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APPLYING DIAGNOSTIC ASSESSMENT WITH RASCH ANALYSIS TO MEASURE STUDENTS' BASIC UNDERSTANDING OF ECONOMICS

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Abstract. This study examined the use of diagnostic assessments with Rasch modeling to gauge the grasp of fundamental economic concepts among 10th-grade students, focusing on students' understanding levels. Employing a descriptive quantitative approach, data were collected through a diagnostic test aligned with the 10th-grade economic curriculum. Three main aspects were analyzed: item quality, student understanding levels, and demographic-based understanding comparisons. Results indicated the test's validity and reliability, with varying levels of student comprehension: 6% showed very high understanding, 25% showed high understanding, 29% showed moderate understanding, 25% showed low understanding, and 15% showed very low understanding. Gender-based analysis showed no disparities in understanding between male and female students. However, school-origin-based analysis revealed significant differences, with varying understanding levels among students from schools A, B, and C. This underscores the necessity of addressing the needs of students with lower comprehension levels and adopting a more tailored teaching approach for economic concepts. Additionally, findings suggest that contextual factors, such as school environment, influence student understanding. To enhance economics education effectiveness, educators should employ strategies accommodating diverse levels of understanding.

Keywords**:** *Diagnostic Assessment; Rasch Analysis; Students' Understanding.*

I. INTRODUCTION

Economics learning in Senior High School is an integral part of the social studies or social science curriculum. It is a very important subject because it provides a basic understanding of how the economy operates, how economic decisions are made, and their impact on individuals, society, and the country as a whole (Safri, 2018). Economic learning in high school begins with learning material about Basic Economic Concepts. The material Basic concepts of economics provide a fundamental understanding of how economics is implemented in real life including how humans meet their needs, how to overcome scarcity problems, make a priority scale and calculate opportunity costs to make wiser economic decisions. It helps students understand the basics of the economy in which they live (Standards Board, Education Curriculum and Assessment, 2022).

As a basic material, if students are able to understand basic economic concepts well, it will be easier to build more complex abilities in accordance with learning outcomes and objectives (Wikasari, 2020). However, if students do not understand basic economic concepts, it will be difficult to understand further economic material that is more complex. As a result, students tend to experience difficulties in stages to understand concepts in economics lessons.

Students' difficulty in understanding a concept is often a signal that the concept has not been understood properly and correctly (Flaig et al., 2018). Several factors can affect students' understanding abilities ranging from intellectual, environmental, and psychological factors (Nurhidayati & Duryati, 2020). By paying attention to the level of understanding, educators can help them overcome barriers in

understanding concepts and achieve a deeper and more meaningful understanding (Romine & Sadler, 2016).

By reviewing students' level of understanding of learning materials on an individual basis, educational practitioners can customize teaching methods, curriculum and learning materials according to students' needs, interests and learning styles. This helps to improve learning effectiveness and ensure that every student has an equal opportunity to succeed (Dejong, Kokinakis, & Kuntzleman, 2002). Good teaching is inseparable from good assessment (Wiggins, 1993). The relationship is described as "a three-way relationship between teaching, testing, and learning; assessment can inform instruction" (Anderson & Goode, 1997).

Measuring understanding is very important. It allows educators to evaluate the extent to which students have understood the learning material taught. This helps in assessing the effectiveness of teaching and identifying areas where students may need additional help. By measuring understanding, educators can ensure that students have achieved the learning objectives set. This helps ensure that each student acquires the knowledge and skills necessary for success at the next level of education (Suwarto, 2013).

Measuring understanding also allows educators to understand the needs and level of understanding of individual students. This enables the development of differential learning strategies, where students with different levels of understanding can receive support and teaching that is appropriate to their needs (Sulkifli, 2021).

Information about students' level of understanding can be used to refine and develop a more effective curriculum. By understanding where students have difficulty or confusion, educators can adjust learning materials to improve their understanding. Measuring understanding also helps in identifying students who require intervention or additional support. By knowing where students are having difficulty, educators can provide appropriate assistance to help them achieve better understanding (Suwarto, 2013).

The process of measuring understanding provides feedback to students on their progress in understanding learning materials. This can motivate students to continuously improve their performance and achieve the set learning objectives. Information on student understanding is also important for decision makers at the institutional or policy level. Data on student understanding can be used to evaluate educational policies, allocate resources effectively, and design more effective educational programs (Sumintono & Widhiarso, 2015).

Thus, measuring understanding is a key step in ensuring educational effectiveness, supporting student-centered learning, and ensuring that every student has an equal opportunity for academic and personal success. Measuring student understanding can be done through a diagnostic assessment process. Diagnostic assessment is an assessment that is carried out specifically to identify learners' competencies, strengths, weaknesses, so that learning can be designed in accordance with the competencies and conditions of learners. Diagnostic tests will be very useful to find out learning difficulties and is the first step to improving the teaching and learning process. Information obtained from the implementation of diagnostic assessment can be used to help solve problems. assessment can be used to help troubleshoot the difficulties faced by students and to improve the success of learning. So it is necessary to have a diagnostic assessment process to determine the condition of student understanding (Suwarto, 2013).

This study aims to assess students' understanding in explaining basic economic concepts. Assessment of the level of understanding includes cognitive aspects of knowledge and understanding (Sudijono, 2005). Evaluation of knowledge is related to measuring students' mastery of the substance (content) of knowledge related to basic economic concepts.

Rasch Modeling Analysis can support the diagnostic assessment process by providing an in-depth description of student abilities and individualized evaluation with an easy process, it can be done with Rasch Model Analysis (Falani, 2017). Rasch developed a measurement model that determines the relationship between the level of ability of students (people) and the level of difficulty of test items by using a logarithmic function to produce measurements with the same interval. It is able to convert raw score data into data with equal intervals so as to produce a measurement scale that is linear, precise and has units (Laliyo et, al., 2022). The result is a new unit called logit (log odds unit) which shows the student's ability and the level of difficulty of the item, so that later from the logit value obtained, it is concluded that the student's success rate in working on the problem depends on the level of ability and the level of difficulty of the item (Falani, 2017).

For some reason, Rasch model should be used in analyzing assessment result. Education practitioners are faced with challenges in measuring student understanding on diagnostic assessments. First, teachers have difficulty designing diagnostic assessments and instrument of test that suit the needs of students and cover various levels of understanding (Magfirah, 2019). Rasch Model analysis can assist in developing valid and reliable assessment instruments by identifying and eliminating inconsistent or irrelevant items (Sumintono & Widhiarso, 2015).

Second, teachers have difficulty measuring student understanding in depth and meaning, not just factual knowledge (Yansa et al., 2021). With Rasch analysis this can be overcome. The Rasch model can analyze student responses to assessment items. The Rasch model can help identify the extent to which students understand certain concepts and indicate weaknesses or gaps in their understanding (Sumintono & Widhiarso, 2015).

