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Analysis of middle semester exam subjects for Automotive Vehicle Chassis (AVC) to improve the implementation management of learning evaluation

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ABSTRACT

Entering the 21st century with the industrial revolution 4.0, the speed of progress in information and communication technology has become unstoppable. One of the most benefited from these advances in the world of education. Exploration of learning resources, and discussion forums, for the evaluation of learning can be done easily because of technological advances. Learning evaluation can use a digital platform, and it is very easy to analyze to improve the management of the implementation of learning evaluation. This study was conducted to analyze the mid-semester test instrument, which includes Higher Order Thinking Skills (HOTS) questions and is used to measure students' abilities in the subject of Automotive Vehicle Chassis (AVC) in the Department of Automotive Engineering) at SMK Dharma Bahari Surabaya, Indonesia. This research method is descriptive and quantitative. The sample in this study was 40 students. The mid-semester questions were given as many as 40 questions related to the mid-semester exam material using the Quizizz platform. Analysis of the items is carried out by using the Rasch model approach to obtain fit items. This analysis was carried out with the help of Winsteps 3.73 software. In this study, it was found that the instrument of the question that Person Reliability at mid-semester Automotive Vehicle Chassis (AVC) was 0.85 while item reliability was 0.86. The magnitude of Cronbach's Alpha is 0.86, so it can be used to evaluate learning in AVC subjects according to the Rasch model.

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INTRODUCTION

Industrial revolution 4.0 has greatly impacted the speed of progress in information and communication technology that can no longer be dammed. This has an impact on several sectors that feel benefited. One of the most benefited from these advances in the world of education. The world of education is a place for students to gain knowledge, develop concepts, apply ideas, and so on as a form of achieving goals. Advances in information and information technology certainly make it easier to explore learning resources, discussion forums, and learning evaluations can be done easily because of technological advances (Szymkowiak et al., 2021). Learning evaluation can be done using a digital platform and is very easy to analyze to improve the management of the implementation of learning evaluation for students. In the learning process in the school environment, the teacher is a

figure who plays an important role in the process of evaluating and assessing student learning success in the subjects being taught (Kaso et al., 2021).

To determine the level of students' ability to master knowledge, it is necessary to conduct an assessment. Educational assessment is a process that cannot be separated into an educational activity (Li et al., 2021). This is why the teaching and learning process if it does not involve assessment as an important thing, it cannot be known for sure whether there is progress in learning and learning objectives are achieved (Li et al., 2021). Educational assessment is a process that cannot be separated into an educational activity. Educational technology, or what is often referred to as EduTech, is a combination of the use of computer hardware, software, and educational theory and practice to facilitate learning (Tuma, 2021). When referred to using the abbreviation EduTech, it often refers to a company that creates educational technology.

Educational technology is based on practical experience in education and theoretical knowledge from various sciences such as communication, education, psychology, sociology, artificial intelligence, and computer science (Lohr et al., 2021). It also covers several other important aspects, including learning theory, computer-based training, online learning, and m-learning, where mobile technology is also very much needed and used nowadays. In addition, in the learning process, an assessment or evaluation is needed to determine student development in terms of science. Currently, the assessment or evaluation of students also uses technology. Educational assessment with technology can be in the form of a formative assessment or a summative assessment (Vittorini et al., 2021). Instructors use both types of assessment to understand student progress and classroom learning. Technology has helped teachers make better judgments to help understand where students who are having problems with the material are having problems (Tuma, 2021). Formative assessment is more difficult because the perfect form is in progress and allows students to demonstrate their learning differently depending on their learning style (Wikipedia).

A competent teacher is a professional teacher. One of the competencies that a teacher must possess is pedagogic competence. Pedagogic competence is a competency or ability that must be possessed by a teacher, which includes the ability to understand students' character, design and implement learning, analyze and evaluate student learning outcomes, and motivate and facilitate students to develop and actualize various competencies or potentials they have. Therefore, the competence of a teacher not only compiles an evaluation tool to determine the achievement of student learning outcomes but can also evaluate whether the evaluation that has been prepared has been able to carry out its function as a measuring tool for learning outcomes that has quality values so that it can improve the quality of teacher competence and learning outcomes students (Fitrianawati, 2017).

Evaluation is a term that is often said in terms of learning assessment. Evaluation comes from the word evaluation, which means measuring and also assessing (Palimbong et al., 2019). Learning evaluation is a process of determining the value of student achievement by using certain benchmarks to achieve predetermined learning objectives (Setiawan, 2021). The evaluation aims to identify whether or not the efforts made in the learning process are carried out well. For these goals to be achieved, the evaluation process needs to be carried out in a planned, gradual, and continuous manner to obtain an overview of students' learning development (Azizah & Wahyuningsih, 2020). Almost all schools hold exams as a means to evaluate the learning process. Therefore, every level of education that exists will always evaluate learning which is usually carried out in the form of exams or tests. Measurement of learning achievement can involve quantitative measurements that produce quantitative data, such as tests and scores (Winata et al., 2014).

At the vocational high school education level or other educational levels, learning evaluations are carried out per semester, which is usually held at least twice, namely an evaluation or learning exam in the first quarter known as the Mid-Semester Examination and an evaluation or exam in the second or third quarter called the End of Semester Exam (Wati et al., 2018). As demand in the 21st century learning period, teachers must develop student skills relevant to the 21st century, one of which is critical thinking (Malik et al., 2021). So that in its application, the questions used in the exam must contain HOTS (High Order Thinking Skill) types of questions. The criteria for HOTS questions can include aspects of critical thinking, creative thinking, and problem-solving skills. Critical thinking is the ability to objectively analyze, create and use criteria, and evaluate data (Wulandani et al., 2019). Thus, it is proper for teachers to train and develop students' scientific

reasoning abilities during learning to support students' preparation for mastering 21st-century skills (Malik et al., 2021).

