17 years old. This age range is included in adolescence as explained that youth is the stage where individuals are 11-18 years old. The samples in this study were 125 students consisting of 59 male students and 66 female students. The research sample can be seen in table 1. The technique used in this study was purposive sampling.

Table 1. Participants.

Senior High School	Major	Gender		Amount
		Male	Female	
Regional Bandung, Indonesia	IPA (Ilmu Pengetahuan Alam)	44	48	92
	IPS (Ilmu Pengetahuan Sosial)	15	18	33
		59	66	125
	Total	59	66	125

Instruments

Theory

Self-determination refers to the results of a study by Richard M. Ryan and Edward L. Deci that self-determination is the ability to identify and achieve goals based on knowledge and an individual's assessment of himself. **Aspects,** The self-determination development construct refers to the results of Ryan and Deci's theoretical study of formulating an individual's ability to achieve goals based on self-assessments. Self-determination is influenced by three aspects, namely competence, autonomy, and relatedness.

Data Analysis

The data analysis procedure using the Rasch model was assisted by Winstep software version 3.73. From the output of the Winsteps software, several item parameters are obtained that fit the Rasch model. The steps are first, developing an instrument which includes measuring unidimensionality to assess whether the developed instrument can measure what it should measure, namely self-determination. Then, analyze the item items to determine the level of difficulty of the item items and their suitability of the item items. Finally, the instrument will be analyzed as a whole to determine its validity and reliability.

3. Results

The results of the student's Self Determination instrument using the Rasch model were analyzed based on the aspects of unidimentionality, item analysis (difficulty level of item items and level of suitability of item items), and instrument analysis which is described as follows.

Unidimentionality

Unidimensionality analysis identifies several dimensions that are measured using the instrument. This analysis uses the output of table 23 in the winstep application version 3.73 with respect to the raw variance explained by measures and unexplained variance in 1st to 5th contrast of residual. The unidimensionality of measurement can be proven if the raw variance explained by measure is ≥ 20% with the general criterion of interpretation that is sufficient if 20-40%. It's good if it's 40-60% and it's great if it's above 60%. And if the unexplained variance in 1st to 5th is <15% respectively.

Table 2. Unidimentionality.

No	Description	Value 1	Value 2	Value 3	Value 4
1	Total raw variance in observations	68.6	100.0%		100.0%
2	Raw variance explained by measures	9.6	14.0%		14.0%
3	Raw variance explained by persons	0.3	0.5%		0.5%
4	Raw Variance explained by items	9.3	13.5%		13.5%

5	Raw unexplained variance (total)	59.0	86.0%	100.0%	86.0%
6	Unexplained variance in 1st contrast	3.7	5.5%	6.3%	
7	Unexplained variance in 2nd contrast	3.2	4.6%	5.3%	
8	Unexplained variance in 3rd contrast	3.0	4.4%	5.1%	
9	Unexplained variance in 4th contrast	2.8	4.0%	4.7%	
10	Unexplained variance in 5th contrast	2.7	3.9%	4.5%	
10	Unexplained variance in 5th contrast	2.7	3.9%	4.5%	

Based on table 2., the raw variance explained by measures 14.0% is included in the less category. Meanwhile, the unexplained variance in 1st to 5th contrast of residual sequentially is Unexplained variance in 1st contrast of 5.5%; Unexplained variance in 2nd contrast 4.6%; Unexplained variance in 3rd contrast of 4.4%; Unexplained variance in 4th contrast of 4.0%; and Unexplained variance in 5th contrast of 3.9%.

Item Analysis

This item analysis includes the level of difficulty (item measure) and the level of suitability of the item (item fit).

Item Difficulty Level

The difficulty level of item items can be seen from the table of 13 item measure orders in the Winstep software. From this table, it is known that the standard deviation value or standard deviation is 1.25. If this standard deviation value (SD) is combined with the average logit value, the item difficulty level can be grouped into the very difficult category (> +1.25 SD), the difficult category (0.0 logit +1.25 SD), the easy category (0.0 logit -1.25 SD), and very easy category (<-1.25 SD). Thus, the value limit for the very difficult category is > 1.25. Difficult categories 0.0-1.25. Easy category 0.0-(-1.25). And the very easy category is < -1.25.

Table 3. Item Measure Order.

