



## Interest STEM based on Family Background for Secondary School Students: Validity and Reliability Instrument Using Rasch Model Analysis

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### Abstract

The decline of student interest in STEM fields has been the subject of much discussion for educators and researchers. Therefore, a good gauge is required to ensure that the student is in good condition. The purpose of this study was to examine the validity and reliability of student interest in the STEM based on family background instrument, which consists of 50 items. The validity and reliability of the instrument were examined using Rasch Model Analysis (RMA), aided by Winsteps software version 3.71.0.1. A total of 150 students involved in this research. The output of instrument validity with RMA obtained (a) person and item reliability, (b) item difficulty level, (c) polarity item, (d) misfit item, (e) unidimensional, and (f) person map item. The findings showed that all the 50 items are reliable, valid, and compatible to measure student interest in the STEM based on family background. It is hoped that this instrument will be useful for teachers and researchers to apply in other studies. Future studies are needed to examine the effectiveness of student outcomes using the student interest in the STEM based on family background instrument.

**Keywords:** Validity, Reliability, Instrument, Interest STEM, Background, Rash model analysis

### 1. Introduction

The development of age requires that students and teachers have the skills to meet the challenges of the 21st century. The teaching and learning (T&L) process with STEM integration is one of the topics that many countries discuss. Although the demands of age require teachers to have STEM-related pedagogical knowledge, not many teachers can incorporate the T&L STEM method of learning. This constraint arises because teachers lack the guidance in STEM knowledge. As such, this condition affects students' interest in STEM.

Increasing people in STEM can improve the economic development of many countries (Schwab & Sala-i-Martin, 2012). However, the reality in the field showed that students are becoming less interested in STEM, such as Europe (from 24.8% in 1999 to 22.7 in 2005). 30% of Australian employers also have difficulty in recruiting qualified individuals to fill the jobs. The USA has a burden to find qualified applicants' capabilities to fill 600,000 jobs in the manufacturing industry (Business Europe, 2011; Healy et al., 2011; STEMconnector, 2012). Furthermore, students' interest in STEM can improve academic achievement. The process of teaching and learning in STEM encourages the students in cooperating, communication, critical thinking, and creative skills (Ergün, 2019). At the same time, Indonesian students have low achievement based on the result of the Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) (Shin et al., 2018). Based on the mean score of PISA 2018, Indonesian students' achievements in math and science were ranked 72nd and 70th out of 78 countries (Schleicher, 2019). Besides, the result of TIMSS 2015 showed that Indonesian 4th graders' scores in science and math were ranked 44th out of 47 and 49 participating countries (Mullis et al., 2016).

The family background has contributed a positive impact for the student to complete the educational stage, educational careers, and educational achievement (Salazar, Cebolla-Boado & Radl, 2019; Vergolini & Vlach, 2017). According to Salazar, Cebolla-Boado, and Radl (2019), the significance of parental influence takes into account students internalizing in academic performance. Similarly, parental education and occupations affect student decision-making in the mathematics and science fields (McGue, Rustichini & Iacono, 2017; Salazar, Cebolla-Boado & Radl, 2019). The students' interest in STEM can influence how parents talk to their children about STEM (Haden et al., 2014). Therefore, the family background is crucial



factors for student attainment; however, that matter of fact was unmeasured substantially (Marks & Mooi-Reci, 2016).

The issues discussed need to be taken into consideration as STEM education influences the nation's success, especially for secondary students. Students' interest in STEM can arise at the beginning of secondary level because, at this time, the student can develop their knowledge about the subject that they are most interested (Kier et al., 2014). The sample for this study is a secondary school student in grade 8. Therefore, a tool to gauge students' interest in STEM fields should be developed based on the instruments developed. An Instrument can be performed on a real study when it meets the validity and reliability of a measuring instrument.