Third, with tradisional assessments that are usually carried out, teachers only review abilities based on student score criteria so that teachers have difficulty adjusting an accurate, objective and meaningful assessment scale for all students (Yansa et al., 2021). Meanwhile, with the Rasch Model, the scale of measurement results will be adjusted automatically in order to distinguish between different levels of student ability objectively, thus providing more accurate and meaningful results (Sumintono & Widhiarso, 2015).

Fourth, diagnostic assessments using traditional analysis are time-consuming and require considerable effort to interpret results and manage assessment data (Magfirah, 2019, Yansa et

al., 2021). By analyzing assessment data using the Rasch model, teachers can gain a deeper understanding of students' level of understanding, thereby identifying areas that require special attention and planning appropriate interventions or support quickly and efficiently (Sumintono & Widhiarso, 2015).

From the explanation above, Rasch model analysis can be an effective tool for teachers and educational practitioners in overcoming the challenges of conducting diagnostic assessments. Using this approach, teachers can design, implement and interpret diagnostic assessments more effectively than conventional assessments so as to gain a deeper understanding of student understanding and design appropriate interventions or supports to facilitate better learning.

Departing from the explanation above, there are several problems that will be examined in this study, namely: 1) Does the test instrument used in the assessment process meet the criteria for instrument reliability and validity based on the Rasch model? 2) What is the level of understanding of basic economic concepts among students in 10th grade? 3) Are there differences in the level of understanding of basic economic concepts of students in terms of demographic criteria?

Based on the explanation above, the objectives of this study are : 1) To determine the quality of test instruments used in the diagnostic assessment process; 2) To determine whether there are differences in the understanding of basic economic concepts of students; 3) To determine whether there are significant differences in the understanding of basic economic concepts based on gender and school origin. From these questions it is expected to obtain results that can show the results of cognitive diagnostic assessment such as, comprehensive description about the instrument items, differences in student ability levels and differences in student ability to answer question items.

II. METHODS

This research used a descriptive quantitative approach. Quantitative research is one of the studies that produces findings using statistical procedures or through measurement (Sujarweni, 2014). Meanwhile, descriptive method is a research method aimed at describing existing phenomena, which take place at this time or in the past. The description of the situation can be in the form of individuals or groups and uses numbers (Hamdi & Bahruddin, 2014). This research is non-experimental descriptive quantitative research so that students' concept understanding in understanding the basics of economics is treated as a variable that can be measured. There is no treatment of the learning process or materials. Before the researcher conducted the assessment, it was ensured that the respondents had received material from the teaching teacher so that there was no researcher intervention in the respondents' understanding.

In measuring the level of understanding of basic economic concepts of students, this study used Rasch modeling in analyzing the assessment results. Rasch modeling, often referred to as Rasch Analysis, is a statistical technique used to analyze test or assessment data. It is used to measure an individual's ability to understand or answer assessment items, as well as to evaluate the quality and characteristics of those items.

Here are more details on how Rasch modeling is implemented (Sumintono & Widhiarso, 2015) :

1) *Design assessment instruments.* The first step in implementing Rasch modeling is to design assessment instruments that are appropriate for the concepts to be measured and the learning objectives set.
2) *Data Collection.* Once the assessment instrument is developed, assessment data is collected from test takers or respondents. This data contains individual responses to assessment items.
3) *Creating a Data Matrix.* The assessment data is then organized into a data matrix, where rows represent individuals and columns represent assessment items. Each cell in the matrix represents an individual's response to a particular item.
4) *Processing and Analyzing Data*. The main step in Rasch modeling is to analyze the data using the Rasch model. This involves using specialized statistical software that enables the implementation of Rasch models. Item analysis consists of summary statistics, item measure, and item fit order. While the analysis of person results is divided into person measure analysis, person fit order and Wrigth Map / Scalogram
5) *Interpretation of Results*. The results of the Rasch analysis provide information about an individual's ability to understand or answer assessment items, as well as the characteristics and quality of those items. Interpretation of these results can be used to understand students' level of understanding, identify inconsistent or irrelevant items, and design appropriate interventions or supports.

Rasch analysis was chosen and used in the study because of several advantages. Rasch analysis uses objective mathematical models to measure individual abilities and the quality of assessment items. In terms of measuring student understanding, the Rasch Model can distinguish between individuals of different ability levels with a high degree of accuracy. This helps in identifying individual abilities more precisely. Finally, Rasch Analysis can provide deep insights into a student's ability to understand certain concepts, allowing educators to design interventions or support tailored to individual needs. Thus, Rasch Analysis is an important tool in the assessment process as it provides accurate, reliable and meaningful information about an individual's ability to understand learning materials as well as the quality of the assessment instruments used.

Instrument Development. In this study, the test was intended as a tool for implementing cognitive diagnostic assessment to determine the ability of 10th grade students' understanding in learning economics in State High School in Gorontalo City. In obtaining data on this cognitive aspect, the instrument used is a test instrument in the form of multiple choice. The following is a lattice of cognitive diagnostic assessment instruments in economic learning:

Journal of Education, Teaching, and Learning
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TABLE I
COGNITIVE DIAGNOSTIC ASSESSMENT INSTRUMENT GRID

Subject Matter	Learning Objectives (STAGE E)	Indicators	Sub Indicators	Item Number
Basic concepts of Economics	1. Students can understand scarcity as the core of economic issues.	Explain the phenomenon of scarcity based on experiences from the surrounding environment.	1) Students are able to understand definition of economics (P1)	1 2 3
			2) Students are able to identify economic problems (scarcity and relatively unlimited needs) (P2)	5 6 7 8
	2. Students understand the priority scale as a reference in determining the various needs that must be fulfilled.	Prioritizing needs as an effort to overcome scarcity problems that occur in the surrounding environment (I2).	3) Students understand, classify and select the concept of choice (needs and wants) (P3)	4 9 13
			4) Students can show the right priority scale (P4)	11 15 17
			5) Students understand needs and ways to fulfill needs (P5)	14 12 16
	3. Students understand the pattern of the relationship between scarcity and opportunity cost.	Analyze the relationship between scarcity and opportunity cost (I3).	6) Students understand the concept of opportunity cost (P6)	10 18 19 20

The research was conducted in three public high schools. The determination of the population in those schools is based on the affordable population. Affordable population is a population that can be observed by researchers because it is limited by place and time (Sukmadinata, 2007). The three schools are located in strategic places so that they are easy to reach.