The vocational school of automotive engineering has several productive subjects that must be taken. Automotive Vehicle Chassis (AVC) is one of the productive subjects of the automotive engineering department, which discusses two competencies. The first competency is about the chassis. In this competency, students are taught several materials such as steering system, wheels, spooring, and brake system. Power transfer includes materials such as clutch, transmission, propeller shaft, and axle/differential. Therefore, to evaluate students' abilities in the first quarter, the Mid-Semester Examination is carried out on the Automotive Vehicle Chassis (AVC) subjects. All school exams generally use a scoring approach to describe student achievement. So that students' abilities can be known and distinguished.

SMK Dharma Bahari Surabaya is one of the schools that has implemented a learning evaluation process, namely the Mid-Semester Examination with the paperless method, which uses a digital platform that currently supports distance learning, namely Quizizz. The appearance of the Quizizz application can be seen in Figure 1. Quizizz is an Indian creativity software company headquartered in Bengaluru, India, that creates and sells a gamified student engagement platform. The software is used in class, group assignments, pre-test reviews, formative assessments, and pop quizzes (Wikipedia).

Figure 1. Platform Digital Quizizz

This digital platform is one platform that makes it easier for teachers to evaluate or conduct cognitive assessments for students today. Through Quizizz, the teacher can see the level of mastery of the material that students have (Amany, 2020). Quizizz has not been used as a learning evaluation medium as a benchmark for assessment because it is only considered a game or game. Even though the Quizizz feature is quite feasible if it is used as an evaluation medium, especially during online learning, this is following with Agustina and Rusmana's (2019) research that Quizizz is an application that is feasible to use as a learning application that supports the 4.0 learning revolution because of its easy use and fast assessment process.

The integration between Quizizz as an evaluation tool and ease of analysis of test instruments is the right solution to help teachers know the instruments' quality. Instruments for testing and determining student abilities are very important in educational assessment. An analysis that can produce more precise measurements (resulting in the same interval scale) will determine the quality of the analysis results and improve the educational process to help students learn. Using the Rasch model can make it easier for teachers to assess or evaluate student learning outcomes. Besides that, it can also improve the quality of the analysis carried out because it applies the basic principles of proper data processing. This is because the Rasch model addresses the five objective measurement requirements. The application of Rasch modeling informative tests has many advantages in terms of measurement accuracy. Therefore, this Rasch model can be used to detect item difficulty and item bias and identify individual abilities so that teachers can provide appropriate learning assistance (Sumintono, 2018).

This study aims to provide accurate information about students' abilities and, at the same time, determine the quality of the questions given through the Rasch Model approach. Besides that, it can also show the ease of managing student learning evaluations. Dr. Georg Racsh first created the Rasch model in 1950 and he was a mathematician from Denmark. One of the characteristics of this Rasch model is that it produces scales whose quality is the same as measurements on physical dimensions in physics, such as measuring length with a centimeter ruler, or measuring weight with a kilogram scale, in which case the results can be compared because they have the same units, linear, and have the same interval (Kurniawan & Andriyani, 2018). In developing this model, Rasch developed a model to measure the probability relationship between a person's ability and the difficulty level of the problem by using the logarithmic function to produce the same interval measurement (Sumintono, 2014). The output of the analysis is a new unit called logit (log odds unit), which shows the ability and difficulty of students' problems (Kurniawan & Andriyani, 2018).

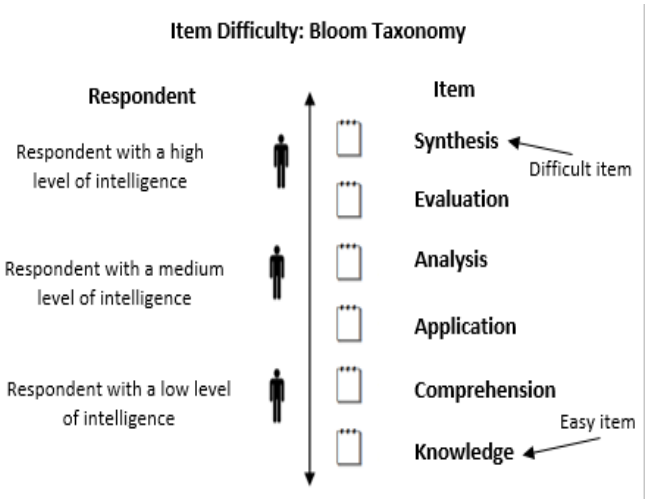

Figure 2. Illustration of Bloom Taxonomy Construct Map

If we illustrate Bloom's taxonomy (Figure 2), an individual who can correctly answer the questions that measure the ability to synthesize can be ascertained that they have a higher ability than other individuals who cannot do the problem correctly. In this study, the researcher wanted to know the quality of the mid-semester test instrument used to determine the student's ability in the Automotive Vehicle Chassis (AVC) subject at SMK Dharma Bahari Surabaya by using the Rasch model approach.