The validity and reliability are a tool that measures the quality of instruments used in research. The type of validity performed in this study is content validity. Content validity is valued by experts in specific fields. The expert evaluates the study instrument in terms of the appropriateness of the construction to the item being created, the language, and the format used. Whereas, instrument reliability was analyzed using the Rasch model. Rasch Model is a tool that can measure the ability of respondents in answering items and measure the difficulty of the item (Rasch, 1980). The quality of reliability is determined by the Cronbach Alpha index. The approaching Cronbach Alpha value index ranges from 0 to 1 (Cronbach, 1951).

## 2. Objectives

The purpose of this study was to examine the validity and reliability of student interest in STEM based on the family background instrument using Rasch Model Analysis.

## 3. Methods

The paradigm used to analyze the validity and reliability of this instrument is to use quantitative methods. The population in this study were grade 8 students of Darul Mursyid Simanosor Julu, Indonesia, in the 2018/2019 academic year, consisting of 240 students. The random sampling method was applied to get the sample for this research. A total of 150 students involved in this research. Instruments conducted were questionnaires (Appendix) consisting of science (11 items), technology (11 items), engineering (11 items), mathematic (11 items), and family background (6 items). The analysis scales used are based on Likert in Table 1.

**Table 1** Scala Likert

Item Responses	Response Scale
Strongly Disagree	1
Disagree	2
Neither Agree nor Disagree	3
Agree	4
Strongly Agree	5

Content validity was conducted by two experts in education. In terms of construct validity, it was based on the results of the Exploratory Factor Analysis output with the SPSS 21 program. As the value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) is 0.631 (> 0.5), factor analysis can be performed. Based on the rotated component matrix output, the obtained distribution of items for each factor that has an eigenvalue of more than 1 (one) is six factors. Factor 1 (items 1-11), factor 2 (items 12-22), factor 3 (items 23-33), factor 4 (items 34-44), and factor 5 (items 45-50). Instrument reliability was tested using



Rasch model analysis using software Winsteps version 3.71.0.1. Rasch Model analysis is one way to find a valid survey result, and it is the simplest models. RM is a statistic method to examine the item difficulty such as person separation and reliability, item difficulty level, item fit, misfit item, and person-item.

#### 4. Results and Discussion

In the 21st century, most of the countries around the world have attempted to increase students' interest in science, technology, engineering, and mathematics (STEM). The interesting aspect is one of the significant factors for the student (Renninger & Su, 2012; Schunk & Mullen, 2012). STEM interventions have a positive impact on student attitude, problem-solving skills, and achievement (Siregar et al., 2019). Therefore, many researchers and educators emphasized the student to participate in a STEM field (Nugent et al., 2015; Oh, Jia, Lorentson, & LaBanca, 2013; Riegle-Crumb, Moore, & Ramos-Wada, 2011). According to Xie, Fang and Shauman (2015), it is found that students' interest in STEM was strongly influenced by family factors. Hence, the educators and researchers need questionnaires that have good validity and reliability to identify student interest in STEM based on family background.

Rasch Model Analysis (RMA) can determine the validity and reliability of students' interest in STEM instrument. The output involved the analysis of (i) person and item reliability, (ii) Item difficulty level, (iii) Polarity Item, (iv) Misfit Item, (v) Unidimensional, and (vi) Person map item. All descriptions of RMA output were discussed.

##### 4.1 Person and Item Reliability

The Rasch analysis can measure and explain that the person answered correctly or did answer the item (Boone, 2016). Table 2. showed 0.91 for person reliability and 0.97 for item reliability. The characters of person and item reliability have reached a maximum alpha (0.90) and recommended value (Streiner, 2003). Therefore, the item of student interest in STEM instrument can be used in studies.

**Table 2** Person and item reliability

Criteria	Person	Item
Reliability	0.91	0.97

##### 4.2 Item difficulty level

The logit scale value can determine the item difficulty level of questionnaire. According to Baker's (1985), there are five categories of item difficulty logits; (i) Very Easy (less than -2.0); (ii) Easy (-1.9 to -0.5); (iii) Medium (-0.4 to 0.4) and (iv) Hard (0.5 to 1.9); and (v) Very Hard (more than 2). Based on Table 3 the items are categorized into Hard (n = 11), Medium (n = 31), Easy (n = 7), Very Easy (n = 1), and Very Hard (n = 0).