The total population is 1324 students. The total population is 1324 students. This number was obtained from the total number of grade 10 students in three schools in Gorontalo City. The total number of 10th grade students in SMA A is 444 students, SMA B is 428 students and SMA C is 452 students. Regarding the determination the number of samples, Arikunto (2010) suggested that when the subjects are fewer than 100, all of them should be taken for the research to be considered a population study. Furthermore, if the number of subjects is large (more than 100), a sample size of between 10%, 15%, or 20%, 25%, or more can be taken. Thus, in this study, researcher used sample size 25%. Thus, 25% of 1324 students are 331 people. The number of samples (respondents) amounted to 331 people who were 10th grade students in public high school.

The sample determination used purposive sampling technique. Purposive sampling is a sampling technique based on the consideration of the researcher or evaluator about which samples are the most useful and representative (Babbie, 2004). The sample was determined by researcher based on the recommendation of the economics teacher. The teacher has chosen which classroom the assessment will be conducted in. And the samples were students where studied in the classroom that the teacher has chosen.

The following is data regarding the number and description of respondents :

TABLE II
DEMOGRAPHIC PROFILE OF RESPONDENTS (N=331)

Demographic	Code	Respondents	Percentage
According to Gender			
Male	L	125	39%
Female	P	206	61%
According to School			
High School A	A	111	34%
High School B	B	107	32%
High School C	C	113	34%
		331	100%

Data Collection. The data collection technique used in this study was a test. Respondents were randomly selected without being given prior briefing on the test material. All respondents were asked to do all 20 questions in the form of multiple choice questions within 30 minutes. The test stages begin with students filling in their identity on the worksheet, then filling in the right choice of answers then all results are collected when the test time ends.

The data obtained in the previous process is still ordinal data. Then the data converted into interval data that has the same logit scale using Winsteps software version 3.7.3. The result was calibration of student ability data and item difficulty levels in the same interval size.

Data Analysis. The initial step involves preparing assessment data in an appropriate format, typically organized in a matrix where rows represent individuals or respondents, and columns represent assessment items. Each cell within the matrix contains individual responses to specific items. Following this, the Rasch model is utilized to estimate relevant parameters. The primary parameters estimated include (Suminotono &Widhiarso, 2015) :

1. Student Ability (θ) : This parameter gauges a student's ability or tendency to comprehend or respond to assessment items.
2. Item Difficulty (β): This parameter measures the relative difficulty of each assessment item.

Next, the Rasch model calculates the probability that a student with a specific ability θ will correctly respond to an item with a certain difficulty β. This involves computing the expected response probability for each combination of student ability and item difficulty (Laliyo et al, 2022).

After calculating response probabilities, the Rasch model is evaluated to assess the extent to which it fits the observed data.

Journal of Education, Teaching, and Learning
Volume 9 Number 2 September 2024. Page 1-11
p-ISSN: 2477-5924 e-ISSN: 2477-8478

The results of the Rasch analysis provide information on student ability levels, item difficulties, as well as the overall quality and characteristics of the assessment. This information can be utilized to comprehend students' levels of understanding, identify inconsistent or irrelevant items, and design appropriate interventions or support (Suminotono &Widhiarso, 2015).

III. Results And Discussion

A. Analysis of Instrument Measurement

Validity. Analysing the validity of the instrument through Rasch model analysis, it can be reviewed based on the results of the Item fit Order output. Item fit order explains whether the items function normally or not in making measurements (valid). If an item is found that does not fit, then it is an indication that there are misconceptions in students about the item. This information is useful for teachers to improve their teaching so that misconceptions can be avoided when doing it again (Sumintono, Widhiarso, 2015). The criteria used to check the accuracy of outlier or misfit items are: Accepted mean square value (outfit MNSQ): 0.5<MNSQ<1.5; Accepted outfit Z standardized value (outfit ZSTD): -2.0 <ZSTD<+2.0 and Accepted Point Size Correlation Value (Pt Mean Corr): 0.4 < Pt Mean Corr < 0.85.

Then, Alagumalai, Curtis, & Hungi (2005) added that the Point Measure Correlation can be classified as follows: 1) excellent (>0.40), good (0.30-0.39); 2) fair (0.20-0.29); 3) unable to discriminate (0.00-0.19); 4) requires item checking (<0.00). If the aitem meets all the criteria above then the aitem is declared to meet the requirements of aitem suitability (fit). And if it does not meet the MNSQ and Pt Mean Corr values, but meets the ZSTD value, it can still be declared fit/valid (Apriliani, 2021). The results of the item suitability test are as follows :

TABLE II
Output of Item Fit Order

Item	Measure	Outfit MNSQ	Outfit ZSTD	Pt Mean Corr	Kriteria
13	2.54	1.72*	2.8*	0.03*	Invalid
4	1.74	1.42	2.7*	0.18*	Invalid
5	-0.12	1.37	5.9*	0.12*	Invalid
15	0.93	1.1	1.2	0.29*	Valid
9	0.4	1.09	1.5	0.32*	Valid
17	0.07	1.09	1.6	0.32*	Valid
19	-0.03	1.06	1.1	0.35*	Valid
6	-1.57	1.04	0.3	0.34*	Valid
3	-1.41	1.04	0.4	0.35*	Valid
1	0.9	1.01	0.2	0.37*	Valid
20	-0.06	0.96	-0.6	0.43	Valid
7	0.27	0.96	-0.7	0.43	Valid
12	0.11	0.92	-1.5	0.44	Valid
14	-1.31	0.79	-1.9	0.46	Valid
11	-0.41	0.87	-2.2	0.47	Valid
2	-1.29	0.85	-1.3	0.46	Valid
8	-0.99	0.87	-1.4	0.49	Valid
16	0.07	0.86	-2.7*	0.5	Valid
10	-0.15	0.81	-3.5*	0.54	Valid
18	0.33	0.81	-3.5*	0.53	Valid

From table 3. above, it is obtained that there are several items that do not fit because they do not meet the requirements of item fit order. Item 13 does not fit because it does not meet all three fit order item requirements (MNSQ>1.50; ZSTD>2.0; and PtMeanCorr <0.40). While items number 4, and 5 have in common that they do not meet both fit order item requirements (ZSTD>2.0 and PtMeanCorr<0.40). Because they do not meet two to three fit order item requirements, the three items will be eliminated and will not be used in the next data processing process.

There were exceptions to items no. 15, no. 9, no. 17, no. 19, no. 6, no. 3, and no. 1 where the PtMeanCorr <0.40 value did not meet the requirements. However, the PtMeanCorr value was still in the range of 0.20-0.40 so it can still be declared good enough and feasible to use (Alagumalai, Curtis, & Hungi, 2005). Then for item no. 11, no. 10 and no. 18 do not meet the ZSTD Outfit requirements where the ZSTD value of each item has an outif ZSTD value below -2.00. However, because they still meet the requirements on two criteria (MNSQ outfit value and PtMeanCorr), these items are still declared suitable for use.

