Prima: Jurnal Pendidikan Matematika
Vol. 8, No. 2, May 2024, pp. 467 - 477
P-ISSN: 2579-9827, E-ISSN: 2580-2216
Web: http://jurnal.umt.ac.id/index.php/prima

ANALYSIS OF PERSON'S PROBLEM-SOLVING SKILLS

Munali[1*], Hawa Liberna[2], Tatan Zenal Mutakin[3]
[1]Magister Pendidikan MIPA, Fakultas Pascasarjana, Universitas Indraprasta PGRI, Jakarta, Indonesia
[2,3]Pendidikan Matematika, Fakultas MIPA, Universitas Indraprasta PGRI, Jakarta, Indonesia
*Email : munalilutfi22@gmail.com

Abstract

This research is part of the development of problem-solving skills instruments for essay questions in the Basic Mathematics Course. Mathematics problem-solving skills were measured on 298 students of the Information Systems Study Program at Indraprastha University PGRI Jakarta, Odd Semester, Academic Year 2023/2024. This research aims to analyze a person's problem-solving skills in the Basic Mathematics Course with 15 questions. Dimensions of problem-solving skills: 1) observation skills and 2) critical thinking skills. This research uses quantitative methodology with Rasch Model analysis. The results of the research are: 1) there are 271 valid persons out of 298 persons, 2) person number 109 is the person with the highest ability of 0.23 logit, and person number 14 is the person with the lowest ability of -4.21 logit, 3) reliability score Cronbach's Alpha person (KR-20) is 0.77, meaning that the person's reliability coefficient score can holistically be categorized as good and acceptable, 3) person reliability score is 0.85, meaning that person's reliability can be categorized as good and acceptable, 4) mean score the person measure is -1.16 logit < 0.00 logit, indicating that the student's ability is less than the level of difficulty of the item, and 5) the accuracy of the person's ability to respond to problem-solving skills is 22% in the low category. Based on the results of this research, it can be concluded that students' problem-solving skills are in a low category. Solutions that can be done by getting students used to solving mathematics problems are related to everyday life.

Keywords:
21st-Century Learning, Problem-Solving Skills, Rasch Model

Abstrak

Penelitian ini merupakan bagian dari pengembangan instrumen keterampilan pemecahan masalah butir soal essay pada Mata Kuliah Matematika Dasar. Pengukuran keterampilan pemecahan masalah Matematika dilakukan pada mahasiswa Program Studi Sistem Informasi Universitas Indraprasta PGRI Jakarta Semester Ganjil Tahun Akademik 2023/2024 sebanyak 298 person. Tujuan penelitian ini adalah menganalisis keterampilan pemecahan masalah person pada Mata Kuliah Matematika Dasar sebanyak 15 butir soal. Dimensi keterampilan pemecahan masalah : 1) *observation skills* dan 2) *critical thinking skills*. Penelitian ini menggunakan metodologi kuantitatif dengan analisis Model Rasch. Hasil penelitian, yaitu : 1) sebanyak 271 person valid dari 298 person, 2) person nomor 109 adalah person dengan kemampuan tertinggi sebesar 0,23 logit dan person nomor 14 adalah person dengan kemampuan terendah sebesar -4,21 logit, 3) skor reliabilitas person *Alpha Cronbach* (KR-20) sebesar 0,77 artinya skor koefisien reliabilitas person tersebut secara holistik dapat dikategorikan baik dan dapat diterima, 3) skor *person reliability* sebesar 0,85 artinya realiabilitas person dapat dikategorikan baik dan dapat diterima, 4) skor *mean person measure* sebesar -1,16 logit < 0,00 logit menunjukkan kemampuan siswa kurang dari tingkat kesulitan butir soal, dan 5) akurasi kemampuan person merespon keterampilan pemecahan masalah sebesar 22% dengan kategori rendah. Berdasarkan hasil penelitian tersebut, dapat disimpulkan bahwa keterampilan pemecahan masalah mahasiswa dalam kategori rendah. Solusi yang dapat dilakukan dengan cara membiasakan mahasiswa menyelesaikan permasalahan Matematika dikaitkan dengan kehidupan sehari-hari.