**Table 3** Item difficulty level

Item	Logit value	Level
LB2	-2.51	Very Easy
LB3; LB4; LB5; LB6; S4; S5; and T4	-1.56 to -0.53	Easy
S1; S2; S3; S6; S7; S8; S9; S10; S11; T1; T2; T3; T5; T6; T7; T8; T10; E4; E5; E10; M1; M2; M3; M4; M5; M6; M7; M8; M10; M11; and LB1	-0.47 to 0.46	Medium
T9; T11; E1; E2; E3; E6; E7; E8; E9; E11; and M9	0.52 to 1.41	Hard

##### 4.3 Polarity Item

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PTMEA CORR value can examine the appropriateness of developing a construct with the item. The meaning of positive (+) value showed that the item measures the construct. However, when the value is negative (-) or zero, that item does not measure the construct (Bond & Fox, 2015; Linacre, 2018). If PTMEA CORR values are negative or zero, the researcher will eliminate or revise the items. Table 4 showed that the PTMEA CORR value was positive, which ranges from 0.21 to 0.60. Therefore, the item of student interest in STEM instrument is suitable for the construct.

**Table 4** Polarity Item

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	TOTAL MEASURE	MODEL S.E.	INFIT MNSQ	ZSTD	OUTFIT MNSQ	ZSTD	PT-MEASURE CORR.	EXP.	OBS%	EXP%	Item
50	647	150	-.75	.12	1.82	5.6	1.81	5.3	.21	.38	46.7	51.6	LB6
18	556	150	.30	.10	1.31	2.6	1.44	3.5	.25	.46	42.7	44.1	T7
48	631	150	-.53	.11	1.38	3.0	1.33	2.6	.31	.40	45.3	50.1	LB4
46	725	150	-2.51	.21	.91	-.4	.73	-1.2	.33	.22	84.0	84.2	LB2
2	626	150	-.47	.11	.93	-.6	.98	-.2	.33	.41	52.7	49.6	S2
49	694	150	-1.56	.15	1.31	2.0	1.22	1.3	.34	.30	69.3	65.7	LB5
45	621	150	-.41	.11	1.36	2.8	1.32	2.5	.35	.41	47.3	49.4	LB1
33	432	150	1.41	.09	1.42	3.5	1.47	3.9	.36	.50	38.7	41.7	E11
17	545	150	.40	.10	.87	-1.2	.92	-.7	.37	.47	46.7	43.6	T6
39	575	150	.11	.10	1.11	1.0	1.11	1.0	.38	.45	42.7	45.1	M6
4	643	150	-.69	.12	.86	-1.2	.87	-1.0	.38	.39	56.0	51.1	S4
22	532	150	.52	.10	1.29	2.5	1.32	2.7	.38	.47	28.7	43.1	T11
11	571	150	.15	.10	1.42	3.4	1.45	3.6	.38	.45	36.7	45.0	S11
15	651	150	-.80	.12	.86	-1.2	.89	-.9	.39	.38	58.0	52.0	T4
21	581	150	.04	.10	.98	-.1	.98	-.1	.39	.45	45.3	45.3	T10
16	620	150	-.39	.11	1.02	.2	1.07	.6	.39	.41	46.7	49.1	T5
5	652	150	-.82	.12	1.12	1.0	1.12	.9	.40	.38	48.7	52.3	S5
47	663	150	-.99	.13	.89	-.8	.86	-1.1	.41	.36	57.3	54.1	LB3
25	525	150	.59	.10	1.10	.9	1.12	1.1	.42	.48	35.3	42.7	E3
19	579	150	.06	.10	.95	-.4	1.00	.1	.42	.45	49.3	45.3	T8
7	590	150	-.05	.10	.94	-.5	.95	-.4	.43	.44	48.0	46.3	S7
26	553	150	.33	.10	.86	-1.3	.87	-1.2	.43	.46	44.7	43.9	E4
6	608	150	-.25	.11	.93	-.6	.96	-.3	.43	.42	51.3	48.2	S6
3	612	150	-.30	.11	.98	-.2	.99	.0	.44	.42	46.0	48.3	S3