Entrance Number	Total score	Measure	Model standard error	Infit		Outfit		Point measure correlation		Exact observed, %	Match expected, %	Item
				Mean-square	*Zstandard*	Mean-square	*Zstandard*	Correlation	Expected value			
19	0	4,05	1,82	Maximum measure				0	0	100	100	19
31	1	2,86	1	1	0,3	1	0,3	0,01	0	99,2	99,2	31
25	2	2,15	0,71	1	0,2	1	0,2	0,01	0	98,4	98,4	25
27	2	2,15	0,71	1	0,2	1	0,2	0,01	0	98,4	98,4	27
37	2	2,15	0,71	1	0,2	1	0,2	0,01	0	98,4	98,4	37
2	3	1,74	0,58	1	0,2	1	0,2	0,01	0	97,6	97,6	2
40	3	1,74	0,58	1	0,2	1,05	0,3	-0,56	0	97,6	97,6	40
56	3	1,74	0,58	1	0,2	1	0,2	0,01	0	97,6	97,6	56

13	4	1,45	0,51	1	0,2	1	0,2	0,02	0	96,8	96,8	13
23	4	1,45	0,51	1	0,2	1	0,2	0,02	0	96,8	96,8	23
1	5	1,21	0,46	1	0,1	1	0,1	0,02	0	96	96	1
38	5	1,21	0,46	1	0,1	1	0,1	0,02	0	96	96	38
15	6	1,02	0,42	1	0,1	1	0,1	0,02	0	95,2	95,2	15
49	8	0,72	0,37	1	0,1	1	0,1	0,02	0	93,6	93,6	49
55	8	0,72	0,37	1	0,1	1	0,1	0,02	0	93,6	93,6	55
32	9	0,59	0,35	1	0,1	1	0,1	0,02	0	92,8	92,8	32
33	9	0,59	0,35	1	0,1	1	0,1	0,02	0	92,8	92,8	33
16	10	0,48	0,33	1	0,1	1	0,1	0,03	0	92	92	16
47	10	0,48	0,33	1	0,1	1	0,1	0,03	0	92	92	47
29	11	0,37	0,32	1	0,1	1,01	0,1	-0,28	0	91,2	91,2	29
43	11	0,37	0,32	1	0,1	1	0,1	0,03	0	91,2	91,2	43
11	12	0,28	0,3	1	0,1	1	0,1	0,03	0	90,4	90,4	11
14	13	0,19	0,29	1	0,1	1	0,1	0,03	0	89,6	89,6	14
30	13	0,19	0,29	1	0,1	1	0,1	0,03	0	89,6	89,6	30
53	13	0,19	0,29	1	0,1	1	0,1	0,03	0	89,6	89,6	53
10	14	0,11	0,28	1	0,1	1	0,1	0,03	0	88,8	88,8	10
34	14	0,11	0,28	1	0,1	1	0,1	0,03	0	88,8	88,8	34
7	15	0,03	0,28	1	0,1	1	0,1	0,03	0	88	88	7
39	15	0,03	0,28	1	0,1	1	0,1	0,03	0	88	88	39
45	15	0,03	0,28	1	0,1	1	0,1	0,03	0	88	88	45
3	16	-0,05	0,27	1	0,1	1	0,1	0,03	0	87,2	87,2	3
51	16	-0,05	0,27	1	0,1	1,01	0,1	-0,23	0	87,2	87,2	51
58	16	-0,05	0,27	1	0,1	1	0,1	0,03	0	87,2	87,2	58
44	18	-0,18	0,25	1	0,1	1	0,1	0,04	0	85,6	85,6	44
48	18	-0,18	0,25	1	0,1	1	0,1	0,04	0	85,6	85,6	48
50	20	-0,31	0,24	1	0,1	1	0,1	0,04	0	84	84	50
8	21	-0,36	0,24	1	0,1	1,01	0,1	-0,19	0	83,2	83,2	8
20	21	-0,36	0,24	1	0,1	1	0,1	0,04	0	83,2	83,2	20
59	22	-0,42	0,23	1	0,1	1	0	0,04	0	82,4	82,4	59
6	23	-0,47	0,23	1	0	1	0	0,04	0	81,6	81,6	6
36	23	-0,47	0,23	1	0	1	0	0,04	0	81,6	81,6	36
42	24	-0,53	0,23	1	0	1	0	0,04	0	80,8	80,8	42

