

Students' Interest in Learning Mathematics Using Augmented Reality: Rasch Model Analysis

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ABSTRACT

Interest in learning is a source of intrinsic motivation that encourages students to do what they want so that it has an impact on student achievement. The purpose of this study is to obtain information about the interests in learning mathematics for MTs students while learning using Augmented Reality media. Quantitative descriptive method is used in this research. Respondents in this study amounted to 20 students at MTs. Data was collected from a student interest questionnaire with 18 statement items which were analyzed using the Rasch model. The results showed that the quality of the statements in the questionnaire was included in the sufficient category, and the level of consistency of students' answers was also in the sufficient category. Cronbach's alpha value is in the very good category, namely 0.85 which can be used to assess the reliability of the interaction between Person and the item as a whole. Furthermore, the level of student interest in MTs in Kampar using Augmented Reality learning media is in the high category. The logit value is 1.62, meaning that the statement items are mostly approved by students.

Keywords: Augmented Reality, Interest to Learn, Rasch models.

INTRODUCTION

Study is a relative modification process stable in stimulus - response relationship developed as consequence from interaction environment functional through five sense (Lachman, 1997; Luxin et al., 2022; Marchy et al., 2022; Mayani et al., 2022; Muhammad, Mukhibin, et al., 2022; Muhammad, Elmawati, et al., 2023; Ramadhaniyati et al., 2023; Sanusi et al., 2023). Thought, knowledge and behavior can changed through the learning process obtained student from a teacher (Puteri, 2018; Ramadhan et al., 2019). Whereas interest Study is desire or great desire to something tight relation with personality (Harefa et al., 2020). According to (Rosfiani et al., 2019) interest Study is source motivation intrinsic drive student For do what is wanted so that impact on performance learning and interested children with something activity, fine games, as well work, will try more hard For learn, then think For finish it. So, interest Study is desire For do something so that will effect on performance learn.

Interest Study influential positive and significant to results Study (Rosfiani et al., 2019). Interest related subject in learning mathematics is predictor important For the success of the learning process (Arif et al., 2023; Darmayanti et al., 2023; Muhammad, Agus Triansyah, et al., 2023; Muhammad, Darmayanti, et al., 2023; Mustakim & Ngaliyah,

2023; Nasiha et al., 2023; Pradana & Uthman, 2023; Segara et al., 2023; Sugianto, 2023; Triansyah et al., 2023; Ufer et al., 2017). Learning at school own component cognitive, emotional and socially strong and successful in this technological era determined by ability environment education For stimulate interest Study student (Durlak et al., 2011). Connection between interest and learning focus on three type interest: 1) interest individual that is trend individual For notice stimuli, events, and objects; 2) interest situational is the interest evoked by the aspects certain from environment. This including feature content like activity man or theme life, and features structural like the ways in which tasks arranged and presented; 3) interests topic is sparked interest when topic certain served, like aspect individual and situational (Ainley et al., 2002). Student feel happy and feel involved will something topic is most special interest (Schiefele, 2011). Furthermore (Ainley et al., 2002) explain For access the linking process interest and learning needed method new.

Moment This based media development technology growing very rapidly. in developing media based technology can done with various device soft (Dianta & Maimunah Yenita Roza, 2020). Augmented Reality is one device software that can used by as a learning medium (Muhammad, Marchy, et al., 2022). Enhancement results Study studying students with use Augmented Reality more tall than approach conventional with use book text (Angraini et al., 2022). Research conducted by (Alegre et al., 2011) claim that results Study more Good when student can interact with picture. With thereby use of Augmented Reality media can more understood if student can see the concept in dimensional view. Furthermore results study from (Garg, 2019) also said that fast world movement towards digital media and information, the role of ICT in education become the more important and important This will Keep going grow and thrive in the 21st century.

In do approach measurement advanced to the instrument to be measure how much big interest student so needed something analysis, for one is analysis with rasch model . The Rasch model is approach measurement capable continuation overcome a number of limitations theory test classic, like lack of control on level item difficulty scaling and sorting category proper ordinal response (Rahayu et al., 2021). The Rasch model is viewed as the most objective measurement model (Isnani et al., 2019). Due to the use of the Rasch model in measure education own advantage of objectivity specific and stable high grain parameter estimation (Wu & Adams, 2007).

Learning outcomes and achievements will increase when interest Study increase (Ida & Maksum, 2021; Permatasari et al., 2019; Ramadani & Qibtiyah, 2021; Senen et al., 2021). To understand more about learning interest among students who use Augmented Reality learning media, this must be studied further. The goal is for math teachers to ascertain the factors that affect students' interest in learning and to try to take actions that will help students become more interested in learning.