Keywords :
Pembelajaran Abad 21, Keterampilan Pemecahan Masalah, Model Rasch

Received: May 5, 2024; Revised: May 20, 2024; Accepted: May 29, 2024

INTRODUCTION

21st-century learning places greater emphasis on project-based, problem-based, inquiry, design, and discovery (Fazrul Prasetya Nur Fahrozy, 2022). Students learn science to be able to create a product that is planned through existing problems, then carry out investigations to solve the solution. Then students will find a solution related to the problem as a product. The student's results will be able to have a positive influence on him to face future challenges and will provide solutions to the problems currently being faced.

Students' skills that are of concern in 21st-century learning are known as 4C skills (Yose Indarta, 2021), namely: critical thinking and problem-solving, creativity and discovery, communication and collaboration. Students will learn directly and think critically when they encounter problems, and then look for solutions. The solution is poured into a product that is useful and used for the future.

Improving critical thinking and problem-solving skills can be done through industrial job training (Shazaitul Azreen Rodzalan, 2020). Through industrial job training, students have several advantages. This requires students to have critical thinking skills to solve problems. Students can reflect on the knowledge they have from college.

Problem-solving skills in mathematics learning have an important role, especially in learning that is linked to the real world, so students have challenges in solving these problems (Nurdan Özreçberoğlu, 2018). Problem-solving skills in mathematics learning prioritize non-routine questions. This is because students become confident, independent, and think creatively.

The factor that influences students' lack of problem-solving skills is the teacher's way of teaching. Teachers still use teacher-centered learning methods. Although many methods can help students improve their problem-solving skills (Munali, 2023).

The results of measuring OSN (National Science Olympiad) critical thinking skills of class VIII students consisting of 24 students, namely: 9 male students and 15 female students show that: students' ability with interpretation sub-skills is 63% in the good category. Meanwhile, sub-skills: analysis, evaluation, inference, explanation, and self-regulation are less than 50% in the low category (Hasan Basri, 2019).

Problem-solving skills are basic skills that need to be developed by training students regarding 21st-century learning (Nadia Mirela Florea, 2015). The results of research related to the problem-solving skills of Science Learning for Junior High School (SMP) students show that (I D Franestian, 2020): sub-skills identify problems by 5.2%, sub-skills cause and effect by 57.6%, sub-skills planning actions by 47.1%, determining relevant solutions by 37.6%, and 39.1% analyzing the influence of solutions. Based on this data, problem-solving skills are in the low category.

Problem-solving skills consist of sub-skills: identifying problems, searching for and selecting variations of alternative solutions, and making problem-solving decisions (Bariyyah, 2021). Research results: 2.3% of problem-solving skills of the student's ability level were low, 62.3% of problem-solving skills of the student's ability level was moderate, 35.3% of problem-solving skills of the student's ability level was high, and there are no students with very low levels of problem-solving skills. Based on this data, the level of problem-solving skills of the students in the medium category is 62.3%.

Based on several theoretical studies related to problem-solving skills, this research is a measurement of the student's ability to respond to problem-solving skills questions with different dimensions or sub-skills. Problem-solving skills consist of two dimensions (Md, 2019): 1) observation skills (ability to observe) and 2) critical thinking skills (ability to think critically).

Observation skills indicators: 1) collecting information, 2) understanding and interpreting meaning by identifying keywords, and 3) observing patterns, similarities, and differences in a problem.

Critical thinking skills indicators: 1) conceptualizing skills are the ability to identify, recognize, and investigate problems partially and completely; 2) logical reasoning is the ability to retrieve some relevant information, interpret the information, provide arguments, and provide conclusions; 3) application skills are the ability to use knowledge in new or familiar situations to solve problems through facts, knowledge, principles, and techniques; 4) analytical thinking is the ability to analyze arguments, prove, interpret, assess or evaluate, make conclusions, 5) decision-making skills are the ability to make choices, solve problems, make effective decisions based on reasons and arguments right; and 6) synthesis skills is the

ability to combine parts to make them interrelated and then these parts become something new.