9	568	150	.18	.10	.89	-1.0	.92	-.7	.44	.45	47.3	45.0	S9
24	515	150	.68	.10	.90	-.9	.93	-.6	.45	.48	45.3	42.6	E2
10	586	150	-.01	.10	.98	-.1	.95	-.4	.45	.44	54.0	45.8	S10
38	612	150	-.30	.11	1.22	1.8	1.23	1.9	.45	.42	40.7	48.3	M5
12	579	150	.06	.10	.92	-.7	.96	-.4	.46	.45	40.7	45.3	T1
44	558	150	.28	.10	1.29	2.5	1.30	2.6	.46	.46	30.0	44.2	M11
1	610	150	-.28	.11	.72	-2.7	.72	-2.6	.47	.42	54.7	48.2	S1
20	530	150	.54	.10	.87	-1.2	.88	-1.1	.47	.48	43.3	42.8	T9
34	572	150	.14	.10	.87	-1.2	.93	-.6	.47	.45	42.0	45.1	M1
29	526	150	.58	.10	.90	-.9	.91	-.9	.48	.48	42.0	42.7	E7
28	529	150	.55	.10	.77	-2.2	.78	-2.2	.48	.48	48.0	42.8	E6
8	594	150	-.10	.10	.92	-.6	.91	-.8	.49	.44	51.3	46.7	S8
14	593	150	-.08	.10	.93	-.6	.91	-.7	.49	.44	46.0	46.4	T3
32	548	150	.37	.10	.75	-2.4	.75	-2.4	.50	.47	56.0	43.6	E10
30	518	150	.65	.10	.91	-.9	.90	-.9	.51	.48	36.7	42.7	E8
41	560	150	.26	.10	.98	-.2	.97	-.3	.51	.46	46.0	44.5	M8
35	568	150	.18	.10	.82	-1.7	.81	-1.8	.52	.45	48.7	45.0	M2
40	539	150	.46	.10	.85	-1.4	.85	-1.4	.54	.47	44.7	43.3	M7
23	523	150	.61	.10	.82	-1.7	.85	-1.4	.54	.48	50.0	42.7	E1
43	545	150	.40	.10	1.05	.5	1.03	.4	.54	.47	42.7	43.6	M10
37	602	150	-.18	.11	.91	-.7	.88	-1.1	.54	.43	51.3	47.1	M4
13	619	150	-.38	.11	.81	-1.7	.81	-1.7	.57	.41	52.0	49.1	T2
27	585	150	.00	.10	.84	-1.5	.85	-1.4	.58	.44	45.3	45.8	E5
31	485	150	.95	.09	.81	-1.8	.82	-1.8	.60	.49	47.3	42.2	E9
42	522	150	.62	.10	1.06	.6	1.05	.5	.60	.48	42.0	42.7	M9
36	541	150	.44	.10	.84	-1.5	.85	-1.4	.60	.47	50.7	43.5	M3

#### 4.4 Instrument validity: Misfit item

There are three things to keep in mind when determining the suitability and fit of an item: (i) checking the Outfit Mean Square (MNSQ) value, the range accepted values were  $0.5 < \text{MNSQ} < 1.5$ ; (ii) checking the Z-standard infit value (ZSTD), the received value is  $-2.0 < \text{ZSTD} < +2.0$ ; and (iii) checking the PTMEA CORR value, a value of  $0.4 < \text{PTMEA CORR} < 0.85$  (Boone, Staver & Yale, 2014). According to Table 5,

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item LB6 is outside the range of MNSQ values, while items that are outside the ZSTD range are items LB6, E11, S11, T7, LB4, LB1, T11, M11, E6, E10, and S1. Subsequently, all items are within the specified PTMEA CORR range value. When an item meets the MNSQ value, the ZSTD value can be ignored (Linacre, 2002; Bond & Fox, 2001). However, except Item LB6 that is less compatible with the Rasch model, all items meet the MNSQ value. The next step recommended for the researcher is to revise and refine item LB6 for using in the instrument.