21	25	-0,58	0,22	1	0	1	0	0,04	0	80	80	21
12	26	-0,63	0,22	1	0	1	0	0,04	0	79,2	79,2	12
52	26	-0,63	0,22	1	0	1	0	0,04	0	79,2	79,2	52
18	27	-0,68	0,22	1	0,1	1	0,1	-0,17	0	78,4	78,4	18
60	31	-0,85	0,21	1	0	1	0	0,05	0,01	75,2	75,2	60
5	33	-0,94	0,2	1	0	1	0	0,05	0,01	73,6	73,6	5
24	34	-0,98	0,2	1	0	1	0	0,05	0,01	72,8	72,8	24
9	37	-1,1	0,2	1	0	1	0	0,06	0,01	70,4	70,4	9
28	39	-1,17	0,19	1	0	1	0	0,06	0,01	68,8	68,8	28
22	41	-1,25	0,19	1	0	1	0,1	-0,12	0,01	67,2	67,2	22
54	42	-1,28	0,19	1	0	1	0	0,06	0,01	66,4	66,4	54
57	44	-1,35	0,19	1	0	1	0	0,06	0,01	64,8	64,8	57
4	45	-1,39	0,19	1	0	1	0,1	-0,12	0,01	64	64	4
46	53	-1,66	0,18	1	0,1	1	0,1	-0,1	0,01	57,6	57,6	46
26	58	-1,82	0,18	1	-0,1	1	-0,1	0,08	0,01	53,6	53,6	26
17	65	-2,04	0,18	1	-0,1	1	-0,1	0,09	0,01	52,8	52	17
35	69	-2,17	0,18	1	0,1	1	0,1	-0,08	0,01	55,2	55,2	35
41	76	-2,4	0,18	1	0	1	0	0,11	0,01	60,8	60,8	41
Mean	20,8	0,07	0,35	1	0,1	1	0,1			83,7	83,7	
Standard deviation	17,6	1,25	0,25	0	0,1	0,01	0,1			12,5	12,5	

Based on the logit value of the items in table 3. item measure order the level of suitability of the items, sequentially based on the level of suitability, from the most difficult item to the easiest. It is known that there are 10 items that fall into the very difficult category, namely items 19, 31, 25, 27, 37, 2, 40, 56, 13, 23. There are 20 items that fall into the difficult category, namely items 1, 38, 15, 49, 55, 32, 33, 16, 47, 29, 43, 11, 14, 30, 53, 10, 34, 7, 39, 45, there are 22 items that fall into the easy category, namely items 3, 51, 58, 44, 48, 50, 8, 20, 59, 6, 36, 42, 21, 12, 52, 18, 60, 5, 24, 9, 28, 22, and there are 8 categories of items that are very easy, namely items 54, 57, 4, 46, 26, 17, 35, 41.

Based on the analysis of the difficulty level of the items, it is known that there are 10 items which are in the very difficult category, 20 items which are in the difficult category, 22 items which are in the easy category, and there are 8 categories of items which are very easy.

Item Suitability Level

At the suitability level of the items, the items are interpreted to function normally to measure self-determination so that there are no misconceptions among individuals about the items studied based on data processing using Winstep software in table 10.1, namely fit order items. Based on table 10.1, fit order items can be analyzed based on the Mean-square, Z*standard*, and point measure correlation columns. The criteria for examining the suitability of item fit or item misfit (misfit), namely the Mean-square outfit scores > 0.5 and < 1.5, are closer to 1 the better.

Outfit Z*standard* > -2.0 and < 2.0, the closer to 0 the better. Point measure correlation > 0.4 and < 0.85. Items can be reviewed in a fit manner if they meet at least 1 of the 3 criteria mentioned above.

Table 4. Item Fit Order.