METHODS

This research uses quantitative research methodology. The research subjects were 298 students of the Information Systems Study Program at Indraprastha University PGRI Jakarta, Odd Semester, Academic Year 2023/2024, in the Basic Mathematics Course. The number of problem-solving skills questions is 15 questions. Data collection was carried out during the Odd Semester Midterm Examination (UTS) for the 2023/2024 Academic Year in October 2023. Data processing was carried out using the Rasch Model.

The Rasch Model is a data analysis technique developed to increase the accuracy of the instruments being developed, assess the quality of the instruments, and identify persons' abilities (Andrich, 1989; Davidowitz, 2016). By using raw data in the form of dichotomous or polytomous data, you can identify persons' abilities and the level of difficulty of the test items (Lutfi Nur, 2020). The Rasch Model formulates a model that connects people and items on the same logit scale (Rika Irmayanti, 2023).

The Rasch Model is also useful as a diagnostic tool to determine the reliability of instruments and the validity of test items (Hye Sun You, 2017). The Rasch Model has two reliability measures, namely item reliability and person reliability (Sharifah Nurulhuda Tuan Mohd Yasin, 2018). The reliability of question items is the consistency of the assessment results produced by the instrument when tested on other groups of respondents with the same characteristics. Person reliability refers to how reliable a group of respondents is in providing the same response to another instrument that has items with the same level of difficulty. The reliability of Cronbach's Alpha score can be seen in Table 1 below:

Table 1. Interpretation of Cronbach's Alpha Score Reliability

Cronbach's Alpha Score	Reliability
0.9 – 1.0	Very good and consistent
0.7 – 0.8	Good and acceptable
0.6 – 0.7	Acceptable
< 0.6	Item needs revision
< 0.5	Items need to be dropped

Testing the suitability of the Rasch Model data by examining items and persons (Shiau Wei Chan, 2020): the score for one of the following assumptions is met: 0.50 < Outfit MNSQ < 1.50; -2.00 < Outfit ZSTD < +2.00; or 0.40 < Point Measure Correlation < 0.85.

Data analysis using the Rasch Model can inform question items and people (Sumintono, 2013): 1) level of suitability of question items (item fit order), 2) level of difficulty of question items (item measure), 3) DIF detection of question items, 4) level person suitability (person fit order), 5) person ability level (person measure), 6) instrument analysis: (a) person measure, (b) Cronbach's Alpha, (c) person reliability and item reliability, and (8) test information function.

In this study, researchers analyzed students' abilities in responding to problem-solving skills questions: 1) Cronbach's Alpha person reliability, 2) person reliability, 3) person mean measure, and 4) measurement information function.

RESULTS & DISCUSSION

1) Fit Person

Before analyzing a person's abilities, the first step is to determine the person's fit against the Rasch Model. After analysis, there were 271 fit persons out of 298 persons. There are 27 misfit persons for the Rasch Model. The results of the misfit person analysis can be seen in Table 2 below:

Table 2. Misfit Person

Misfit	Total	Number
Person	27	48, 80, 246, 260, 239, 110, 137, 129, 38, 128, 193, 82, 271, 18, 96, 37, 130, 86, 174, 8, 39, 272, 278, 298, 131, 6, 200

A total of 27 misfit persons were dropped from the data, then the data was analyzed again. After the data was reanalyzed, a total of 271 persons were fit for the Rasch Model. Some of the fit person data can be seen in Table 3 below.