**Table 5** Misfit item according to Infit MNSQ

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	ZSTD	OUTFIT MNSQ	ZSTD	PT-MEASURE CORR.	EXP.	OBS%	EXACT EXP%	MATCH	Item
50	647	150	-.75	.12	1.82	5.6	1.81	5.3	A .21	.38	46.7	51.6	LB6	
33	432	150	1.41	.09	1.42	3.5	1.47	3.9	B .36	.50	38.7	41.7	E11	
11	571	150	.15	.10	1.42	3.4	1.45	3.6	C .38	.45	36.7	45.0	S11	
18	556	150	.30	.10	1.31	2.6	1.44	3.5	D .25	.46	42.7	44.1	T7	
48	631	150	-.53	.11	1.38	3.0	1.33	2.6	E .31	.40	45.3	50.1	LB4	
45	621	150	-.41	.11	1.36	2.8	1.32	2.5	F .35	.41	47.3	49.4	LB1	
22	532	150	.52	.10	1.29	2.5	1.32	2.7	G .38	.47	28.7	43.1	T11	
49	694	150	-1.56	.15	1.31	2.0	1.22	1.3	H .34	.30	69.3	65.7	LB5	
44	558	150	.28	.10	1.29	2.5	1.30	2.6	I .46	.46	30.0	44.2	M11	
38	612	150	-.30	.11	1.22	1.8	1.23	1.9	J .45	.42	40.7	48.3	M5	
5	652	150	-.82	.12	1.12	1.0	1.12	.9	K .40	.38	48.7	52.3	S5	
25	525	150	.59	.10	1.10	.9	1.12	1.1	L .42	.48	35.3	42.7	E3	
39	575	150	.11	.10	1.11	1.0	1.11	1.0	M .38	.45	42.7	45.1	M6	
16	620	150	-.39	.11	1.02	.2	1.07	.6	N .39	.41	46.7	49.1	T5	
42	522	150	.62	.10	1.06	.6	1.05	.5	O .60	.48	42.0	42.7	M9	
43	545	150	.40	.10	1.05	.5	1.03	.4	P .54	.47	42.7	43.6	M10	
19	579	150	.06	.10	.95	-.4	1.00	.1	Q .42	.45	49.3	45.3	T8	
3	612	150	-.30	.11	.98	-.2	.99	.0	R .44	.42	46.0	48.3	S3	
21	581	150	.04	.10	.98	-.1	.98	-.1	S .39	.45	45.3	45.3	T10	
10	586	150	-.01	.10	.98	-.1	.95	-.4	T .45	.44	54.0	45.8	S10	
41	560	150	.26	.10	.98	-.2	.97	-.3	U .51	.46	46.0	44.5	M8	
2	626	150	-.47	.11	.93	-.6	.98	-.2	V .33	.41	52.7	49.6	S2	
6	608	150	-.25	.11	.93	-.6	.96	-.3	W .43	.42	51.3	48.2	S6	
12	579	150	.06	.10	.92	-.7	.96	-.4	X .46	.45	40.7	45.3	T1	
7	590	150	-.05	.10	.94	-.5	.95	-.4	Y .43	.44	48.0	46.3	S7	
14	593	150	-.08	.10	.93	-.6	.91	-.7	Y .49	.44	46.0	46.4	T3	
24	515	150	.68	.10	.90	-.9	.93	-.6	x .45	.48	45.3	42.6	E2	
34	572	150	.14	.10	.87	-1.2	.93	-.6	w .47	.45	42.0	45.1	M1	
9	568	150	.18	.10	.89	-1.0	.92	-.7	v .44	.45	47.3	45.0	S9	
8	594	150	-.10	.10	.92	-.6	.91	-.8	u .49	.44	51.3	46.7	S8	
17	545	150	.40	.10	.87	-1.2	.92	-.7	t .37	.47	46.7	43.6	T6	
37	602	150	-.18	.11	.91	-.7	.88	-1.1	s .54	.43	51.3	47.1	M4	
46	725	150	-2.51	.21	.91	-.4	.73	-1.2	r .33	.22	84.0	84.2	LB2	
29	526	150	.58	.10	.90	-.9	.91	-.9	q .48	.48	42.0	42.7	E7	
30	518	150	.65	.10	.91	-.9	.90	-.9	p .51	.48	36.7	42.7	E8	
47	663	150	-.99	.13	.89	-.8	.86	-1.1	o .41	.36	57.3	54.1	LB3	
15	651	150	-.80	.12	.86	-1.2	.89	-.9	n .39	.38	58.0	52.0	T4	
20	530	150	.54	.10	.87	-1.2	.88	-1.1	m .47	.48	43.3	42.8	T9	
4	643	150	-.69	.12	.86	-1.2	.87	-1.0	l .38	.39	56.0	51.1	S4	
26	553	150	.33	.10	.86	-1.3	.87	-1.2	k .43	.46	44.7	43.9	E4	
23	523	150	.61	.10	.82	-1.7	.85	-1.4	j .54	.48	50.0	42.7	E1	
40	539	150	.46	.10	.85	-1.4	.85	-1.4	i .54	.47	44.7	43.3	M7	
36	541	150	.44	.10	.84	-1.5	.85	-1.4	h .60	.47	50.7	43.5	M3	
27	585	150	.00	.10	.84	-1.5	.85	-1.4	g .58	.44	45.3	45.8	E5	
31	485	150	.95	.09	.81	-1.8	.82	-1.8	f .60	.49	47.3	42.2	E9	
35	568	150	.18	.10	.82	-1.7	.81	-1.8	e .52	.45	48.7	45.0	M2	
13	619	150	-.38	.11	.81	-1.7	.81	-1.7	d .57	.41	52.0	49.1	T2	
28	529	150	.55	.10	.77	-2.2	.78	-2.2	c .48	.48	48.0	42.8	E6	
32	548	150	.37	.10	.75	-2.4	.75	-2.4	b .50	.47	56.0	43.6	E10	
1	610	150	-.28	.11	.72	-2.7	.72	-2.6	a .47	.42	54.7	48.2	S1	

