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Analysis of Quality and Cognitive Levels of Physics Final Assessment Questions of Class X

Agustina Trianti Br Sinaga[1*], Rosane Medriati [2], Eko Risdanto[3]

[1,2,3]Universitas Bengkulu
Bengkulu, Indonesia
agustinasinaga27@gmail.com *

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Abstract

This study aims to describe the quality and distribution of cognitive levels of physics final assessment questions for class X. This research is a quantitative descriptive study. The research subjects were in the form of student questions and answer sheets at Senior High Schools 4, 8, and 9 Bengkulu City. The results showed that Senior High School 4 had 64% good questions, 12% good enough, 24% bad, and cognitive levels C1 (4%), C2 (20%), C3 (68%), C4 (8%), there is neither C5 nor C6. Senior High School 8 has 21% good questions, 11% good enough, and 68% bad questions, as well as cognitive levels C1 (3%), C2 (13%), C3 (55%), C4 (29%), and not there are C5 and C6. Senior High School 9 has 7% good questions, 29% good enough, 64% bad questions, and cognitive levels C1 (11%), C2 (21%), C3 (68%), and no C4, C5 or C6.

A. Introduction

Education is an effort in the process of fostering both individuals and groups of people during the learning process. In Law Number 20 of 2003 Article 58 (1) concerning the National Education System it is stated that "Evaluation of student learning outcomes is carried out by educators to monitor the process, progress, and continuous improvement of student learning outcomes". Thus, it is important for a teacher to carry out the evaluation for increase quality education (Suardipa & Primayana, 2020).

Based on the results of observations and interviews with one of the physics teachers at Senior High School 9 Bengkulu City, it was found that besides teaching, the teacher also made assessments during the learning process such as assessing attitudes and skills. In addition, the teacher also evaluates learning outcomes using test instruments such as practice questions, assignments done at home, daily assessments, midterm assessments, and final semester assessments. Final Semester Assessment Questions are made by the teacher who teaches the subject starting from the preparation of the grid. The questions are made at different levels based on the cognitive level of Bloom's Taxonomy, namely C2, C3, and maybe there are one or two HOTS questions. The quality of the items has not been statistically measured due to the lack of time to analyze the items.

Evaluation of tests is important to do because sometimes the test questions made by the teacher are not known for their accuracy and reliability, so students just accept whatever the results are. Errors in doing the test are not only due to the lack of accuracy of students in working on the questions, but can be caused by the test questions that are used poorly. It is important to evaluate the quality of the assessments used in education as having a highly valid and reliable assessment ensuring competent learners are differentiated from learners who have incomplete subject knowledge.

Final Semester Assessment is a test that is held to measure the achievement of students' abilities and see the progress of student learning after the learning process for one semester. In the Final Semester Assessment, good questions are needed to guarantee their quality so that they can test students well.

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Therefore, an analysis of the quality of the test must be carried out to determine whether a test is good or not good.

One way to determine the quality of the test is to analyze the quality of the items. Analysis of the quality of questions (tests) is a stage that is carried out to determine whether a test is good or bad as a tool in a measurement. Analysis of the quality of the items is a step that must be passed to determine the level of quality of a test, both as a whole and the items that are part of the test. Analysis of the quality of the tests and items can be reviewed based on the validity, reliability, level of difficulty, discriminating power, and the pattern of distribution of the answers to the questions. Validity is the accuracy of a measuring instrument in measuring what you want to measure based on the goals you want to achieve (Anita et al., 2018). Test reliability relates to the question of whether a test is accurate and reliable according to predetermined criteria. The level of difficulty of the question relates to how much the level of difficulty of a question is. A question can be said to be good if the question has a level of difficulty that is balanced (proportional). The differential power of items (items) is the ability of a question to distinguish students who are able to answer questions or students who have a high level of ability from students who have low ability in answering questions (Erfan et al., 2020). The pattern of answers referred to here is the testee distribution in terms of determining the choice of answers in the multiple-choice questions.

In addition to analyzing the quality of the questions, it is also necessary to analyze the cognitive level of the questions. Based on Bloom's Taxonomy on the dimension of cognitive processes that have been revised, there are six levels of processes from the easiest to the most difficult, namely remembering, understanding, applying, analyzing, evaluating, and creating. Category C1- Remembering is the process of retrieving relevant knowledge from long-term memory. Category C2- Understanding is building meaning or understanding on the basis of prior knowledge, connecting new information with existing knowledge or integrating new knowledge into existing patterns in students' thinking. Category C3- Applying/using procedures or using procedures to perform exercises or solve problems that are closely related to procedural knowledge. Category C4- Analyzing includes describing a problem or object in its constituent elements and determining the interrelationships between these constituent elements and the grand structure. Category C5- Evaluating is defined as making a judgment based on existing criteria and standards. Category C6- Creating or creating is uniting elements into a unified whole, namely the reorganization of elements into a new pattern or structure (Effendi, 2015).

Novia et al. (2020) conducted research on the quality of the questions and determined that the validity of the questions has a moderate validity value and the reliability of the questions has a good value (Novia et al., 2020). Then, Usman (2021) once examined the quality of the Semester Final Examination questions, discovering that some were invalid, the level of difficulty was disproportionate, questions with discriminatory power did not work, and the instrument's reliability was said to be reliable (Usman, 2021). Furthermore, Anita et al (2018) discovered that the proportion of difficulty levels was unbalanced, that the differential power of the questions had not functioned properly, that the majority of the effectiveness of the distractor had functioned properly, that 65% of the questions were said to be valid, and that reliability was in the medium category. In addition, research by (Umacina et al., 2020) shows that there are questions that need to be corrected and discarded, there are more question in the LOTS category and only a few questions in the HOTS category.