Entrance Number	Total Score	Total Count	Measure	Model StandardError	Infit		Outfit		Point measure correlation		Exact observed, %	Match expected, %	Item
					Mean-square	Z*standard*	Mean-square	Z*standard*	Correlation	Expected value			
40	3	125	1,74	0,58	1	0,2	1,05	0,3	A-.56	0	97,6	97,6	40
29	11	125	0,37	0,32	1	0,1	1,01	0,1	B-.28	0	91,2	91,2	29
51	16	125	-0,05	0,27	1	0,1	1,01	0,1	C-.23	0	87,2	87,2	51
8	21	125	-0,36	0,24	1	0,1	1,01	0,1	D-.19	0	83,2	83,2	8
18	27	125	-0,68	0,22	1	0,1	1	0,1	E-.17	0	78,4	78,4	18
22	41	125	-1,25	0,19	1	0	1	0,1	F-.12	0,01	67,2	67,2	22
4	45	125	-1,39	0,19	1	0	1	0,1	G-.12	0,01	64	64	4
46	53	125	-1,66	0,18	1	0,1	1	0,1	H-.10	0,01	57,6	57,6	46
35	69	125	-2,17	0,18	1	0,1	1	0,1	I-.08	0,01	55,2	55,2	35
1	5	125	1,21	0,46	1	0,1	1	0,1	J .02	0	96	96	1
2	3	125	1,74	0,58	1	0,2	1	0,2	K .01	0	97,6	97,6	2
13	4	125	1,45	0,51	1	0,2	1	0,2	L .02	0	96,8	96,8	13
23	4	125	1,45	0,51	1	0,2	1	0,2	M .02	0	96,8	96,8	23
25	2	125	2,15	0,71	1	0,2	1	0,2	N .01	0	98,4	98,4	25
27	2	125	2,15	0,71	1	0,2	1	0,2	O .01	0	98,4	98,4	27
31	1	125	2,86	1	1	0,3	1	0,3	P .01	0	99,2	99,2	31
37	2	125	2,15	0,71	1	0,2	1	0,2	Q .01	0	98,4	98,4	37
56	3	125	1,74	0,58	1	0,2	1	0,2	R .01	0	97,6	97,6	56
3	16	125	-0,05	0,27	1	0,1	1	0,1	S .03	0	87,2	87,2	3
11	12	125	0,28	0,3	1	0,1	1	0,1	T .03	0	90,4	90,4	11
15	6	125	1,02	0,42	1	0,1	1	0,1	U .02	0	95,2	95,2	15
7	15	125	0,03	0,28	1	0,1	1	0,1	V .03	0	88	88	7
10	14	125	0,11	0,28	1	0,1	1	0,1	W .03	0	88,8	88,8	10

14	13	125	0,19	0,29	1	0,1	1	0,1	X .03	0	89,6	89,6	14
16	10	125	0,48	0,33	1	0,1	1	0,1	Y .03	0	92	92	16
32	9	125	0,59	0,35	1	0,1	1	0,1	Z .02	0	92,8	92,8	32
45	15	125	0,03	0,28	1	0,1	1	0,1	z .03	0	88	88	45
47	10	125	0,48	0,33	1	0,1	1	0,1	y .03	0	92	92	47
49	8	125	0,72	0,37	1	0,1	1	0,1	x .02	0	93,6	93,6	49
53	13	125	0,19	0,29	1	0,1	1	0,1	w .03	0	89,6	89,6	53
55	8	125	0,72	0,37	1	0,1	1	0,1	v .02	0	93,6	93,6	55
6	23	125	-0,47	0,23	1	0	1	0	u .04	0	81,6	81,6	6
12	26	125	-0,63	0,22	1	0	1	0	t .04	0	79,2	79,2	12
21	25	125	-0,58	0,22	1	0	1	0	s .04	0	80	80	21
36	23	125	-0,47	0,23	1	0	1	0	r .04	0	81,6	81,6	36
42	24	125	-0,53	0,23	1	0	1	0	q .04	0	80,8	80,8	42
44	18	125	-0,18	0,25	1	0,1	1	0,1	p .04	0	85,6	85,6	44
48	18	125	-0,18	0,25	1	0,1	1	0,1	o .04	0	85,6	85,6	48
50	20	125	-0,31	0,24	1	0,1	1	0,1	n .04	0	84	84	50
58	16	125	-0,05	0,27	1	0,1	1	0,1	m .03	0	87,2	87,2	58
59	22	125	-0,42	0,23	1	0,1	1	0	l .04	0	82,4	82,4	59
5	33	125	-0,94	0,2	1	0	1	0	k .05	0,01	73,6	73,6	5
9	37	125	-1,1	0,2	1	0	1	0	j .06	0,01	70,4	70,4	9
24	34	125	-0,98	0,2	1	0	1	0	i .05	0,01	72,8	72,8	24
52	26	125	-0,63	0,22	1	0	1	0	h .04	0	79,2	79,2	52
28	39	125	-1,17	0,19	1	0	1	0	g .06	0,01	68,8	68,8	28
60	31	125	-0,85	0,21	1	0	1	0	f .05	0,01	75,2	75,2	60
54	42	125	-1,28	0,19	1	0	1	0	e .06	0,01	66,4	66,4	54
57	44	125	-1,35	0,19	1	0	1	0	d .06	0,01	64,8	64,8	57
	Better	Fitting	Omitted										
17	65	125	-2,04	0,18	1	-0,1	1	-0,1	c .09	0,01	52,8	52	17
26	58	125	-1,82	0,18	1	-0,1	1	-0,1	b .08	0,01	53,6	53,6	26
41	76	125	-2,4	0,18	1	0	1	0	a .11	0,01	60,8	60,8	41
Mean	20,8	125	0,07	0,35	1	0,1	1	0,1			83,7	83,7	
Standard	17,6	0	1,25	0,25	0	0,1	0,01	0,1			12,5	12,5	