RESEARCH METHOD

This research method is descriptive and quantitative. The subjects of this study were students of class XII TKR 2 who took the Automotive Vehicle Chassis (AVC) subject consisting of 40 students. Subjects were selected randomly and did not pay attention to gender because the majority of students majoring in Automotive Engineering at SMK Darma Bahari Surabaya, Indonesia were male. Questions are given to students through the Quizziz digital platform. There are 40 items in the form of multiple choice. In the output results from Quizzis, data obtained from the number of students who took the exam, questions answered correctly got a score of 1, and questions answered incorrectly got a score of 0, so the data obtained was dichotomous. This makes it easier to process into the analysis software, namely Winstep.

Data were analyzed using WIN STEP Rasch Software version 3.73. From the output of the Winsteps software, the results of several parameter items will be obtained according to the Rasch model. In addition, Cronbach's alpha value will also be obtained, which is the result of the overall item reliability test. Meanwhile, the Outfit MNSQ value, Outfit ZSTD value, and the correlation value between items and the question as a whole will show the limit items that are declared fit with

the model. Where the item is declared fit with the model if the value generated from Outfit MNSQ is in the range of 0.5 to 1.5, ZSTD Outfit values are in the range of -2.0 to 2.0, and the item correlation value with the total score is in the range of 0.4 to 0.85 (Sumintono, 2018).

RESULT AND DISCUSSION

Student responses in answering the Mid-Semester Examination for Automotive Vehicle Chassis (AVC) subjects were obtained through a Quizizz report. Through the Quizizz digital platform, it is known that students who have worked on the questions will be recorded, and it will be known whether the student answered correctly or incorrectly. Student response data to answer the Mid-Semester Examination questions are shown in Figure 3.

Student 01L	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1
Student 02L	1	1	0	1	1	1	1	1	1	1	0	0	0	0	1	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	1	0	1
Student 03L	1	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	0	1	1	1	1	0
Student 04L	1	0	1	1	1	1	1	1	1	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
Student 05L	1	1	0	1	1	1	1	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	1	1
Student 06L	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	1	0	0
Student 07L	1	1	0	0	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	1	1	0	0	0	1	0	1	0	0	0	1	0	0	1	0	1	0	0	0	1
Student 08L	1	0	0	0	1	0	0	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	1	0	1	0	1	0	1	1	1	1	0	1	1	0	0	1
Student 09L	1	1	0	0	0	0	1	1	0	1	0	0	0	0	1	0	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1	0
Student 10L	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Student 11L	1	1	0	0	0	0	1	1	0	1	0	0	0	0	1	0	1	0	1	0	0	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Student 12L	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	1	0	1	1	0	0	0	1
Student 13L	0	0	0	1	1	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	1	1	0	0	0	1	1	0	0
Student 14L	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	1	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1	0
Student 15L	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0	0
Student 16L	0	1	0	0	1	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	0
Student 17L	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1
Student 18L	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0
Student 19L	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Student 20L	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	0	1	0	1	0	1	1	0
Student 21L	1	1	1	1	1	1	1	1	0	1	0	1	0	0	1	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	0	0	0	0	0	1	0	1
Student 22L	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	0	1	1	0	1
Student 23L	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	0	1	0	0
Student 24L	1	1	1	1	1	1	1	1	0	1	0	0	1	0	1	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1
Student 25L	1	1	0	1	1	1	1	1	0	1	1	1	0	1	1	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	0	1	1	0	1
Student 26L	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1	1	0	1	1	1	1	1	0	1	1	1	0	1	1	1	0	1	0	1	0	1	1	0
Student 27L	1	1	1	1	1	1	1	1	0	1	0	1	0	0	1	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1
Student 28L	1	1	0	1	1	1	1	1	0	1	1	1	0	1	0	0	1	1	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	0	0	1
Student 29L	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0	0	1	0	1	0	1	0	0	0	1	1	0	1	0	0	1	1	1	0	0
Student 30L	1	1	0	0	1	0	0	1	0	1	0	0	0	1	1	0	1	0	0	1	1	0	0	0	0	0	1	1	0	1	1	0	0	0	0	1	0	0	0	1
Student 31L	1	1	0	0	1	0	1	0	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	1	1	0	1	0	1	1	0	1	1	0	0	1	1	1	1	0
Student 32L	1	1	1	0	1	0	1	1	0	1	0	1	0	0	1	0	1	1	0	1	0	0	1	1	0	1	1	0	0	1	0	1	0	1	0	0	0	0	1	1
Student 33L	0	1	1	0	1	0	1	1	1	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1	0	0
Student 34L	1	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	1	0	1	0	0	1	1	1	0	0	1	1	0	1	0	1	0	1	0	0	0	0	0	0
Student 35L	1	1	1	0	1	0	1	1	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	1	0	1	0	1	1	1	0	0	0	1
Student 36L	1	1	1	1	1	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	1	0	1	0	0	1	1	0	0
Student 37L	1	1	0	1	1	0	1	1	0	0	0	0	0	0	1	1	1	1	0	1	1	0	0	0	1	0	0	1	0	1	1	1	1	0	0	1	1	1	0	0
Student 38L	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0
Student 39L	1	1	1	0	1	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	1	1	0	1	0	0	1	1	0	0	1	1	0	1
Student 40L	1	0	1	1	1	0	1	1	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1	0	0	1	0	0	0	1	0	1	0	0	0	0	1	1	0	1

Figure 3. Student responses to the Mid-Semester Examination Automotive Vehicle Chassis (AVC) questions