METHOD

Objective from study This that is for obtain information about interest Study mathematics student MTs school during learning with using Augmented Reality media. As for the method used that is descriptive quantitative. Study held in month January 2023 to month March 2023 activities that is start from planning, manufacturing instruments, instrument deployment and data analysis. Sample in research This totaling 20 students MTs. Researcher use deep purposive sampling taking sample with criteria MTs students who have use Augmented Reality in the learning process.

For ensure respondent serious and full attention moment answer questionnaire as Ilham Muhammad, Lilis Marina Angraini, Rani Darmayanti, Rahmad Sugianto

well as minimize happening respondent who filled in in a manner random, then questionnaire in the form of a related google form interest Study mathematics which contains 18 items, divided into 10 statements positive and 8 of them negative. instrument order can used and sentences statement can understandable with clear by students, especially formerly done checking validity instruments by two lecturers professional Mathematics Education Study Program, Islamic University of Riau. Likert scale with four alternative answer used For every statement, and the Rasch model is used For evaluate result. As for the score alternative answer can seen in table 1 below.

Table 1. Alternative Scores Answer

Alternative Answer	Score for Statement	
	Positive	Negative
Strongly Agree / Always	4	1
Agree / Often	3	2
No Agree / Rarely	2	3
Very No Agree / No Once	1	4

RESULTS AND DISCUSSION

After evaluated by two knowledgeable lecturers wide, questionnaire about interest Study mathematics student furthermore given to subject research, particularly in schools MTs. According to Muhammad & Yolanda (2022) following indicator interest Study students: 1) Feelings happy ; 2) Interest students ; 3) Caution students ; and 4) Engagement student. Reliability level, person measure, dimensionality items, person items map, item fit order and suitability of person responses everything examined by researchers after the data is obtained with using the Rasch model using the Winsteps program.

Results Analysis Level Reliability

With the Winsteps program, the data summary shown in Figure 1 can be used for measure level reliability.

SUMMARY OF 20 MEASURED PERSON									
	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	ZSTD	OUTFIT MNSQ	ZSTD	
MEAN	56.8	18.0	1.62	.88	.92	-.28	.71	-.12	
SEM	.7	.0	.41	.01	.16	.28	.18	.17	
P.SD	3.1	.0	1.77	.06	.71	1.22	.78	.76	
S.SD	3.2	.0	1.81	.06	.73	1.25	.80	.78	
MAX.	69.0	18.0	7.36	.94	2.34	1.90	2.47	1.28	
MIN.	53.0	18.0	-1.23	.71	.22	-1.64	.10	-.94	
REAL RMSE	.99	TRUE SD	1.46	SEPARATION	1.47	PERSON RELIABILITY	.68		
MODEL RMSE	.89	TRUE SD	1.53	SEPARATION	1.73	PERSON RELIABILITY	.75		
S.E. OF PERSON MEAN = .41									
PERSON RAW SCORE-TO-MEASURE CORRELATION = .97									
CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .85 SEM = 1.23									
STANDARDIZED (50 ITEM) RELIABILITY = .89									
SUMMARY OF 18 MEASURED ITEM									
	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	ZSTD	OUTFIT MNSQ	ZSTD	
MEAN	63.1	20.0	.00	.94	.88	-.19	.71	-.18	
SEM	1.1	.0	.51	.06	.19	.24	.20	.19	
P.SD	4.4	.0	2.11	.23	.78	.99	.82	.79	
S.SD	4.5	.0	2.17	.24	.80	1.02	.85	.81	
MAX.	75.0	20.0	2.99	1.18	2.86	1.80	3.19	1.52	
MIN.	59.0	20.0	-4.81	.53	.06	-1.36	.03	-1.14	
REAL RMSE	1.10	TRUE SD	1.80	SEPARATION	1.63	ITEM RELIABILITY	.73		
MODEL RMSE	.96	TRUE SD	1.87	SEPARATION	1.95	ITEM RELIABILITY	.79		
S.E. OF ITEM MEAN = .51									

Figure 1. Summary Statistics

Figure 1 shows the results of reliability to determine the level of reliability of the statement in each item with the results showing that the personal reliability score has a value of 0.68, while the reliability of the item has a value of 0.73. With thereby can said Ilham Muhammad, Lilis Marina Angraini, Rani Darmayanti, Rahmad Sugianto

that quality question statement on the questionnaire including in category enough, and rate consistency answer students are also in the category enough. Cronbach's alpha value in category Good very ie 0.85 which can used For evaluate reliability interaction between person and item individually whole. For criteria mark person and item reliability can seen in table 2 (Sumintono & Widhiarso, 2013).