Table 3. Fit Person

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%
106	31	9	.06	.30	1.53	.9	9.90	9.9	A .69	.87	55.6	54.0
7	9	9	-3.80	.71	6.87	2.4	3.03	1.4	B .95	.95	77.8	84.1
134	23	9	-.71	.32	4.40	4.0	2.61	1.3	C .81	.92	22.2	42.4
292	11	9	-2.75	.62	1.85	1.1	3.93	1.7	D .92	.96	77.8	81.6
113	25	9	-.50	.31	3.79	3.5	2.28	1.1	E .79	.91	22.2	37.8
253	26	9	-.41	.31	3.49	3.2	2.13	1.1	F .77	.90	44.4	41.0
175	12	9	-2.42	.54	2.88	2.0	3.10	1.4	G .90	.96	66.7	72.0
212	12	9	-2.42	.54	2.88	2.0	3.10	1.4	H .90	.96	66.7	72.0
206	16	9	-1.59	.40	2.96	2.7	2.25	1.1	I .91	.95	55.6	48.7
19	17	9	-1.44	.38	2.92	2.7	2.36	1.2	J .90	.94	33.3	44.6
89	15	9	-1.75	.42	2.80	2.4	2.07	1.1	K .88	.95	33.3	50.0
147	20	9	-1.04	.35	2.71	2.5	2.18	1.1	L .87	.93	11.1	35.9
123	14	9	-1.94	.45	2.64	2.2	2.12	1.1	M .89	.96	55.6	63.7
145	24	9	-.60	.32	2.60	2.4	2.46	1.2	N .81	.91	55.6	38.0
273	19	9	-1.16	.36	2.60	2.4	2.15	1.1	O .88	.94	11.1	32.6
280	18	9	-1.30	.37	2.54	2.4	2.09	1.1	P .91	.94	22.2	38.4
30	17	9	-1.44	.38	2.50	2.3	2.05	1.1	Q .92	.94	44.4	44.6
157	24	9	-.60	.32	2.47	2.3	2.28	1.1	R .83	.91	44.4	38.0
251	22	9	-.81	.33	2.35	2.1	1.93	1.0	S .86	.92	11.1	36.2
9	21	9	-.92	.34	2.26	2.0	1.82	.9	T .87	.93	22.2	36.3
14	8	9	-4.21	.60	2.24	1.3	2.19	1.1	U .98	.94	77.8	85.9
183	21	9	-.92	.34	2.23	2.0	1.76	.9	V .88	.93	33.3	36.3
204	21	9	-.92	.34	2.21	2.0	1.76	.9	W .88	.93	33.3	36.3
10	21	9	-.92	.34	2.20	2.0	1.68	.9	X .89	.93	22.2	36.3
142	11	9	-2.75	.62	1.77	1.0	2.20	1.1	Y .93	.96	77.8	81.6
185	25	9	-.50	.31	2.20	2.0	2.16	1.1	Z .84	.91	33.3	37.8
186	11	9	-2.75	.62	1.77	1.0	2.20	1.1	.93	.96	77.8	81.6
79	18	9	-1.30	.37	2.11	1.9	1.92	1.0	.86	.94	11.1	38.4
122	13	9	-2.16	.49	2.11	1.5	2.08	1.1	.91	.96	55.6	71.9
25	14	9	-1.94	.45	2.10	1.6	1.40	.7	.92	.96	55.6	63.7
28	18	9	-1.30	.37	2.04	1.8	1.77	.9	.87	.94	22.2	38.4
171	13	9	-2.16	.49	2.01	1.4	1.22	.6	.93	.96	66.7	71.9
102	22	9	-.81	.33	2.00	1.7	1.94	1.0	.84	.92	11.1	36.2
109	33	9	.23	.29	2.00	1.4	1.11	.4	.84	.85	44.4	49.1
209	26	9	-.41	.31	1.98	1.7	1.85	1.0	.86	.90	22.2	41.0
140	14	9	-1.94	.45	1.96	1.5	1.20	.6	.93	.96	66.7	63.7
148	14	9	-1.94	.45	1.96	1.5	1.20	.6	.93	.96	66.7	63.7
153	16	9	-1.59	.40	1.96	1.6	1.69	.9	.88	.95	44.4	48.7
282	14	9	-1.94	.45	1.96	1.5	1.20	.6	.93	.96	66.7	63.7
158	28	9	-.22	.31	1.94	1.5	1.71	.9	.86	.89	11.1	44.4
36	22	9	-.81	.33	1.93	1.6	1.53	.8	.88	.92	44.4	36.2
24	23	9	-.71	.32	1.90	1.6	1.57	.8	.86	.92	33.3	42.4
125	20	9	-1.04	.35	1.89	1.6	1.61	.8	.86	.93	33.3	35.9
205	20	9	-1.04	.35	1.89	1.6	1.44	.8	.91	.93	33.3	35.9
221	13	9	-2.16	.49	1.26	.6	1.88	1.0	.92	.96	55.6	71.9
101	25	9	-.50	.31	1.83	1.5	1.74	.9	.83	.91	11.1	37.8
250	14	9	-1.94	.45	1.83	1.3	1.33	.7	.91	.96	44.4	63.7
103	19	9	-1.16	.36	1.81	1.5	1.62	.8	.88	.94	11.1	32.6
227	15	9	-1.75	.42	1.80	1.4	1.38	.7	.90	.95	22.2	50.0
288	17	9	-1.44	.38	1.79	1.4	1.54	.8	.91	.94	22.2	44.6
138	16	9	-1.59	.40	1.75	1.4	1.33	.7	.91	.95	44.4	48.7
83	20	9	-1.04	.35	1.74	1.4	1.44	.8	.86	.93	22.2	35.9
127	25	9	-.50	.31	1.74	1.4	.90	.4	.85	.91	33.3	37.8
132	22	9	-.81	.33	1.74	1.4	1.31	.7	.91	.92	11.1	36.2
146	22	9	-.81	.33	1.71	1.3	1.22	.6	.85	.92	22.2	36.2
41	14	9	-1.94	.45	1.68	1.2	1.55	.8	.93	.96	66.7	63.7
44	14	9	-1.94	.45	1.68	1.2	1.55	.8	.93	.96	66.7	63.7