Reliability. The next step was reliability testing. Instrument reliability analysis can be reviewed based on the results of data output on the summary statistic menu. In the output results, it contains information in the form of score results or values such as, standard deviation value (mean logit), differential power, person and item reliability and Cronbach Alpha (KR-20) value. The standard deviation value will be used to see the distribution of data and as a basis for measuring the reliability category of person and scale items. The separation value is used to find the reference value of the measurement scale. While the reliability value is to measure the reliability of the instrument in measuring the person and item under study. The summary statistic output results for measuring instrument reliability and creating the next measurement category scale are as follows :

TABLE III
Output of Summary Statistic

Paramater	Mean Logit (SD)	Separation	Reliability	KR-20
Person (331)	0.88	1.45	0.68	0.71
Item (20)	0.79	5.99	0.97	

From table 4. above, it is obtained information that the Person Reliability value is 0.68 (R=0.67-0.80), which means that the respondent's ability to answer questions is in the "Good Enough" category (Aprilia, 2021). Meanwhile, the Item Reliability is 0.97 (R>0.94). Where this showed that the reliability of questions to test the ability of respondents is in the "Very Good" category (Aprilia, 2021). While the Cronbach Alpha (KR-20) value = 0.71 indicated the overall level of reliability of the items as an instrument is in the "Good" category (0.70-0.80), so that henceforth it can be used as an instrument to measure understanding of basic economic concepts (Aprilia, 2021).

Journal of Education, Teaching, and Learning
Volume 9 Number 2 September 2024. Page 1-11
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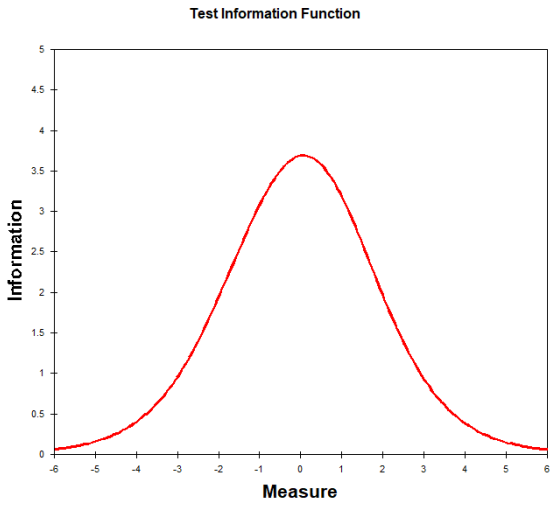


Fig. 1 Test Information Function

Figure 1. showed the measurement information graph to indicate measurement reliability. The higher the peak of the graph, the higher the measurement reliability value. The test instrument can measure the ability of respondents at a moderate level of student ability (-4.0 logit to +4.0 logit). This indicates that the instrument's ability to explain the phenomenon of understanding the basic concepts of economics used, can provide optimal information on moderate ability students. This means that the instrument has good measurement reliability (Sumintono & Widhiarso, 2014).

Measurement of Item Difficulty Level. After the item is declared valid and reliable, it is necessary to review the level of difficulty of the item. The level of difficulty of a question aims to show the proportion of test takers who answer the question correctly. The higher the value of the difficulty level of the question (p), the higher the probability that the respondent answers correctly and it can be interpreted that the item has a low level of difficulty. The level of difficulty of a question does not indicate whether the question is good or bad. The level of difficulty of a question only shows the difficulty or ease of the question for groups with certain criteria (Zainul et al, 1997). A good question item is one that is neither too easy nor too difficult. Problems that are too easy discourage students from working twice as hard to solve them. Conversely, a problem that is too difficult will discourage students and discourage them from trying again because it is out of their reach (Arikunto, 2011).

In this study, to determine the criteria for the level of difficulty of the question items can be obtained from the mean logit value or standard deviation of the question items where based on the previous table 4. where the mean logit (SD) is 0.79, the criteria can be seen in the following table :

TABLE V
CATEGORY OF ITEM BY DIFFICULTY LEVEL

Logit Value	Category
Greater than +1.80 SD	Very difficult
+0.80 logit to +1.79 SD	Difficult
0.00 logit to +0.79 SD	Medium
-0.79 logit to -0.01 SD	Easy
Smaller than -0.80 SD	Very Easy

Then, after determining the criteria, the test results went through data processing using the Rasch model application, Winstep 3.7.3. reviewed the output of the measure order item. The results of the measure order table output were as follows :

TABLE VI
OUPUT OF ITEM MEASURE

Item	Measure (Logit Score)	Criteria
1_p1	-1.38	Very Easy
2_p1	-1.09	Very Easy
3_p1	1.2	Difficult
6_p2	0.22	Medium
7_p2	-1.11	Very Easy
8_p2	0.32	Medium
9_p3	1.23	Difficult
11_p4	-0.18	Easy
15_p4	0.32	Medium
17_p4	-1.21	Very Easy
14_p5	0.53	Medium
12_p5	0.37	Medium
16_p5	-0.78	Easy
10_p6	0.1	Medium
18_p6	0.6	Medium
19_p6	0.67	Medium
20_p6	0.19	Medium

Based on table 6. the results of the item measure order output showed that there are 4 (*four*) categories of questions, namely very easy, easy, medium and difficult questions. There are four very easy items (item no. 1, 2, 7 and 17), two easy items (item no. 11, 16), eight medium items (item no. 6, 8, 10, 12, 14, 18, 19 and 20) and two difficult items (item no. 3 and 9).

Analyzing students' weaknesses, it can be seen that the most difficult items are items no. 3 and no. 9. Where these are questions to test indicator point 1, namely students can understand definitions and terms in economics (P1). Another difficult question to answer is question no. 9 where the question tests indicator 3, namely students understand, classify and select the concept of choice : *needs and wants* (P3).