Based on Figure 3, the scores were analyzed by students' abilities using the Rasch model whereas previously the scores were analyzed using Winstep software. The following is the result of the output shown in Figure 4.

```
TABLE 3.1 ANALISIS BUTIR SOAL UTS PSPTKR         ZOU231WS.TXT  Nov  8  7:59 2021
INPUT: 40 Person  40 Item  REPORTED: 40 Person  40 Item  2 CATS    WINSTEPS 3.73
-------------------------------------------------------------------------------

     SUMMARY OF 40 MEASURED Person

-------------------------------------------------------------------------------
|          TOTAL                          MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN      21.6      40.0         .25     .38       .99     .0   1.01     .0 |
| S.D.       7.2        .0        1.02     .04       .17    1.1    .29    1.0 |
| MAX.      36.0      40.0        2.62     .55      1.37    2.3   1.76    2.3 |
| MIN.       8.0      40.0       -1.69     .35       .70   -2.2    .58   -2.1 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .40 TRUE SD     .93  SEPARATION  2.35  Person RELIABILITY  .85 |
|MODEL RMSE    .39 TRUE SD     .94  SEPARATION  2.44  Person RELIABILITY  .86 |
| S.E. OF Person MEAN = .16                                                   |
-------------------------------------------------------------------------------
Person RAW SCORE-TO-MEASURE CORRELATION = 1.00
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .86

     SUMMARY OF 40 MEASURED Item

-------------------------------------------------------------------------------
|          TOTAL                          MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN      21.6      40.0         .00     .38       .99    -.1   1.01     .0 |
| S.D.       7.9        .0        1.09     .04       .19    1.2    .34    1.3 |
| MAX.      36.0      40.0        1.91     .54      1.36    2.4   1.78    2.2 |
| MIN.       8.0      40.0       -2.29     .35       .59   -3.2    .53   -2.9 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .40 TRUE SD    1.01  SEPARATION  2.53  Item   RELIABILITY  .86 |
|MODEL RMSE    .39 TRUE SD    1.02  SEPARATION  2.63  Item   RELIABILITY  .87 |
| S.E. OF Item MEAN = .17                                                     |
-------------------------------------------------------------------------------
UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -1.00
1600 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 1675.77 with 1521 d.f. p=.0032
Global Root-Mean-Square Residual (excluding extreme scores): .4177
Capped Binomial Deviance = .2274 for 1600.0 dichotomous observations
```

Figure 4. Output Summary Statistics

From the output summary statistics in Figure 4, important information is obtained regarding the person and item reliability, Cronbach's Alpha value and person measure is obtained. The values obtained are shown in Table 1.

Table 1. Summary of Statistics

	Information	Score
Logit	Person	0.25
	Items	0
Reliability	Person Reliability	0.85
	Item Reliability	0.86
	Alpha Cronbach	0.86
MNSQ Outfits	Person	1.01
	Items	1.01
ZSTD Outfits	Person	0
	Items	0

In Table 1, it can be seen that the logit person measure value is 0.25, and the item measure value is 0. This means that the person measure value is greater than the item measure value, so it can be concluded that students' abilities tend to be higher than the difficulty level of the question. In other words, there is a possibility that all questions can be answered correctly by students so that students who have the highest ability can answer the most difficult questions correctly. Meanwhile, item reliability (item reliability) is 0.86, person reliability is 0.85, and Cronbach's Alpha is 0.86. From this value, it can be stated that the level of consistency of students' answers is relatively high, and the quality of the items on the test instrument used has good reliability of 0.86.

Another number shown in Table 1 is the Outfit Mean Squared (Outfit MNSQ) value of 1.01 in the person and item columns. The value of 1.01 is included in the fit criteria, which is located between the interval 0.5 < MNSQ < 1.5, this means that the test instrument used follows the model

to measure student competence in AVC subjects. Furthermore, the Outfit Z Standard value (Outfit ZSTD) is 0 for persons and items. The value 0 is between -2.0 < ZSTD < 2.0. This can be interpreted that the data have a possible rational value. In other words, overall, the questions or items follow the Rasch model so that these questions can be used as instruments for the Mid-Semester Examination in the automotive vehicle chassis subject.

The distribution of items deemed inappropriate or inconsistent with the model can be seen in Table 1. Provisions or item limits can be declared fit with the model if one or both of the following conditions are met: 1.) The MNSQ Outfit value lies between the interval 0.5 to 1.5; 2.) Outfit ZSTD value is between the interval -2.0 to 2.0; and 3.) The item correlation value with the total score (point measure correlation) lies between the intervals of 0.4 to 0.85 (Sumintono, 2018). Then Figure 5 is an output image of the item statistics.