Table 2. Classification of Person and Item Reliability Values and Cronbach's Alpha

Person & Item Reliability Value	Criteria	Cronbach's Alpha Value	Criteria
< 0.67	Weak	< 0.5	Bad
0.67 - 0.80	Enough	0.5 - 0.6	Bad
0.81 - 0.90	Good	0.6 - 0.7	Enough
0.90 - 0.94	Good very	0.7 - 0.8	Good
> 0.94	Special	> 0.8	Good very

Table 2 shown above, is the result of the Person and Item Reliability Value Classification and Cronbach's Alpha in each item will be examined for the Outfit Mean Square (MNSQ) and Outfit Z-standard (ZSTD) values. The MNSQ outfit value displays the same number, both in the person and item column, namely 0.71. Questionnaire statements can accepted For evaluate interest Study student in use learning media Augmented Reality Because mark This including in fit criteria (table 3). ZSTD outfit values in column person and item respectively displays values -0.12 and -0.18. In other words, information the Possible own entered value sense. With thereby student can understand every grain statement nor every grain statement in a manner whole. If the item fulfills One or more characteristics listed in Table 3, the criteria for fit items can be set (Susilowati & Mulyani, 2020).

Table 3. Item Fit Criteria

Mark	Range
Outfit Mean Square Value (MNSQ)	0.5 < MNSQ < 1.5
Z-standard Outfit Value (ZSTD)	-2.0 < ZSTD < +2.0
Point Measure Correlation	0.4 < Pt Measure Corr < 0.85

RESULTS OF ITEM DIMENSIONALITY ANALYSIS

Findings in section This will show succeed or nope statements questionnaire in measure interest student in Study mathematics with using Augmented Reality media. As shown in Figure 2, raw variance explained by measure is 57.2%. this score show that minimum threshold of 20% for unidimensional has achieved (Susilowati & Mulyani, 2020). Requirements are also met by grades unexplained variance in contrast Because No some exceed 15 % (Ghazali, 2017), the maximum is 10.1%. The result tool or the instruments used can measure what want measured.

Table of STANDARDIZED RESIDUAL variance in Eigenvalue units = ITEM information units

	Eigenvalue	Observed	Expected
Total raw variance in observations =	42.0343	100.0%	100.0%
Raw variance explained by measures =	24.0343	57.2%	54.1%
Raw variance explained by persons =	9.8243	23.4%	22.1%
Raw Variance explained by items =	14.2101	33.8%	32.0%
Raw unexplained variance (total) =	18.0000	42.8%	45.9%
Unexplnd variance in 1st contrast =	4.2633	10.1%	23.7%
Unexplnd variance in 2nd contrast =	3.3830	8.0%	18.8%
Unexplnd variance in 3rd contrast =	2.5831	6.1%	14.4%
Unexplnd variance in 4th contrast =	2.0530	4.9%	11.4%
Unexplnd variance in 5th contrast =	1.7378	4.1%	9.7%

Figure 2. Questionnaire Dimensionality Item Values Interest Study Student

Item Fit Order Analysis Results

In the item analysis stage, the first thing to do is measure student interest. For each item to be used in measuring student interest, an appropriate calculation is required. The calculation can be seen in table 3.