B. Analysis of Differences in Students' Understanding of Basic Concepts

Analysis of respondents' abilities (Person Measure) was used to map students' abilities based on the achievement of grouping results. In this aspect, teachers could find out early information from the test results, which will provide information on the level of student learning abilities that are valuable for improving teaching and helping students. In this study, to determine the criteria for student ability can be seen in the Wright Map Output below:

Journal of Education, Teaching, and Learning
Volume 9 Number 2 September 2024. Page 1-11
p-ISSN: 2477-5924 e-ISSN: 2477-8478

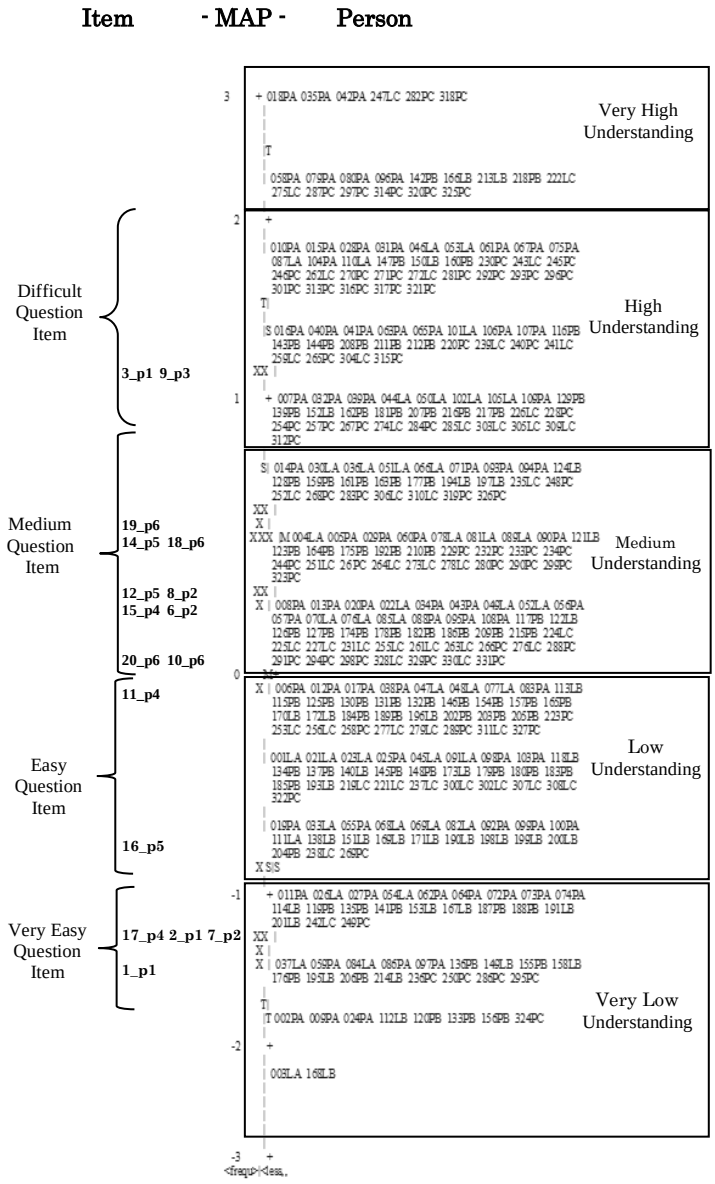


Fig. 2 Person Wright Map Output

From the Wright Map data in Figure 2. There were 48 students with very low understanding skills are 011PA, 026LA, 027PA, 054LA, 062PA, 064PA, 072PA, 073PA, 074PA, 114LB, 119PB, 135PB, 141PB, 153LB, 167LB, 187PB, 188PB, 191LB, 201LB, 242LC, 249PC, 037LA 059PA, 084LA, 086PA, 097PA, 136PB, 149LB, 155PB, 158LB, 176PB, 195LB, 206PB, 214LB, 236PC, 250PC, 286PC, 295PC, 002PA, 009PA, 024PA, 112LB, 120PB, 133PB, 156PB, 324PC, 003LA and 168LB. Of the total number, 18 students were High School A students, 23 students were High School B students and 7 students were High School C students. Based on gender category, there were 17 students are male and 31 students are female.

There were 21 students with very high Understanding ability, namely respondents 018PA, 035PA, 042PA, 247LC, 282PC, 318PC, 058PA, 079PA 080PA, 096PA, 142PB, 166LB, 213LB, 218PB, 222LC, 275LC, 287PC, 297PC, 314PC, and 320PC 325PC. Very high ability students in High School A totaled 7 students, in High School B totaled 4 students and in High School C totaled 10 students. Based on gender, there were 16 students are female with very high Understanding ability and 5 students are male with very high Understanding ability.

More detailed data of student's ability can be obtained from the mean logit value or standard deviation of the person where based on table 4. where the mean logit (SD) is 0.88, to see an overview of the student ability category can be seen in the following table :

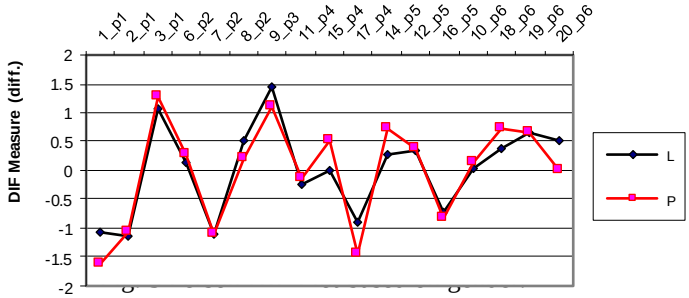
TABLE VII
RECAPITULATION OF LOGIT VALUES ON PERSON MEASUREMENT OUTPUT

Logit Score (Person)	Category	School			Gorontalo City	
		A	B	C	Total	%
Above +1.89 SD	Very High	7	4	10	21	6%
+0.89 logit to +1.88 SD	High	28	17	37	82	25%
0.00 logit to +0.88 SD	Medium	32	24	39	95	29%
-0.88 logit to -0.01 SD	Low	26	39	19	84	25%
Below -0.89 SD	Very Low	18	23	7	48	15%
Total		**111**	**107**	**112**	**331**	**100**

Table 7. above showed that the ability of 10th grade students in understanding basic economic concepts in Gorontalo City is divided into: students with very high concept understanding was 21 students (6%); high understanding was 82 students (25%); moderate understanding was 95 students (29%); low understanding was 84 students (25%); very low was 48 students (15%).

C. Differences in Understanding Based on Demographics

The next step measured differences in students' conceptual understanding on the focused topic based on gender and school origin of respondents using Differential Item Functioning (DIF). The results of the DIF plot output can be seen in the figure below :



Based on Figure 3. Person DIF plot based on student gender level illustrated that no significant differences were found. Male and female students' curve points are at the same logit limit of item difficulty. For example, item number 1_p1

Journal of Education, Teaching, and Learning
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does show a difference in the distance of the curve point between male (logit -1.00) and female (-1.50 logit) but the point is still at a low item difficulty level (bottom of the curve). In order that both male and female consider question number 1_p1 to be an easy question.