TABLE 10.1 ANALISIS BUTIR SOAL UTS PSPTKR ZOU231WS.TXT Nov 8 7:59 2021
INPUT: 40 Person 40 Item REPORTED: 40 Person 40 Item 2 CATS WINSTEPS 3.73

Person: REAL SEP.: 2.35 REL.: .85 ... Item: REAL SEP.: 2.53 REL.: .86

Item STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item
2	32	40	-1.40	.42	1.08	.4	1.78	1.6	A .16	.31	80.0	80.4	Soal 2
35	11	40	1.41	.39	1.36	1.7	1.76	2.2	B .07	.42	67.5	76.3	Soal 35
9	11	40	1.41	.39	1.15	.8	1.53	1.7	C .24	.42	77.5	76.3	Soal 9
5	31	40	-1.24	.40	.91	-.4	1.47	1.2	D .35	.33	82.5	78.4	Soal 5
15	24	40	-.27	.35	1.31	2.3	1.43	1.8	E .11	.40	50.0	67.5	Soal 15
25	11	40	1.41	.39	1.26	1.3	1.41	1.3	F .17	.42	72.5	76.3	Soal 25
3	20	40	.22	.35	1.22	1.6	1.39	2.0	G .20	.43	55.0	68.4	Soal 3
14	11	40	1.41	.39	1.10	.5	1.39	1.3	H .29	.42	77.5	76.3	Soal 14
19	10	40	1.57	.40	1.16	.8	1.36	1.1	I .23	.41	82.5	77.8	Soal 19
37	20	40	.22	.35	1.34	2.4	1.34	1.8	J .14	.43	45.0	68.4	Soal 37
11	10	40	1.57	.40	1.18	.9	1.30	.9	K .25	.41	72.5	77.8	Soal 11
29	21	40	.10	.35	1.19	1.4	1.28	1.5	L .23	.42	62.5	67.7	Soal 29
16	8	40	1.91	.43	1.21	.9	1.25	.7	M .21	.39	75.0	81.3	Soal 16
31	23	40	-.15	.35	1.16	1.2	1.22	1.1	N .26	.41	60.0	67.3	Soal 31
36	22	40	-.02	.35	1.12	1.0	1.12	.7	O .31	.41	65.0	67.3	Soal 36
39	12	40	1.26	.38	1.10	.6	1.04	.3	P .35	.43	72.5	75.2	Soal 39
40	21	40	.10	.35	1.07	.6	1.09	.6	Q .35	.42	67.5	67.7	SOal 40
32	26	40	-.52	.36	.99	.0	1.08	.4	R .37	.38	75.0	69.1	Soal 32
33	25	40	-.40	.36	.99	.0	1.04	.3	S .39	.39	72.5	68.0	Soal 33
26	21	40	.10	.35	.92	-.6	1.02	.2	T .47	.42	72.5	67.7	Soal 26
27	32	40	-1.40	.42	1.01	.1	.79	-.4	t .33	.31	80.0	80.4	Soal 27
8	34	40	-1.79	.46	1.01	.1	.76	-.3	s .31	.28	85.0	84.9	Soal 8
34	24	40	-.27	.35	.99	.0	.90	-.4	r .43	.40	65.0	67.5	Soal 34
17	36	40	-2.29	.54	.99	.1	.76	-.1	q .26	.23	90.0	90.0	Soal 17
24	26	40	-.52	.36	.90	-.7	.76	-1.0	p .50	.38	65.0	69.1	Soal 24
7	33	40	-1.59	.44	.90	-.3	.76	-.4	o .39	.30	85.0	82.6	Soal 7
1	30	40	-1.08	.39	.88	-.6	.73	-.7	n .46	.34	80.0	76.2	Soal 1
21	23	40	-.15	.35	.87	-1.0	.77	-1.2	m .54	.41	65.0	67.3	Soal 21
10	25	40	-.40	.36	.86	-1.0	.74	-1.2	l .54	.39	62.5	68.0	Soal 10
38	26	40	-.52	.36	.86	-1.1	.73	-1.1	k .53	.38	75.0	69.1	Soal 38
18	25	40	-.40	.36	.86	-1.1	.76	-1.1	j .53	.39	72.5	68.0	Soal 18
22	23	40	-.15	.35	.85	-1.2	.74	-1.3	i .56	.41	70.0	67.3	Soal 22
20	20	40	.22	.35	.84	-1.3	.82	-1.0	h .57	.43	75.0	68.4	Soal 20
30	35	40	-2.02	.50	.82	-.4	.54	-.7	g .44	.26	87.5	87.4	Soal 30
28	24	40	-.27	.35	.81	-1.5	.70	-1.5	f .59	.40	70.0	67.5	Soal 28
4	22	40	-.02	.35	.78	-1.8	.70	-1.7	e .62	.41	75.0	67.3	Soal 4
23	20	40	.22	.35	.77	-1.9	.71	-1.8	d .64	.43	80.0	68.4	Soal 23
13	8	40	1.91	.43	.73	-1.1	.53	-1.3	c .64	.39	85.0	81.3	Soal 13
12	12	40	1.26	.38	.65	-2.1	.53	-2.0	b .74	.43	87.5	75.2	Soal 12
6	17	40	.59	.36	.59	-3.2	.54	-2.9	a .79	.43	90.0	70.7	Soal 6
MEAN	21.6	40.0	.00	.38	.99	-.1	1.01	.0			73.3	73.3	
S.D.	7.9	.0	1.09	.04	.19	1.2	.34	1.3			10.3	6.4	

Figure 5. Misfit Order

In Figure 5, it can be seen that, when viewed from the boundary conditions, the item is declared to fit with the model, so question number 35 is a misfit or does not follow the model so that the question can be replaced or revised. Furthermore, the items' difficulty level is known from the item measure order shown in Figure 6. The measured column shows the logit value of each item ordered from highest to lowest. For items 13 and 16 or questions number 13 and 16, the logit value of 1.91 logits indicates the most difficult item, while item 17 or item number 17 shows the easiest item with a logit value of -2.29 logit. The output of the Guttman scale of student responses can be seen in Figure 7.