4.5 Unidimensional



Principal Component Analysis (PCA) is an approach to identify the condition of good items. This approach was first discovered by Smith (Smith, 2002). The minimum percentage unidimensional of the instrument is 20% (Linacre, 2018). According to Fisher (2007), the raw and unexplained variance in first contrast should not exceed 15%. Based on Table 6 it showed the raw variance explained by measures (31.7%) and unexplained variance in first contrast (7.9%). Both of them do not exceed the specified values. Therefore, student interest in STEM instrument is a fit based on the unidimensional index.

**Table 6** Standardized residual variance

		Empirical		Modeled
Total raw variance in observations	73.2	100.0%		100.0%
Raw variance explained by measures	23.2	31.7%		31.7%
Raw variance explained by persons	6.9	9.5%		9.5%
Raw variance explained by items	16.3	22.3%		22.2%
Raw unexplained variance (total)	50.0	68.3%	100.0%	68.3%
Unexplained variance in 1st contrast	5.8	7.9%	11.6%	

To determine the dependent item, the statistic value measures are based on the standardized residual correlation. The value measures of standardized residual correlation on the dependent item are above 0.7 (Linacre, 2018). In Table 7, there are ten pairs of items less than 0.7 that need to be addressed and dropped one of the items for each pair correlation. Like correlation value of 0.66 between item E1 and item E2; correlation value 0.64 between E7 and E8; correlation value 0.62 between E3 and E7; correlation value 0.52 between M4 and M8; correlation value 0.51 between E2 and E3; correlation value 0.50 between E4 and E8; correlation value 0.49 between E7 and E9; correlation value 0.49 between M1 and M8; correlation value 0.48 between E3 and E8; and correlation value 0.48 between E1 and E3. However, MNSQ infit and outfit values that are closest to 1.0 must be retained (Linacre, 2010). Therefore, item E3, which has the MNSQ infit and outfit of 1.10 and 1.12, respectively, has been retained.