devia tion								

For the first category, based on the Mean-square outfit value, it is known that all 60 items are appropriate. Then, the second category is based on the value of the Z*standard* outfit, all 60 items are appropriate. Furthermore, the third category is based on the value of the outfit point measure correlation, all 60 items are not appropriate.

Instrument Analysis

For instrument analysis, the information presented is based on Output Tables 3.1. Summary Statistics on the Winstep application version 3.73. In detail, the analysis of the instrument can be seen in table 5.

Table 5. Summary Statistic.

	Total score	**Count**	**Measure**	**Model error**	**Infit**		**Outfit**	
					Mean-square	***Zstandard***	**Mean-square**	***Zstandard***
Mean	10	60	-1.96	0.37	1	0	1	0
Standard deviation	0.1	0	0.01	0	0.16	0.7	0.52	0.9
Maximun	10	60	-1.96	0.39	1.54	2.2	4.16	4.1
Minimum	9	60	-2.11	0.37	0.69	-1.5	0.43	-1.4
Real root-mean-square deviation	.39	True standard deviation	.00	Separation	.00		Person reliability	.00
Model root-mean-square deviation	.37	True standard deviation	.00	Separation	.00		Person reliability	.00
Standard error of person mean = .00								

	Total score	**Count**	**Measure**	**Model Error**	**Infit**		**Outfit**	
					Mean-square	***Zstandard***	**Mean-square**	***Zstandard***
Mean	21.2	125	0	0.32	1	0.1	1	0.1
Standard deviation	17.5	0	1.15	0.17	0	0.1	0.01	0.1
Maximum	76	125	2.86	1	1	0.3	1.05	0.3
Minimum	1	125	-2.4	0.18	1	-0.1	1	-0.1
Real root-mean-square deviation	0.36	True standard deviation	1.09	Separation	3.01		Item reliability	0.90

Model root-mean-square deviation	0.36	True standard deviation	1.09	Separation	3.01	Item reliability	0.90

Standard error of item mean = 0.15

4. Discussion

The important considerations in designing a measurement in an instrument is to ensure that the measuring instrument is unidimensional. Unidimensionality is an important thing to do because to find out whether the instrument measures what it should measure [18]. Unidimensionality considers items in a measuring tool to measure a single ability [19].The dimensionality provides a brief procedure for checking the dimensions of measuring instruments. Basic component analysis based on PCA (Principal Component Analysis) in the residual procedure allows the Rasch measurement model to recognize a side factor that may be a unidimensional threat.

Unidimensionality analysis is an important measurement to evaluate whether the instrument that has been developed is able to measure what it should measure. Unidimensionality analysis shows how the instrument can evaluate many dimensions. This analysis uses Table 23 in the Winstep software by taking the Raw Variance values explained by measure and Unexplained Variance at contrast 1 to 5 If the Raw Variance is explained with a size of 20% with a note that the interpretation requirements are: 1) sufficient if 20-40%, 2) good if 40-60%, and 3) very good if above 60% and the unexplained variance value is said to have fulfilled requirements if it is less than 15%, which means that the level of independence of the instrument can be said to be ideal [20].Based on this explanation, the self-determination instrument is in the sufficient category in measuring all variables because it is still less than 20% or 14.0%. Meanwhile, the value of unexplained variances which amounted to 3.9% -5.5% indicated that it met the requirements, namely less than 15% so that the level of independence of the instrument was said to be ideal.