	BETTER	FITTING	NOT SHOWN									
268	31	9	.06	.30	.74	-.2	.62	-.2	.87	.87	22.2	54.0
236	20	9	-1.04	.35	.73	-.4	.66	.2	.95	.93	44.4	35.9
92	34	9	.31	.28	.72	-.3	.49	-.5	.84	.84	55.6	49.2
240	27	9	-.31	.31	.72	-.4	.40	-.3	.95	.90	66.7	44.4
261	27	9	-.31	.31	.72	-.4	.40	-.3	.95	.90	66.7	44.4
167	14	9	-1.94	.45	.71	-.4	.54	.1	.97	.96	66.7	63.7
208	32	9	.14	.29	.71	-.3	.51	-.4	.88	.86	66.7	49.4
238	24	9	-.60	.32	.69	-.5	.69	.2	.94	.91	33.3	38.0
154	34	9	.31	.28	.68	-.3	.68	-.2	.87	.84	77.8	49.2
60	26	9	-.41	.31	.67	-.5	.63	.1	.94	.90	55.6	41.0
211	19	9	-1.16	.36	.67	-.6	.59	.1	.97	.94	22.2	32.6
56	23	9	-.71	.32	.66	-.6	.66	.2	.94	.92	44.4	42.4
69	26	9	-.41	.31	.66	-.6	.41	-.2	.95	.90	66.7	41.0
249	28	9	-.22	.31	.61	-.6	.63	.0	.91	.89	66.7	44.4
283	18	9	-1.30	.37	.61	-.7	.52	.1	.97	.94	33.3	38.4
73	29	9	-.12	.30	.59	-.6	.41	-.4	.97	.88	66.7	47.5
MEAN	21.1	9.0	-1.16	.39	1.05	.0	.89	.2			50.8	48.4
P.SD	6.9	.0	1.27	.15	.84	1.3	.87	.9			22.0	15.0

The criteria used to check a person's fit with the Rasch Model are that one of the Outfit MNSQ, Outfit ZSTD, or Point Measure Correlation scores are met. If a person does not meet these three criteria, then the person is not good enough and needs to be repaired or replaced. Criteria used to check person fit: 1) 0.50 < MNSQ < 1.50; 2) -2.00 < ZSTD < +2.00; and 3) 0.40 < Point Measure Correlation < 0.85.