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	JMLE MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	EXP.	EXACT OBS%	MATCH EXP%	ITEM
16	61	20	.92	1.18	2.71	1.47	3.19	1.52	A .61	.58	90.0	96.2	P16
18	61	20	.92	1.18	2.86	1.54	2.02	1.04	B .42	.58	90.0	96.2	P18
14	72	20	-3.86	.54	1.51	1.80	1.82	1.17	C .43	.47	65.0	75.7	P14
6	75	20	-4.81	.60	1.14	.52	1.18	.48	D .34	.42	80.0	80.0	P6
15	60	20	2.16	1.01	1.05	.31	.50	.00	E .70	.50	95.0	93.9	P15
2	62	20	-.23	.94	.84	.05	.65	.02	F .59	.56	95.0	93.8	P2
10	62	20	-.23	.94	.84	.05	.65	.02	G .59	.56	95.0	93.8	P10
8	59	20	2.99	.83	.83	-.13	.56	-.06	H .16	.43	95.0	90.7	P8
3	64	20	-1.41	.66	.81	-.41	.49	-.45	I .61	.51	85.0	84.7	P3
4	63	20	-.93	.75	.75	-.34	.38	-.53	i .65	.53	90.0	89.4	P4
9	70	20	-3.29	.53	.74	-1.19	.65	-.14	h .61	.49	85.0	73.6	P9
5	62	20	-.23	.94	.72	-.14	.34	-.42	g .66	.56	95.0	93.8	P5
7	60	20	2.16	1.01	.43	-.73	.11	-.69	f .00	.50	95.0	93.9	P7
13	60	20	2.16	1.01	.43	-.73	.11	-.69	e .00	.50	95.0	93.9	P13
1	61	20	.92	1.18	.06	-1.36	.03	-1.14	d .75	.58	100.0	96.2	P1
11	61	20	.92	1.18	.06	-1.36	.03	-1.14	c .75	.58	100.0	96.2	P11
12	61	20	.92	1.18	.06	-1.36	.03	-1.14	b .75	.58	100.0	96.2	P12
17	61	20	.92	1.18	.06	-1.36	.03	-1.14	a .75	.58	100.0	96.2	P17
MEAN	63.1	20.0	.00	.94	.88	-.19	.71	-.18			91.7	90.8	
P.SD	4.4	.0	2.11	.23	.78	.99	.82	.79			8.5	7.1	

Figure 3. Questionnaire Fit Order Item Values Interest Study Mathematics Student

In table 3 shown above, it is the first step that has been completed to find out whether each item used in the questionnaire function is correct or not in measurement. According to the FIT item criteria, the statement items are set in Figure 3 from the smallest to the largest. Every statement item that is proven to be inappropriate is called a non-conforming item. There are no items in the 18 statements that fall into the inappropriate category. This indicates that the third condition is met by at least one item value (MNSQ clothing value and ZSTD clothing value and Pt Measure Corr value). The student is given free time to fill out a questionnaire about his interest in learning.

Results of Person Item Map Analysis

Objective analysis This is for can determine level interest you have student in learn mathematics using learning media Augmented Reality and levels difficulty of questionnaire items. Figure 4 displays findings analysis. With inspect the value of the separation of persons and items that can be seen in statistics summary in Figure 1 is possible for determine amount category learning and level statement item difficulty in questionnaire. The number of categories or levels can be determined by the formula below (Sumintono & Widhiarso, 2013).

$$H = [(4 \times SEPARATION) + 1] / 3 \quad (1)$$

Information:

H: Value of person/item strata SEPARATION

To find the H value, you must first know the separation value, which can be seen in Figure 1. The separation person value is 1.47, so after calculating with the formula above, the value $H = 2.29$ is obtained. This means that the value of H is close to 2 so that the strata of students are divided into 2 groups, namely high and low.

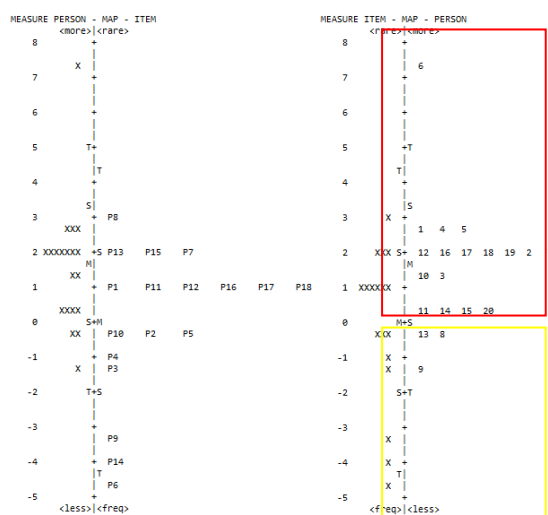


Figure 4. Results of Person Item Map Analysis

There are symbols in grouping based on measure person (part right) with numbers and item symbols (parts left) with symbol letters and numbers that can seen in Figure 4 above. Furthermore will detailed amount students in each category that can seen in table 4 below.

Table 4. Categories of Students' Interest in Learning Mathematics

Category	Code	Amount	Percentage
Tall	1,2,3,4,5,6,7,10,11,12,14,15,16,17,18,19,20	17	85%
Low	13, 8, 9	3	15%
Total		20	100%

Based on the data obtained, if analyzed so interest Study mathematics students who use learning media Augmented Reality shared into two groups that is student with interest Study height and students with interest Study low. A total of 17 students own interest high learning to use of Augmented Reality media in learning. Only 3 students only have interest low learning. It means Augmented Reality media This can make student interested For Study math. 85 percent student own response positive with interest high learning to learning mathematics with using learning media Augmented Reality.