Furthermore, the results of the analysis of the difficulty level of the questions were dominated by questions that were in the difficult and easy categories. Based on the Rasch model, these items have a good level of difficulty because the questions are more dominated by questions that are in the moderate category, which means the questions are not too difficult and not too easy. This is also one of the advantages of using the Rasch model because the Rasch model can provide detailed information about the level of difficulty of the item on a given instrument [21].

Based on the results of the analysis of the item difficulty level, the results showed that both in terms of items and respondents showed differences in understanding of the items in each student which were analyzed using the Rasch model. The states that a question that can be answered correctly by smart students and students who are less intelligent is a question that is not good because it has no distinguishing power [22]. However, this instrument shows that the level of difficulty of the items in the self-determination instrument can already be categorized based on the level of difficulty, it's just that in each category the distribution of the difficulty levels of the items is still uneven.

Hereafter,iItem fit analysis was carried out to find out whether the items used to measure self-determination function normally (fit) or not (misfit). Item fit explains whether the items are used to determine the level of suitability of the items normally or not. If items are found that do not look fit, it appears that there is a misunderstanding in these items [23]. Furthermore, the z-standard outfit values, outfit means square, and point measures correlation values are said to be accepted if the item fit level meets the criteria used. Based on the analysis of the suitability of the item items (item fit), the results show that all 60 items are said to be accepted or normal (fit) because they meet at least one of the three criteria used.

The suitability analysis of these items is included in the content validity analysis which functions to see the quality of the item's suitability level with the model. As already explained, the items are said to be valid or accepted if they meet at least 2 criteria and are corrected if they meet one of the three criteria, and are discarded if none meet

these criteria. The suitability value of the item is greatly influenced by the amount of data, the larger the sample used, the better the level of suitability [24].

lattermost, the person measure shows the average score of all participants in working on the item items of the student self-determination data disclosure instrument. The average person value which is greater than the average item (where the average item is 0.00 logit) indicates that the participant's ability is generally greater than the difficulty of the instrument item items. In line with this opinion, suggested that an average value that is greater than the logit indicates a tendency for the respondent's ability to be greater than the level of difficulty of the questions or respondents tend to be able to answer the statements in the instrument [25].

The Cronbach Alpha value, which represents the interaction between the person and the item items as a whole, is 0.00 which is in the bad category because the value is below 0.5. Furthermore, the personal reliability value is 0.00 as an indicator of the consistency of the respondents' answers, including the low category. While the item reliability of 0.90 as an indicator of the quality of the item items in the instrument, is classified as a strong category.

Other data in table 4 that can be used are Infit Mean-square and Outfit Mean-square in both the Person and Item tables. Based on the Person table, it is known that the average values of Infit Mean-square and Outfit Mean-square are 1.00 and 1.00, respectively. Meanwhile, based on the Item table, it is known that the average Infit Mean-square and Outfit Mean-square are 1.00 and 1.00, respectively. The criterion is, the closer to number 1 the better, because the ideal value is 1. Thus, the average person and item are close to the ideal criteria.

Meanwhile, with regard to Infit Z*standard* and Outfit Z*standard*, the average scores for the person are 0.0 and 0.0, respectively. While the value of Infit Z*standard* and Outfit Z*standard* items are 0.1 and 0.1 respectively. The ideal Z*standard* value is 0, the closer to 0, the better. Thus, it can be said that the quality of the person and item is good.

Last, with regard to the separation or grouping of persons and items, individual separation shows how well a set of items in the student self-determination instrument spreads across the logit ability range. The greater the individual separation, the better the instrument is prepared because the items in it are able to reach individuals with high to low levels of ability. Meanwhile, item separation shows how large the sample subject to measurement is spread along a linear interval scale. The higher the grain separation, the better the measurement will be. This index is also useful for defining the meaningfulness of the construct being measured.