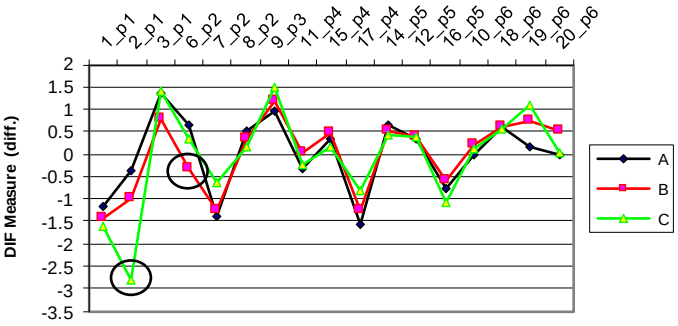

Fig. 4 Person DIF Plot based on School.

Based on Figure 4. Person DIF plot based on the level of school of students have illustrated that there are two items identified as having significant disparities. The first item is on question item 2_p1. Question number 2 is a question that tests indicator 1, namely the definition of economics. The item was detected to contain a difference at the High School C (diff. value <-2.50 logit) point that crossed the logit center limit. That can be said that High School C students feel that item no.2 is an easy question item compared to High School A and High School B.

The second question is on question item 6_p2. Item number 6 is a question that tests indicator 2, namely identifying scarcity as an economic problem. The item is detected to contain differences that are close to the lower limit at the High School B curve point (diff. value <0.00). Where this showed that High School B students feel that item no.6 is a very easy item compared to High School A and High School C students. Therefore, there were differences in student ability based on school category in some basic economic materials.

D. Discussion

Economics education plays an important role in shaping students' understanding and ability to deal with complex economic realities. Understanding economics helps students prepare for real-life challenges after they graduate (Schug & Wood, 2011). If teachers or educators cannot instill understanding in students related to basic economic concepts, it is feared that it will affect the economic aspects of students in the future.

For reviewing students' understanding of basic economic concepts, it is necessary to conduct a diagnostic assessment. To facilitate the analysis of assessment results, teacher or educators can use of diagnostic assessments with Rasch modeling in economics education offers several significant advantages. By using Rasch, teachers can more accurately measure student ability. This allows for a more accurate identification of students' strengths and weaknesses, allowing for more targeted interventions (Laliyo, et. al., 2022). Rasch diagnostic assessments allow teachers to better understand where students are struggling and confused. This allows them to tailor their instruction to meet students' individual needs. Rasch provides the ability to objectively measure student progress over time. This allows teachers to better track student progress and adjust curriculum and teaching methods based on student understanding (Sumintono &Widhiarso, 2015). Rasch diagnostic assessment provides not only information about students' errors, but also constructive feedback about steps that can be taken to improve their understanding. This helps create an inclusive and supportive learning environment (Bond & Christine, 2007). Thus, implementing diagnostic assessments using Rasch modeling is not only about improving students' understanding of economics, but also about creating a learning environment that enables each student to reach his or her full potential (Sumintono & Widhiarso, 2015, Dejong, Kokinakis, & Kuntzleman, 2002).

The results of assessment using rasch model to measuring students' understanding provided some information about high school students' understanding in Gorontalo City. First, the assessment test instrument has good quality item reliability (Cronbach Alpha KR-20 = 0,71). This was done to check that the questions are well suited to checking that students understanding. The results of the item measure order output showed that there were four very easy items, two easy items, eight medium items and two difficult items. In analyzing students' weaknesses, it can be seen that the most difficult items are items no. 3 (P1) and no. 9 (P3). Item no. 3 tests students' understanding of the meaning of economic terms, more precisely the meaning of scarcity, while item no. 9 tests students' understanding of the concept of choice of needs and wants. This can be an evaluation material for teachers in the teaching process of the two learning indicators.

In the analysis of differences in the level of understanding ability, the data showed that 10th grade students in Gorontalo City have varying concept understanding abilities. Students with very high concept understanding amounted to 21 students (6%). This indicated that a small portion of the student population has very deep concept understanding. This group can easily answer some difficult questions. The very high level of understanding indicates that students have already met the learning indicators.

Students with high understanding amounted to 82 students (25%). A total of 82 students fall into this category, indicating that most students have a relatively high understanding of concepts, although not as strong as the very high group. This group can easily answer some moderate questions and can tackle some difficult items. The high level of understanding indicates that students have met the understanding indicators.

Students with Medium understanding amounted to 95 students (29%). This showed that most students have a fairly good understanding of the concept, although not as strong as the high group. This group can answer questions with moderate difficulty level. A moderate level of understanding indicates that students have not fully met the learning indicators. Further evaluation is needed for students in this category.

Students with low understanding as many as 84 students (25%). This group, indicating that most students have limited or low concept understanding. This group can answer

questions with an easy difficulty level. A low level of understanding indicates that students have not grasped most of the material taught. Further evaluation is needed for students in this category.

Students with very low understanding amounted to 48 students (15%). This group includes 48 students, indicating that there were a number of students who have very limited concept understanding. This group can only answer questions with a very easy difficulty level and may even be unable to answer easy questions at all. A very low level of understanding indicates that students have not comprehensively understood the material taught. Special actions are needed for students in this category.

The percentage representing students' ability to understand concepts represents the distribution of concept understanding among the student population. This provides an overview of how well students understand the material taught in the context of the research. This finding highlights the importance of paying attention to the needs of students who have a low level of understanding, as well as the need for a more differential approach in teaching basic economic concepts (Wiggins & McTighe, 2005).

From the results of the person measure output, the researcher found that the level of understanding of High School A and High School C students was higher than the understanding of High School B students, as seen from the average student obtaining a logit person value above 0.00 so that the average High School C student's ability was at a medium-high level. High School A students on average obtained a logit person value between -1.00 and 2.00 so that the ability of students' understanding was at a low - high level. Meanwhile, High School B has an average level of ability in the logit range of -1.00 to 1.00 or in the low-medium category. In short, there is a difference in ability between the three schools.

Observing whether there was a difference in understanding ability based on gender and school was carried out through DIF analysis. The results showed that in the gender category there were no differences in Understanding. Men and female have equal ability to understand basic economic concepts although there is a slight difference in the results of the diff value but not significant.

However, in the category of school origin, there were significant differences in student understanding, namely in question items number 2 and 6. High School C students felt that item no.2 was an easy question item compared to High School A and High School B. The second question, namely on question item 6, High School B students felt that item no.6 was a very easy question item compared to High School A and High School C. The differences in DIF values among schools A, B, and C in the Rasch model analysis results indicate variations in students' understanding of the tested material between these schools.

Several potential reasons for these differences may arise due to various factors (Nurhidayati & Duryati, 2020). Firstly, differences in the quality of teaching by teachers in each school may lead students from better-performing schools to have a better understanding of the tested material. Secondly, variations in the curriculum across schools can influence students' understanding of the tested material, especially with the current implementation of the Merdeka Curriculum in Indonesia, where schools have autonomy in organizing their learning systems. Thirdly, environmental factors surrounding students, both at home and at school, can impact their understanding of the tested material. Fourthly, the facilities and educational support available at each school can affect students' abilities to comprehend the material.