TABLE 13.1 ANALISIS BUTIR SOAL UTS PSPTKR ZOU231WS.TXT Nov 8 7:59 2021
INPUT: 40 Person 40 Item REPORTED: 40 Person 40 Item 2 CATS WINSTEPS 3.73

Person: REAL SEP.: 2.35 REL.: .85 ... Item: REAL SEP.: 2.53 REL.: .86

Item STATISTICS: MEASURE ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item
13	8	40	1.91	.43	.73	-1.1	.53	-1.3	.64	.39	85.0	81.3	Soal 13
16	8	40	1.91	.43	1.21	.9	1.25	.7	.21	.39	75.0	81.3	Soal 16
11	10	40	1.57	.40	1.18	.9	1.30	.9	.25	.41	72.5	77.8	Soal 11
19	10	40	1.57	.40	1.16	.8	1.36	1.1	.23	.41	82.5	77.8	Soal 19
9	11	40	1.41	.39	1.15	.8	1.53	1.7	.24	.42	77.5	76.3	Soal 9
14	11	40	1.41	.39	1.10	.5	1.39	1.3	.29	.42	77.5	76.3	Soal 14
25	11	40	1.41	.39	1.26	1.3	1.41	1.3	.17	.42	72.5	76.3	Soal 25
35	11	40	1.41	.39	1.36	1.7	1.76	2.2	.07	.42	67.5	76.3	Soal 35
12	12	40	1.26	.38	.65	-2.1	.53	-2.0	.74	.43	87.5	75.2	Soal 12
39	12	40	1.26	.38	1.10	.6	1.04	.3	.35	.43	72.5	75.2	Soal 39
6	17	40	.59	.36	.59	-3.2	.54	-2.9	.79	.43	90.0	70.7	Soal 6
3	20	40	.22	.35	1.22	1.6	1.39	2.0	.20	.43	55.0	68.4	Soal 3
20	20	40	.22	.35	.84	-1.3	.82	-1.0	.57	.43	75.0	68.4	Soal 20
23	20	40	.22	.35	.77	-1.9	.71	-1.8	.64	.43	80.0	68.4	Soal 23
37	20	40	.22	.35	1.34	2.4	1.34	1.8	.14	.43	45.0	68.4	Soal 37
26	21	40	.10	.35	.92	-.6	1.02	.2	.47	.42	72.5	67.7	Soal 26
29	21	40	.10	.35	1.19	1.4	1.28	1.5	.23	.42	62.5	67.7	Soal 29
40	21	40	.10	.35	1.07	.6	1.09	.6	.35	.42	67.5	67.7	SOal 40
4	22	40	-.02	.35	.78	-1.8	.70	-1.7	.62	.41	75.0	67.3	Soal 4
36	22	40	-.02	.35	1.12	1.0	1.12	.7	.31	.41	65.0	67.3	Soal 36
21	23	40	-.15	.35	.87	-1.0	.77	-1.2	.54	.41	65.0	67.3	Soal 21
22	23	40	-.15	.35	.85	-1.2	.74	-1.3	.56	.41	70.0	67.3	Soal 22
31	23	40	-.15	.35	1.16	1.2	1.22	1.1	.26	.41	60.0	67.3	Soal 31
15	24	40	-.27	.35	1.31	2.3	1.43	1.8	.11	.40	50.0	67.5	Soal 15
28	24	40	-.27	.35	.81	-1.5	.70	-1.5	.59	.40	70.0	67.5	Soal 28
34	24	40	-.27	.35	.99	.0	.90	-.4	.43	.40	65.0	67.5	Soal 34
10	25	40	-.40	.36	.86	-1.0	.74	-1.2	.54	.39	62.5	68.0	Soal 10
18	25	40	-.40	.36	.86	-1.1	.76	-1.1	.53	.39	72.5	68.0	Soal 18
33	25	40	-.40	.36	.99	.0	1.04	.3	.39	.39	72.5	68.0	Soal 33
24	26	40	-.52	.36	.90	-.7	.76	-1.0	.50	.38	65.0	69.1	Soal 24
32	26	40	-.52	.36	.99	.0	1.08	.4	.37	.38	75.0	69.1	Soal 32
38	26	40	-.52	.36	.86	-1.1	.73	-1.1	.53	.38	75.0	69.1	Soal 38
1	30	40	-1.08	.39	.88	-.6	.73	-.7	.46	.34	80.0	76.2	Soal 1
5	31	40	-1.24	.40	.91	-.4	1.47	1.2	.35	.33	82.5	78.4	Soal 5
2	32	40	-1.40	.42	1.08	.4	1.78	1.6	.16	.31	80.0	80.4	Soal 2
27	32	40	-1.40	.42	1.01	.1	.79	-.4	.33	.31	80.0	80.4	Soal 27
7	33	40	-1.59	.44	.90	-.3	.76	-.4	.39	.30	85.0	82.6	Soal 7
8	34	40	-1.79	.46	1.01	.1	.76	-.3	.31	.28	85.0	84.9	Soal 8
30	35	40	-2.02	.50	.82	-.4	.54	-.7	.44	.26	87.5	87.4	Soal 30
17	36	40	-2.29	.54	.99	.1	.76	-.1	.26	.23	90.0	90.0	Soal 17
MEAN	21.6	40.0	.00	.38	.99	-.1	1.01	.0			73.3	73.3	
S.D.	7.9	.0	1.09	.04	.19	1.2	.34	1.3			10.3	6.4	