From the output of table 5, it is known that the separation for persons is 0.00 and for items is 3.01. The greater the separation value, the better the quality of the person and instrument as a whole. The separation value is calculated more accurately through the formula: H= {(4 x separation) + 1)/3. Thus the separation value for persons is 0.39 rounded to 0, while the separation for items is 4.34 rounded to 4. This implies that research participants have a variety of abilities that can be categorized into 0 groups. Meanwhile, the level of difficulty of the items spread out into 4 groups starting from the easiest to the most difficult group.

Analysis of self-determination instruments is proven to be able to determine the dynamics of individual behavior, this is in accordance with research [26].As seen from table 5, there is some information obtained. First, the Cronbach Alpha value obtained is included in the bad category. This shows that the reliability of interaction between students and item items as a whole has poor quality. Then, the personal reliability value obtained is in a low category. This shows that students have weak consistency in answering questions. Furthermore, the reliability value of the item is in a strong category. Furthermore, there is an infit value that shows close to 1, meaning that this condition is feasible to measure. Finally, there is an outfit value that shows close to 0, which means that the value is logical because it is close to 0.

5. Conclusion

The reliability of an instrument refers to the stability of a measure and consistency in measurement. This self-determination instrument is very useful for expressing self-determination in students. The Cronbach Alpha value, which measures how individuals interact with item items as a whole, is categorized as bad. The Person Reliability value is also in the low category which indicates that the respondent's answers are not consistent. Meanwhile,

Item Reliability is classified as a strong category as an indicator of item quality. Then, the Item Fit value is included in the normal category and the suitability of the items is appropriate. This self-determination instrument can distinguish differences in individual abilities. However, there is still much to be improved from this self-determination instrument. Therefore, there is still a need for improvement and development for this instrument so that it can become an instrument that can measure the validity and reliability of individual self-determination.

6. Acknowledgment

Thanks go to all those people who have contributed to this research.

References

[1] R. M. Ryan and E. L. Deci, *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications, 2017.

[2] U. C. Millner, T. Woods, K. Furlong-norman, E. S. Rogers, and D. Rice, "Socially Valued Roles , Self-Determination , and Community Participation among Individuals Living with Serious Mental Illnesses," pp. 32–45, 2019, doi: 10.1002/ajcp.12301.

[3] N. M. Aitken, L. G. Pelletier, and D. E. Baxter, "Doing the Difficult Stuff: Influence of Self-Determined Motivation Toward the Environment on Transportation Proenvironmental Behavior," *Ecopsychology*, vol. 8, no. 2, 2016, doi: 10.1089/eco.2015.0079.

[4] D. Suwanda, D. Suryana, U. Suherman, N. A. Nadhirah, T. H. Dahlan, and A. B. Ahmad, "Effect of Tacit Knowledge on Student Self-Determination in Indonesia: A Mixed-Methods Study," *Educ Res Int*, vol. 2023, 2023, doi: 10.1155/2023/6122547.

[5] H. Y. Muslihin, "Analysis of the Reliability and Validity of the Self-Determination Questionnaire Using Rasch Model," *International Journal of Instruction*, vol. 15, no. 2, pp. 207–222, 2022, doi: 10.29333/iji.2022.15212a.

[6] E. L. Deci and R. M. Ryan, *Self-Determination Theory [Basic Psychological Needs in Motivation, Development, and Wellness*. New York: The Guilford Press, 2017. [Online]. Available: https://www.guilford.com

[7] D. Suryana, "Self Determination Development in Multicultural Society," *JOMSIGN: Journal of Multicultural Studies in Guidance and Counseling*, vol. 2, no. 2, pp. 134–147, 2019, doi: 10.17509/jomsign.v2i2.10834.

[8] D. Indihadi, D. Suryana, and A. B. Ahmad, "the Analysis of Construct Validity of Indonesian Creativity Scale Using Rasch Model," *Creativity Studies*, vol. 15, no. 2, pp. 560–576, 2022, doi: 10.3846/cs.2022.15182.

[9] D. A. M. Lidinillah, M. Aprilia, D. Suryana, and A. B. Ahmad, "Development of creativity instrument through Rasch model analysis," *Universal Journal of Educational Research*, vol. 8, no. 4, pp. 1620–1627, 2020, doi: 10.13189/ujer.2020.080455.