A slight difference in students' levels of understanding can still be considered normal. If not handled properly, differences in students' understanding between schools can lead to disparities in educational outcomes between schools that may widen further. Students from schools with lower understanding may have fewer opportunities for academic advancement, career prospects, or higher education due to their limited understanding of the material (Williams, 2010).

Teachers in schools with lower understanding may face challenges in delivering effective instruction and may feel frustrated by students' difficulties in grasping the material. Schools with lower understanding may require additional resources, support, or interventions to address students' understanding gaps, potentially diverting resources from other areas in need. Disparities in educational outcomes can perpetuate existing social and economic inequalities, as students from schools with lower understanding may face barriers to accessing higher-paying jobs or opportunities for socioeconomic mobility (Hammond, et al, 2010).

Based on the explanation of the findings above, to improve the effectiveness of teaching and learning economics, teacher and educational practitioners need to consider strategies that can help students with different levels of understanding. Teachers need to have several alternatives that have enough opportunities to condition students to be more active in learning in class so as to obtain good learning outcomes (Uno & Koni, 2012). There are several strategies that can help students with different levels of understanding. Teachers can use Problem-Based learning, Project-Based Learning or Collaborative Teaching methods that encourage cooperation among students in completing tasks or projects. Teachers can also use Technology in Learning such as economic simulations, educational games or online learning platforms. Differentiated teaching by customizing teaching approaches and learning materials according to students' individual needs as well as using learning strategies that actively engage students, such as group discussions, role-playing or problem solving, which can help strengthen their understanding (Wiggins & McTighe, 2005, Uno dan Koni, 2012).

IV. Conclusions And Suggestions

Overall, this study contributed to provide an overview of the benefits of measuring students' understanding with applying cognitive diagnostic assessments using the Rasch model. The results showed that the test instruments used based on the provisions of validity and reliability have a good quality. Based on the level of difference in understanding of basic economic concepts of students, the results showed that there were still students who have very low abilities. Based on the

DIF analysis, differences were found based on students' understanding based on school origin. High School C tends to easily answer questions about the definition of economic terms compared to High School A and High School B. While High School B is easier to answer questions about scarcity as an economic problem than High School A and High School C. In the Gender DIF analysis, no differences in understanding were found. Male and female have equality in understanding the question items.

The percentage of students with a very low level of understanding is quite large at 15% so there needs to be repressive steps for students with low understanding in terms of improving understanding. Teachers should also review the materials, strategies or learning styles used to improve the quality of student understanding. The significant difference by school category indicates that there is a difference in ability between the three schools in this study.

This research had significant implications in the context of measuring students' understanding using cognitive diagnostic assessments with the Rasch model. The findings indicated that the test instruments used, based on validity and reliability, had good quality. However, the research also revealed that there were still a number of students with very low abilities in understanding basic economic concepts. These findings highlighted the need for effective intervention measures to improve the understanding of less capable students. Teachers needed to review the curriculum, teaching strategies, or learning styles used to enhance the quality of student understanding, while schools also needed to consider policies or programs to help improve the understanding of lagging students.

Additionally, the results of the DIF analysis showed differences in students' understanding based on school origin. This indicated variations in abilities among the three schools studied. These findings underscored the importance of developing tailored teaching strategies to meet the needs of each school. For example, High School C might need to focus on certain economic concepts perceived as difficult by students, while High School B could maintain its superiority in understanding resource scarcity issues. The practical implication of this research was the importance of evidence-based approaches in designing curricula and teaching strategies that could stimulate student understanding uniformly, regardless of school origin or gender.

Finally, researchers realize that research still has several limitations. So the researcher recommends to future researchers to further develop this research. It is hoped that future researchers can develop research by comparing the effectiveness of Rasch diagnostic assessments in measuring the understanding of economic concepts between different teaching methods, such as project-based teaching, problem-based teaching, or traditional approaches. This can provide insight into which teaching approach is most effective in improving students' understanding of economic concepts.

One of the limitations of this study is that it cannot describe in detail the factors that influence students' understanding. It is suggested that future researchers explore the influence of external factors, such as socioeconomic background or previous learning experiences, on students' understanding of economic concepts. This can help understand the factors that influence students' performance in economics subjects and identify appropriate intervention strategies. Also, future research should explore the relationship between Rasch diagnostic assessments in measuring students' understanding of economic concepts and economic literacy skills. This can help understand the extent to which diagnostic assessments can predict students' ability to understand and make decisions in real-life economic contexts.

By exploring these potential areas, future research can provide valuable insights on how to improve the teaching and learning of basic economic concepts at the 10th grade high school through the application of diagnostic assessments with Rasch model analysis.

V. REFERENCES

Alagumalai, S., David D. C., Njora H., & John K. (2005). *Applied Rasch measurement: an exemplary book: papers in honor of John P. Keeves (1st ed.).* Springer.

Anderson, A., & Goode, R. (1997). Assessment informs instruction. *Journal of Physical Education, Recreation & Dance*, 68(3), 42-49.

Anggraena, Y., Dion G., dan Nisa F. (2022). *Pembelajaran dan Asesmen.* Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Aprilia, N. 2021. Dipetik Agustus 25, 2023, *Cara Membaca Data Hasil Analisis Rasch Model, Interpretasi Data Output Rasch Model* dari URL Video Edukasi Youtube: www.youtube.com/watch?v=ZkK5h3E7pC8.

Arikunto, S. (2016). *Prosedur Penelitian Suatu Pendekatan Praktik.* PT. Rineka Cipta.

Babbie, E. 2004. *The practice of social research*. Wadsword.

Badan Standar Kurikulum dan Asesmen Pendidikan. 2022a. *Capaian Pembelajaran Mata Pelajaran Ekonomi Fase E - Fase F untuk SMA/MA/program* . https://guru.kemdikbud.go.id/kurikulum/referensi-penerapan/capaian-pembelajaran/sd-sma/ekonomi/fase-e/.

Bond, T. G., dan Christine M. F. (2007). Applying the rasch model: Fundamental measurement in the human sciences: Second edition. 1-340. *Psychology Press*. DOI: 10.4324/9781410614575.

DeJong, G. & Kokinakis, C.L. & Kuntzleman, C. (2002). The role of assessment in meeting the NASPE physical education content standards. *Journal of Physical Education Recreation and Dance*, 73(7), 22-25.

Falani, I., & Kumala, S.A. (2017). Kestabilan Estimasi Parameter Kemampuan Pada Model Logistik Item Response Theory Ditinjau Dari Panjang Tes. *Jurnal SAP (Susunan Artikel Pendidikan), 2(2), 146-150.* DOI: http://dx.doi.org/10.30998/sap.v2i2.2028.