Figure 6. The Results of the Output Item Statistics

GUTTMAN SCALOGRAM OF RESPONSES:

```
Person |Item
       |13   2  233113123223 3224 223 13 1231111
       |7087275142808358412146690303762994551936
       |----------------------------------------
    19 +1111111111111111111111111101111111110110  19L
     1 +1111110111111111111111101111111111100110  01L
     4 +1111011111111111111011111111111010110100  04L
     3 +1111011111111011111111001111111101001011  03L
    20 +1111111111111001111111100111011101001111  20L
    22 +1111111110111111111111011101111011000010  22L
    23 +1111111111111011111111001110111000101001  23L
    25 +1111111110111111111111011101111001001000  25L
    26 +1111111111111001111111100111010101001011  26L
     2 +1111111101111111111111111011010010010000  02L
    24 +1111111111111111101101011111101000000010  24L
    27 +1111111111111111101101011111101000000000  27L
    21 +1111111111111011011010111111011000000000  21L
    10 +1110111011100101111101111001100100011000  10L
    28 +1111111111011101000111011000011001011000  28L
     5 +1101111101011100100111011000010100011010  05L
    32 +1111111111011010100000101111001100000000  32L
    37 +1111101101101111010111000010100000100001  37L
    17 +0110111101101101101100111001100100000000  17L
    29 +1111100010111100001111100100110010000100  29L
    33 +1111111001100110111001010100100010010000  33L
    35 +1111111101010011100001101100000001010001  35L
    31 +1101111111100110000001010000100110100100  31L
     6 +0111100000111100101111000100110010000100  06L
    14 +1111001011101000101000100101001100100001  14L
    39 +1111111110100111110000001100100000000000  39L
     7 +1011111100010010110101001010000001100000  07L
     8 +0010011111000110100101011000100101100100  08L
    36 +1111101101100011111010000100100000000000  36L
    40 +1111001101101010001010101101100000000000  40L
    30 +1110111100010011010101001010000001000000  30L
    34 +1111110111010001101000000101000000000100  34L
     9 +1111110110011010100000000011000100000000  09L
    12 +1000111010010101000001111000000000110001  12L
    38 +1101010101001100100110110100000000010000  38L
    11 +1111110110010010001000000001000000100100  11L
    13 +1101001001100111011010000001000000001000  13L
    16 +1101111010100010010000010000000000001000  16L
    18 +0010100000000000000101100110100001000000  18L
    15 +1010010000001000000100010000000010010000  15L
       |----------------------------------------
       |13   2  233113123223 3224 223 13 1231111
       |7087275142808358412146690303762994551936
```

Figure 7. Guttman Scalogram Output

The analysis of the output of the Guttman scalogram shows that 19L students have the highest ability to answer questions correctly. 19L students can work on the easiest questions (15) to the most difficult ones (13). This indicates that the student has more authentic skill suitability. In contrast to 15L students, where 15L students have the lowest ability to answer questions correctly. The results of this data can provide information to teachers to identify the skills and suitability of students. Thus, these results provide recommendations to implementers of learning to apply learning by paying more attention to students who have poor skills and to improve students who still have low thinking skills. Teachers can then use this scalogram analysis as learning implementers to describe what students have obtained from the test results. The analysis of the Rasch model has provided comprehensive information on data processing based on student responses to the Mid-Semester Examination.

Furthermore, the level of difficulty of the test items with their indicators for assessment can be identified. These results illustrate that the items that have been compiled can describe the pattern of student skills and their suitability. However, the results of the analysis of the Rasch Model are more specific to provide a comprehensive picture of the learning carried out. The results of the Rasch model analysis can be different or similar depending on the conditions and learning situations, such as student characteristics and the implementation of learning in a particular class or school. In addition, the value of the student's ability level in working on the problem is also shown from the Winstep output, namely the Wright map. Wright map output results are presented in Figure 8.