[10] M. M. Mohamad, N. L. Sulaiman, L. C. Sern, and K. M. Salleh, "Measuring the Validity and Reliability of Research Instruments," *Procedia Soc Behav Sci*, vol. 204, 2015, doi: 10.1016/j.sbspro.2015.08.129.

[11] K. Karlimah, D. Andriani, and D. Suryana, "Development of Mathematical Anxiety Instruments with a Rasch Model Analysis," *Open Psychol J*, vol. 13, no. 1, 2020, doi: 10.2174/1874350102013010181.

[12] N. Rusmana, A. Hafina, R. O. Wardhany, and D. Suryana, "Students' Confidence Instrument Analysis in Poetry Learning through Rasch Model," *Open Psychol J*, vol. 13, no. 1, pp. 289–299, 2020, doi: 10.2174/1874350102013010289.

[13] D. Andrich, "An extension of the rasch model for ratings providing both location and dispersion parameters," *Psychometrika*, vol. 47, no. 1, pp. 105–113, 1982, doi: 10.1007/BF02293856.

[14] A. Taufik, E. S. Yudha, and D. Suryana, "The Raven ' s Advanced Progressive Matrices in Education Assessment with a Rasch Analysis," vol. 7, no. 9, pp. 1996–2002, 2019, doi: 10.13189/ujer.2019.070921.

[15] S. Yusuf, "Rasch analysis of the Indonesian mental health screening tools," *Open Psychology Journal*, vol. 14, no. 1, pp. 198–203, 2021, doi: 10.2174/1874350102114010198.

[16] S. Yusuf, N. Budiman, E. S. Yudha, D. Suryana, and S. M. J. B. Yusof, "Rasch Analysis of the Indonesian Mental Health Screening Tools," *Open Psychol J*, vol. 14, no. 1, pp. 198–203, 2021, doi: 10.2174/1874350102114010198.
[17] B. Sumintono, "Rasch Model Measurements as Tools in Assesment for Learning," 2018. doi: 10.2991/icei-17.2018.11.
[18] I. Neumann, "Evaluating instrument quality in science education: Rasch-based analyses of a nature of science test," *Int J Sci Educ*, vol. 33, no. 10, pp. 1373–1405, 2011, doi: 10.1080/09500693.2010.511297.
[19] L. Nur, A. Hafina, N. Rusmana, D. Suryana, and A. Abdul Malik, "Basic Motor Ability: Aquatic Learning for Early Childhood," *J Phys Educ*, vol. 8, no. 2, pp. 51–54, 2019.
[20] W. Boone, "Rasch analysis for instrument development: Why,when,and how?," *CBE Life Sci Educ*, vol. 15, no. 4, 2016, doi: 10.1187/cbe.16-04-0148.
[21] A. Rouquette, "Differential Item Functioning (DIF) in composite health measurement scale: Recommendations for characterizing DIF with meaningful consequences within the Rasch model framework," *PLoS One*, vol. 14, no. 4, 2019, doi: 10.1371/journal.pone.0215073.
[22] Y. J. Vermetten, J. D. Vermunt, and H. G. Lodewijks, "Powerful learning environments? How university students differ in their response to instructional measures," *Learn Instr*, 2002, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0959475201000135
[23] W. Wang, "Item parameter recovery, standard error estimates, and fit statistics of the WINSTEPS program for the family of Rasch models," *Educ Psychol Meas*, vol. 65, no. 3, pp. 376–404, 2005, doi: 10.1177/0013164404268673.
[24] L. Ma, "Stability of the philadelphia geriatric center morale scale: A multidimensional item response model and rasch analysis," *Journal of Applied Gerontology*, vol. 29, no. 4, pp. 475–493, 2010, doi: 10.1177/0733464809339623.
[25] D. Andrich, "A General form of rasch's Extended logistic Model for Partial credit Scoring," *Applied Measurement in Education*, vol. 1, no. 4, pp. 363–378, 1988, doi: 10.1207/s15324818ame0104_7.
[26] R. M. Ryan and E. L. Deci, "Toward a social psychology of assimilation: Self-determination theory in cognitive development and education," *Self-Regulation and Autonomy: Social and Developmental Dimensions of Human Conduct*, pp. 191–207, 2005, doi: 10.1017/CBO9781139152198.014.

1.
2.