Flaig, M. dkk. 2018. Reprint of Conceptual change and knowledge integration as learning processes in higher education: A latent transition analysis. Learning and

Individual Differences. *Elsevier*: 92–104. doi: 10.1016/j.lindif.2018.07.001

Gallo, M. A,. Sheehy, D., Patton K. & Griffin, L. 2006. Assessment Benefits and Barriers, What Are You Committed To?. *JOPERD* 77 (8). https://files.eric.ed.gov/fulltext/EJ794484.pdf

Hamdi, A. S., & Bahruddin, E. (2014). *Metode Penelitian Kuantitatif Aplikasi dalam Pendidikan*. CV Budi Utama.

Hammond, L., Burns, D., & Whitebook, M., (2016). *Teaching in Low-Income Schools: A Guide for Educational Equity.* Teachers College Press.

Laliyo, L.A.R., La Kilo, A., et.all. (2022). Rasch modeling to Evaluate Reasoning Difficulty, Response Change, and Misconception Patterns of Hydrolysis Items. *Baltic Journal of Science Education, 21(5), 817-835*. DOI: https://doi.org/10.33225/jbse/22.21.817.

Magfirah, R.A. (2019). *Pelaksanaan Tes Diagnostik di SMAN 4 Palopo.* Tesis. Program Studi Tadris Bahasa Inggris Fakultas Tarbiyah dan Ilmu Keguruan Institut Agama Islam Negeri Palopo.

Nurhidayati, N., & Duryati, D. (2020). Perbedaan Pemahaman Membaca Siswa Sd Di Kota Bukittinggi Ditinjau Dari Jenis Kelamin. *Jurnal Riset Psikologi, 1 (1), 1-12.* DOI : https://doi.org/10.24036/jrp.v2020i1.8056.

Purnomo, S. (2016). *Pengembangan Soal Matematika Model PISA Konten Space And Shape untuk Mengetahui Level Kemampuan Berpikir Tingkat Tinggi.* Tesis. Program Studi Magister Pendidikan Matematika Fakultas Keguruan Dan Ilmu Pendidikan Universitas Jember.

Purwanto, Ngalim. 2011. *Ilmu Pendidikan Teoritis dan Praktis.* Remaja Rosdakarya.

Romine, W. L. & Sadler, T. D. 2016. D. 2016. Measuring Changes in Interest in Science and Technology at the College Level in Response to Two Instructional Interventions. Research in Science Education. *Research in Science Education, 46(3):309–32 tion, 46(3):309–327. doi: 10.1007/s11165-014-9452-8.*

Saadi, F. Halidjah, S. & Kartono. (2013). Peningkatan Efektivitas Belajar Peserta Didik Dalam Pembelajaran Ilmu Pengetahuan Sosial Menggunakan Media Tepat Guna di Kelas IV Sekolah Dasar Negeri 02 Toho. *Jurnal Pendidikan dan Pembelajaran Khatulistiwa (JPPK), 2(7).* DOI: http://dx.doi.org/10.26418/jppk.v2i7.2460.

Safri, Hendra. 2018. *Pengantar Ilmu Ekonomi.* Lembaga Penerbit Kampus IAIN Palopo.

SIMPKB Kemendikbud. 2021. *Asesmen Diagnostik : Modul Unit Asesmen.* Kementrian Pendidikan dan Kebudayaan.

Schug, M. C., & Wood, W. C. 2011. *Teaching economics in troubled times: Theory and practice for secondary social studies*. Routledge.

Sudjana, N. (2010). *Penilaian Hasil Proses Belajar Mengajar*. Remaja Rosdakarya.

Sugiyono. (2013). *Metodelogi Penelitian Kuantitatif, Kualitatif Dan R&D.* Alfabeta.

Suhermiati, Ita. (2015). Analisis Miskonsepsi Siswa Pada Materi Pokok Sintesis Protein Ditinjau Dari Hasil Belajar Biologi Siswa. *Jurnal BioEdu Universitas Negeri Surabaya, 4(3), 985-990.*

Sujarweni, V. Wiratna. (2014). *Metode Penelitian: Lengkap, Praktis, dan Mudah Dipahami.* Pustaka Baru Press.

Sukmadinata, N. S. (2007). *Metode Penelitian Pendidikan*. PT. Remaja Rosdakarya.

Sulkifli. 2021. The Importance of Understanding Student Character to Support Successful Learning in Junior High School. *Jurnal Konsepsi* 10 (3), 277-286.

Sumintono, B. dan Widhiarso, W. (2014). *Aplikasi model Rasch untuk penelitian ilmu-ilmu sosial (edisi revisi).* Trim Komunikata Publishing House.

Sumintono, B. dan Widhiarso, W. (2015). *Aplikasi Pemodelan Rasch Pada Assessment Pendidikan.* Trim Komunikata Publishing House.

Suparno, Paul. (2013). *Miskonsepsi dan Perubahan Konsep dalam Pendidikan Fisika*. Grasindo.

Suwarto. (2013). *Pengembangan Tes Diagnostik dalam Pembelajaran.* Pustaka Pelajar.

Uno, H., Koni, S., 2012. *Assesment Pembelajaran*. Sinar Grafika Offset.

Wiggins, G. (1993). *Assessing student performance: Exploring the purpose and limits of testing*. Josey-Bass.

Wiggins, G., McTighe, J. (2005). *Understanding by Design. Association for Supervision & Curriculum Development*.

Wikasari, A. (2020). *Pengaruh Penerapan Model Pembelajaran Elpsa Terhadap Pemahaman Konsep Matematika Siswa Kelas VIII SMP Negeri 4 Denpasar*. Skripsi. Universitas Pendidikan Ganesha.

Williams, B., (2010). *Closing the Achievement Gap: A Vision for Changing Beliefs and Practices.* Teachers College Press.

Yansa, H. dan Retnawati, H. (2021). Identifikasi Praktik dan Hambatan Guru dalam Asesmen Kognitif Matematika di Masa Pandemi COVID-19. *Jurnal Elemen, 7 (1), 84 - 97.* DOI: 10.29408/jel.v7i1.2585.

Yumitasari, D. (2018). *Pengaruh Pelaksanaan Manajemen Kelas Study Groups Terhadap Pemahaman Siswa Pada Mata Pelajaran Ekonomi Di Sekolah Menengah Atas Negeri 12 Pekanbaru*. Skripsi, Universitas Islam Negeri Sultan Syarif Kasim Riau.

Zainul, A. & Nasoetion, N. 1997. *Penilaian Hasil Belajar*. Pusat Antar Universitas, Direktorat Jenderal Pendidikan Tinggi: Departemen Pendidikan Dan kebudayaan.