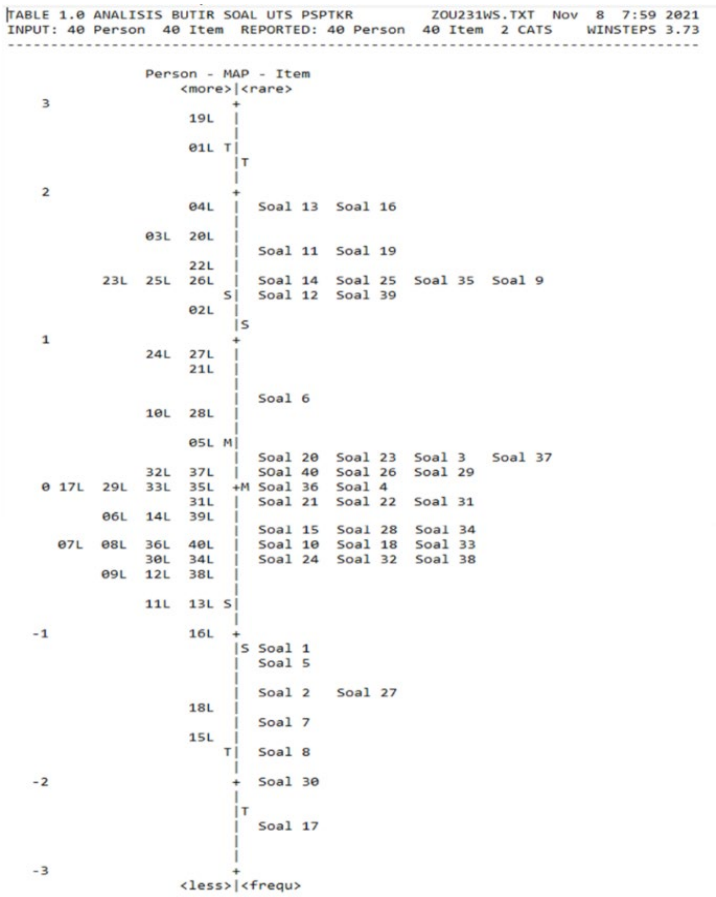

Figure 8. Map of Wright

From Wright's map, data obtained from students with code 19L have the highest level of ability or ability, while students with code 15L have the lowest level of ability or ability. In addition, it can also be seen that the item questions that have a level of difficulty in the difficult category are questions number 13,16,11,19,14,25,35,9,12,39. Then the questions with the medium category are questions number 6, 20, 23, 3, 37, 40, 26, 29, 36, 4, 21, 22, 31, 15, 28, 34, 10, 18, 33, 24, 32, 28.

Furthermore, the easy categories are questions 1, 5, 2, 27, 7, 8, 30, and 17. It can be summarized that there are ten questions in the difficult category, 22 questions in the medium category, while the easy category questions have eight questions.

Figure 9 shows the measurement information obtained from the Mid-Semester Examination instrument for Automotive Vehicle Chassis (AVC) subjects. The X-axis shows the level of students' ability to do the given test, while the Y-axis shows the value of the information function. Based on the graph, the information obtained by the measurement is very high at the medium ability level. So that the mid-semester exam instrument for Automotive Vehicle Chassis (AVC) subjects is suitable or optimal if it is used for students with moderate abilities.

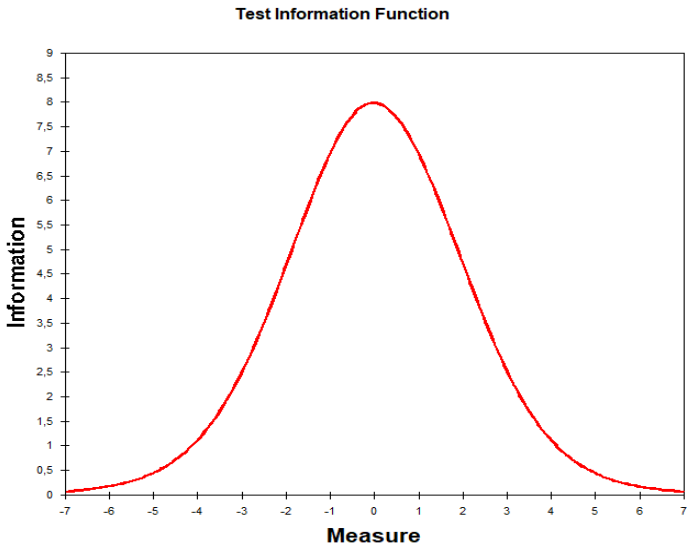

Figure 9. Test Information Function

Item analysis using the Rasch model approach has several advantages, which can help teachers detect whether the questions are fit or not and can measure student abilities or abilities so that teachers can more easily provide treatment, especially for students who still have low abilities or abilities so that it can be done actions to motivate students to improve their abilities or abilities in certain subjects. Therefore, learning evaluation management is very important to be carried out by a teacher where this evaluation can determine the value of student achievement by using certain benchmarks to achieve predetermined learning objectives.

The purpose of assessing educators' learning outcomes on students is 1.) Knowing the level of mastery of competencies in attitudes, knowledge, and skills that have and have not been mastered by a person/group of students to be improved in remedial learning and enrichment programs; 2.) Determine the completeness of mastery of student learning competencies within a certain period; 3) Establish improvement or enrichment programs based on the level of competency mastery for those identified as slow or fast learners in learning and achieving learning outcomes; and 4.) Improve the learning process at the next semester's meeting (Setiawan, 2021).

Teachers must be more creative in filling learning and be more innovative in utilizing technology. The development of interactive questions to measure scientific reasoning skills is a step toward solving the problem (Malik et al., 2021). Regulation of the Minister of Education of the Republic of Indonesia Number 4 of 2020 concerning the Implementation of regarding education policies in the emergency phase of the coronavirus pandemic. Minister of Education of the Republic of Indonesia. Nadiem Makarim has provided an overview of learning assessments on the online learning system, which is contained in 4 main points. First, learning is done at home (study at home) by applying distance learning to provide a learning experience without the burden of completing curriculum targets and grade promotions or graduation. Second, distance learning can focus on life skills education, such as about Covid-19. Third, student activities and assignments may vary

according to their interests and conditions, including learning gaps and facilities at home. Finally, evidence or product activity should be given feedback (Mahmud et al., 2021). Therefore, this research tries to provide solutions and facilities for teachers to determine students' abilities so that the feedback that will be given follows student needs.

CONCLUSION

Based on the above discussion, it can be concluded that the Automotive Vehicle Chassis (AVC) Mid-Semester Exam questions with the help of Winsteps Software show that Person Reliability at Mid-Semester Exam Automotive Vehicle Chassis (AVC) is 0.85 while item reliability is 0.86. The magnitude of Cronbach's Alpha is 0.86. In addition, the integration between Quiziz and analysis using this Rasch model can facilitate the management of learning evaluation for teachers to determine student abilities and student abilities in mastering the knowledge that has been taught and can help teachers identify students who need more treatment so that there are no gaps in the learning process.

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