Based on Table 3, it can be concluded: 1) the person's ability is more than 0.00 logit, namely person number 109 is 0.23 logit and person number 106 is 0.06 logit; 2) the lowest person's ability is person number 7 is -3.807 logit and person number 14 is -4.21 logit.

2) Person Reliability

Person reliability can be seen in Table 4 below:

Table 4. Person Reliability

	TOTAL SCORE	COUNT	MEASURE	MODEL S. E
MEAN	21.1	9.0	-1.16	0.39
P. SD	6.9	0.0	1.27	0.15
S. SD	6.9	0.0	1.27	0.15
MAX	36.0	9.0	0.45	1.56
MIN	0.0	9.0	-8.67	0.27

REAL RMSE 0.48 TRUE SD 1.17 SEPARATION 2.42 PERSON RELIABILITY 0.85
MODEL RMSE 0.42 TRUE SD 1.19 SEPARATION 2.86 PERSON RELIABILITY 0.89
CRONBACH ALPHA (KR-20) PERSON RAW SCORE 'TEST' RELIABILITY = 0.77 SEM = 3.30

Based on Table 4, the Person Alpha Cronbach reliability coefficient score (KR-20) is 0.77. The person's holistic reliability coefficient score can be categorized as good and acceptable or the person's consistency in responding to the question items holistically is in the good and acceptable category. The person's reliability score is 0.85 means that the person's reliability can be categorized as good and acceptable.

The mean person measure score shows the mean score of all persons in responding to the question items. The mean person measure score of less than 0.00 logit indicates that the person's ability is less than the difficulty level of the item. Based on Table 4, the mean person measure score is -1.16 logit < 0.00 logit, indicating that the person's ability is less than the difficulty level of the questions.

3) Test Information Function

Each measurement will produce information related to the measurement results. The measurement information function describes the person's ability to respond to the item as a whole. The higher the peak of the test information function, the higher the measurement information function (Erina Afriani, 2023). The higher the measurement information function is related to the person's ability to respond to the question items. The information function of the problem-solving skills test can be seen in Figure 1 below.

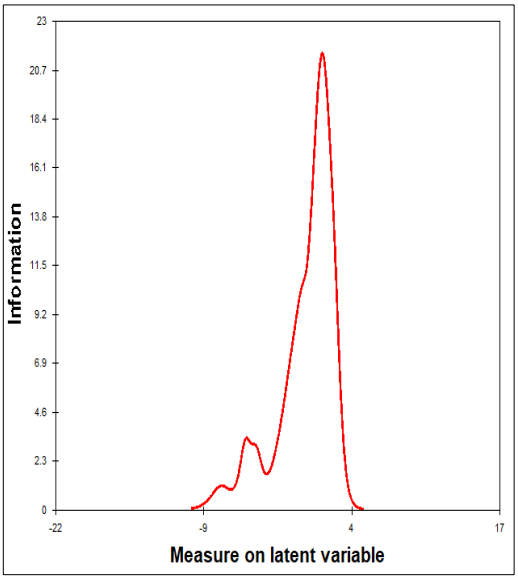

Figure 1. Problem-Solving Skills Test Information Function

Figure 1 shows that the X axis is the person's ability to respond to problem-solving skills questions and the Y axis is the information function score. It can be seen that at low abilities, the information obtained from measurements is low. Likewise, for high abilities, the information obtained from measurements is also low.

The person's ability lies between -9.00 logit to 4 logit, which is -2.50 logit in the low category. The maximum information function is 22%, providing information that the correct accuracy of measuring problem-solving skills items is 22% in the low category.

CONCLUSION

The accuracy of the person's ability to respond to problem-solving skills questions was 22%. Based on these results, it can be concluded: that students' problem-solving skills are in the low category. Solutions that can be taken to improve students' problem-solving skills are getting used to responding to mathematical problems related to everyday life. In the next research, it is hoped that researchers will be able to measure students' problem-solving skills again using relevant courses. This measurement is expected to have student abilities of more than 22%.