In categorize level statement item difficulty in questionnaire after know level category interest learning mathematics student. With use same procedure for determine stratum item values, it is possible For determine level or category of items. Figure 1 displays the value of separation items, namely 1.63. because it, with use the same formula or formula used previously so got value of $H = 2.52$ which is more close to 3 so Item statement in questionnaire classified become three group based on level the difficulty. Separation value reveals level quality instrument in something research. Great separation value show quality instrument more Good Because can detect more statement item groups large range in difficulty from simple until challenge the more tall (Sumintono & Widhiarso, 2013). Figure 4 illustrates placement statement item difficulty from easy level until difficult in questionnaire. If sorted of the easiest items Approved student to the most difficult For Approved student that is start from items P6, P14, P9, P3, P4, P10, P2, P5, P1, P11, P12, P16, P17, P18, P13, P15, P7, P8. Consequently, item statement P6 is an easy one For Approved students, while P8 is the most difficult item For Approved student. Naming of statement items consists from working letters and digits as code. the figure show order of statement items to possible indicator seen in table 5.

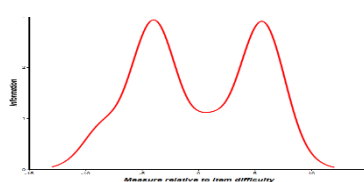
Table 5. Information on naming statement item codes in the questionnaire

Indicator	item item no	Code
Feeling like	1, 2, 3, 4, 5	P
Interest student	6, 7, 8, 9, 10	P
Attention student	11, 12, 13, 14	P
Involvement student	15,16,17, 18	P

From the results obtained in table 5 above, it shows that in general students' interest in learning mathematics is in the high category with a percentage of 85%. In addition, 2 items on the student interest indicators, namely items P7 and P8, were the most difficult items for students to agree on than the other items as a whole. This means that there are 2 items out of 5 items on the student interest indicator that are difficult to agree on. However, there is 1 item on the student interest indicator which is the easiest item for students to agree on than the other items, that item is item P6.

Analysis Results Person Measure

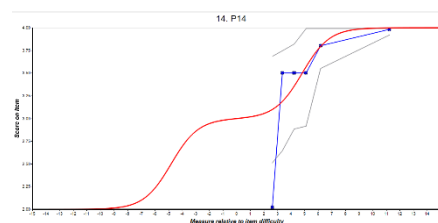
The average value of the measure person in Figure 1, which has log value 1.62 and over of 0.00, indicating that student more Like approve statement items in questionnaire more continue. Analysis person measure can also be seen from test information function like in the picture under following

**Figure 5.** Test Information Function

From figure 5 above show about information the measurements obtained from instrument questionnaire interest Study student. The -x axis shows level ability students, meanwhile -y axis shows mark from function information. Based on chart such, because student shared into 2 groups that is high and low so that no there is group medium, so information obtained by measurement is very high Good For students in groups low nor high. So that development instrument questionnaire interest Study student suitable or optimally if used on students with ability low and high.

Analysis suitability response student

For see is student has fill in questionnaire with in accordance What No Can We look at the chart below.

**Figure 6.** ICC Expected Score

on the picture on seen that on item 14 or with code P14 answer student No in accordance as expected, this showed with the blue line comes out from curve colored gray. There are two items, namely items 14 and 16. The meaning of these items response

student No in accordance with what is expected. For example picture response appropriate students can seen in the picture under as following.

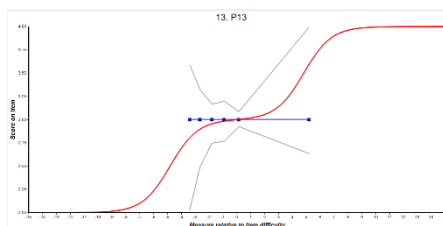


Figure 7. ICC Expected Score

On the picture on seen that blue line still be on track red or no go out of colored lines gray as shown in item P13, that is answer student has in accordance with what to expect. As for the items is besides from items 14 and 16.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions obtained is quality question statement on the questionnaire including in category enough, and rate consistency answer students are also in the category enough. Cronbach's alpha value in category Good very is 0.85 which can used for evaluate reliability interaction between person and item individually whole. Furthermore For level interest Study students at MTs in Kampar use instructional media Augmented Reality are in category high. The logit value is 1.62, meaning grain statement more Lots approved by students. Recommended For study next to understand other related things with the use of augmented reality media such as motivation students and others.

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