**Table 7** Standardized residual correlation

CORREL- ATION	ENTRY NUMBER	ENTRY It	ENTRY NUMBER	ENTRY It
.66	23	E1	24	E2
.64	29	E7	30	E8
.62	25	E3	29	E7
.52	37	M4	41	M8
.51	24	E2	25	E3
.50	26	E4	30	E8
.49	29	E7	31	E9
.49	34	M1	41	M8
.48	25	E3	30	E8
.48	23	E1	25	E3

#### 4.6 Person Map Item



Figure 1 is a Person-Item Map (PIDM) that gives information about person ability and item difficulty. PIDM can measure the maximum and minimum value of person and item based on the logit scale. The estimates range from approximately of logit scale is -3 to +3. Based on Figure 1, the item that is disagreed is E11 The statement refers to “I know someone in my family who is an engineer.” Meanwhile, the item which is easily agreed by the student is LB2, which refers to “My parents and family always direct in terms of forming superior personality attitudes and not giving up easily”. While the same measure item construct of student interest in STEM are E9, E1, E2, E3, E8, M9, E6, E7, M3, M7, T11, T9, E10, E4, M10, M11, M8, T6, T7, M1, M2, M6, S11, S9, E5, S10, S7, T1, T10, T8, M4, S8, T3, LB1, M5, S1, S3, S6, T2, T5, LB4, S2, LB6, S4, S5, T4, LB3, and LB5.

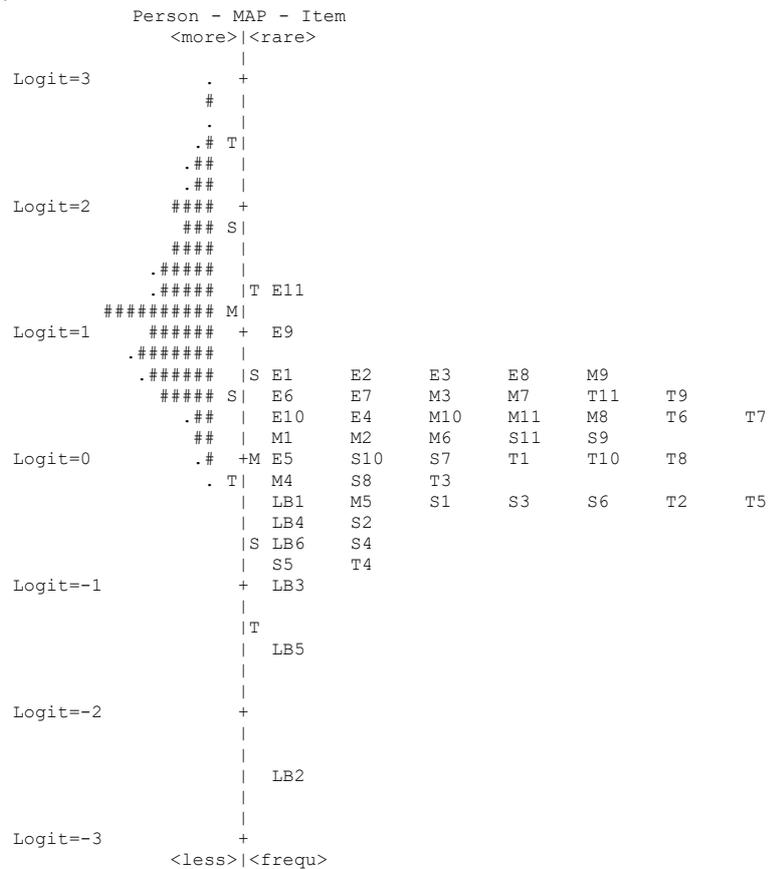


Figure 1 Person-item map

### 5. Conclusion

The Rasch model is one of the valid measurement tools that can find out and prove the effectiveness of instrument validity that will be used in the study. The output of the Rasch Model Analysis showed that the instrument of student interest in STEM has good validity and reliability. In this study, the instrument consists of 50 items. All items can be used in the real study except the item LB6, which refers to the statement “My parents provide freedom of employment and education choices for their children.” This item (LB6) must be revised by the researcher to make sure that the student will be clearer to understand the item.

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