ACKNOWLEDGMENT

The researcher would like to thank the Head of the Information Systems Study Program, Mrs. Zai'matun Niswati, S.Pt., M.Pd., M.Kom, and the Information Systems Students who have given permission regarding the collection of research data.

REFERENCES

Andrich, D. (1989). Assumptions and Requirements in Measurement in the Social Sciences. *Mathematical and Theoretical Systems*, 7-16.

Bariyyah, K. (2021). Problem-solving skills: essential skills challenges for the 21st century graduates. *Jurnal EDUCATIO (Jurnal Pendidikan Indonesia)*, 71-80.

Davidowitz, B. (2016). Use of the Rasch measurement model to explore the relationship between content knowledge and topic-specific pedagogical content knowledge for organic chemistry. *International Journal of Science Education*, 1-20.

Erina Afriani, E. S. (2023). Analisis Kompetensi Minimum Siswa pada Materi Hidrolisis Garam Melalui Pengembangan Instrumen Tes Bermuatan AKM dengan Konteks Saintifik Daily Life . *Chemistry in Education*, 162-170.

Facione, P. A. (1990). Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction. Research Findings and Recommendations. *Eric*, 1-111.

Fazrul Prasetya Nur Fahrozy, S. I. (2022). Upaya Pembelajaran Abad 19-20 dan Pembelajaran Abad 21 di Indonesia. *Jurnal Basicedu*, 3093-3101.

Hasan Basri, P. A. (2019). Investigating Critical Thinking Skill of Junior High School in Solving. *International Journal of Instruction*, 745-758.

Hye Sun You, K. K. (2017). Assessing Science Motivation for College Students: Validation of the Science Motivation Questionnaire II using the Rasch-Andrich Rating Scale Model. *EURASIA Journal of Mathematics, Science and Technology Education*, 1161-1173.

I D Franestian, S. A. (2020). Analysis problem solving skills of student in Junior High. *Journal of Physics: Conference*, 1-6.

Lutfi Nur, L. A. (2020). Rasch Model Application on Character Development Instrument for Elementary School Students. *International Journal of Learning, Teaching and Educational Research*, 437-459.

Md, M. R. (2019). 21st Century Skill "Problem Solving": Defining the Concept. *Asian Journal of Interdisciplinary Research*, 64-74.

Munali. (2023). ANALISIS BUTIR SOAL PROBLEM-SOLVING SKILLS. *Al Amin: Jurnal Kajian Ilmu dan Budaya Islam*, 272-283.

Nadia Mirela Florea, E. H. (2015). Critical thinking in elementary school children. *Procedia - Social and Behavioral Sciences*, 565 – 572.

Nurdan Özreçberoğlu, Ç. K. (2018). Making It Count: Strategies for Improving Problem-Solving Skills in Mathematics for Students and Teachers' Classroom. *EURASIA Journal of Mathematics, Science and Technology Education*, 1253-1261.

Rika Irmayanti, M. R. (2023). The Rasch Model: Implementation of Physics Learning Evaluation Instrument Based on Higher Order Thinking Skills. *Integrated Science Education Journal*, 62-68.

Sharifah Nurulhuda Tuan Mohd Yasin, M. F. (2018). The use of Rasch measurement model for validity and reliability. *Journal of Counseling and Educational Technology*, 22-27.

Shazaitul Azreen Rodzalan, N. N. (2020). Factors Influencing the Improvement of Students' Critical Thinking and Problem-Solving Skills An Industrial Training Intervention. *International Journal of Emerging Technologies in Learning (iJET)*, 134-145.

Shiau-Wei Chan, C.-K. L. (2020). Assessing computational thinking abilities among Singapore secondary students: a Rasch model measurement analysis. *J. Comput. Educ*, 1-24.

Sumintono, B. W. (2013). *Aplikasi Model Rasch Untuk Penelitian Ilmu-Ilmu Sosial.* Cimahi: TrimKom Publishing House.

Yose Indarta, N. J. (2021). 21st Century Skills: TVET dan Tantangan Abad 21. *Edukatif : Jurnal Ilmu Pendidikan*, 4340 - 4348.