Based on the description above, the researcher is interested in conducting research with the title "Analysis of Quality and Cognitive Levels of Class X Physics Final Semester Assessment Questions" with the research objectives namely: 1) To describe the quality of the physics semester Final Assessment questions for class X at City High Schools Bengkulu. 2) To describe the distribution of cognitive levels that appear in the physics semester final assessment questions for class X at Bengkulu City Senior High School based on the Revised Bloom's Taxonomy.

B. Research Methods

This research uses a type of quantitative descriptive research. Sources of research data were obtained from questions and answer sheets of class X students in the Final Assessment for even semester 2021/2022 at Senior High Schools 4, 8 and 9 in Bengkulu City. This study aims to describe the quality of the items on the Final Semester Assessment in terms of validity, reliability, level of difficulty, discriminatory power and distribution patterns of the item answers. In addition, this study also aims to describe the distribution of cognitive levels that appear in the Final Semester Assessment questions based on the Revised Bloom's Taxonomy. The research procedure in this study was divided into 3 stages.

1. Stage Preparation
   a) Determining High School as the place of research
   b) Doing a preliminary study at the research site using observation sheet instruments and interview sheets.
   c) Determine the Final Semester Assessment questions to be analyzed
2. Stage Implementation
   a) Collect data by documenting the questions and answer sheets of class X students taking part in the 2021/2022 Physics Even Semester Final Assessment
   b) Testing the validity, reliability, level of difficulty, discriminating power and distribution patterns of the answers to questions using Microsoft Excel 2010
   c) Analyze grain question based on cognitive levels from the Revised Bloom's Taxonomy.
3. Stage End
   a) Analyze the results of the quality test questions by interpreting the data on predetermined criteria
   b) Calculating the percentage of emerging cognitive levels based on the Revised Bloom's Taxonomy
   c) Drawing conclusions from the results of data analysis
   d) Describe the results of the analysis of the quality and cognitive level of the questions

The observation sheet and interview sheet were the research instruments employed. In this study, data analysis techniques such as qualitative and quantitative analysis were used. The preliminary study used qualitative data analysis to analyze observations and interviews. Quantitative data obtained using documentation approaches. The quantitative data analysis technique is used to examine the validity, reliability, level of difficulty, varied power of the questions, and distribution patterns of the answers to questions, as well as calculating the distribution of cognitive level in the Final Semester Assessment questions.

1. Validity

The validity of the questions can be calculated using the product-moment correlation formula with rough numbers as follows

$$r_{xy} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{\{N \sum X^2 - (\sum X)^2\}\{N \sum Y^2 - (\sum Y)^2\}}} \quad (1)$$

Information:

r_{xy}	=	The correlation coefficient between the X and Y variables is correlated
X	=	Score on the item questions
Y	=	Total score
$\sum X$	=	The total score on the item questions
$\sum Y$	=	Total score sum
N	=	Number of respondents

According to Syofian (2015) the question is declared valid if the correlation coefficient rxy > rtable and if rxy ≤ rtable then the question can be declared invalid. The validity of the questions was calculated using *Microsoft Excel 2010*.

2. Reliability

The reliability of the Bengkulu City Senior High School Final Semester Assessment questions can be calculated using the Kuder-Richardson 20 formula as follows:

$$r_{11} = \left(\frac{n}{n-1}\right)\left(\frac{S^2 - \sum pq}{S^2}\right) \quad (2)$$

Information:

r_{11}	=	Overall test reliability
P	=	The proportion of subjects who answered the item correctly
Q	=	Proportion of subjects answering the wrong item (q=1-p)
$\sum pq$	=	The number of multiplication results between p and q
N	=	Number of items
S	=	The standard deviation of the test (the standard deviation is the root of the variance)

Table 1 shows the following requirements for instrument reliability:

Table 1. Instrument Reliability Criteria

Correlation coefficient	Correlation
$0.90 \leq r \leq 1.00$	Very high
$0.70 \leq r < 0.90$	Tall
$0.40 \leq r < 0.70$	Currently
$0.20 \leq r < 0.40$	Low
$r < 0.20$	Very low

According to Table 1, the higher the reliability correlation, the bigger the correlation coefficient of the test reliability. If the correlation coefficient is $0.70 \leq r < 0.90$ the test is regarded to be reliable. The questions' reliability was calculated using Microsoft Excel 2010 software.

3. Difficulty Level

The proportion of correct answers (p) can be calculated using the following formula:

$$p = \frac{\sum B}{N} \quad (3)$$

Information:

P = difficulty level
$\sum B$ = the number of students who answered correctly
N = Number of students

The question difficulty index criteria are in Table 2 below:

Table 2. Difficulty Index Criteria

Difficulty Level	Criteria
0.71 – 1.00	Easy
0.31 – 0.70	Currently
0 – 0.30	Hard

Table 2 shows that there are three categories of item difficulty index, namely easy, medium and difficult. The greater the index of difficulty the item has, the easier the item is. Conversely, the smaller the difficulty index the item has, the more difficult the item is. The difficulty level of the questions was calculated using Microsoft Excel 2010 software.

4. Difference Power

The formula for determining the discrimination index in the Final Semester Assessment questions is in the form of multiple choices as follows:

$$D = \frac{B_A}{J_A} - \frac{B_B}{J_B} = P_A - P_B \quad (4)$$

Information:

J = Number of test takers
J_A = Number of upper group participants
J_B = Number of participants in the lower group
B_A = The number of upper group participants who can answer the questions correctly
B_B = The number of participants in the lower group who can answer the questions correctly
P_A = Proportion of upper group participants who answered correctly
P_B = Proportion of lower group participants who answered correctly

The criteria for the discriminating power of questions are in Table 3 below

Table 3. Criteria for Discriminating Power

Discriminating Power	Criteria
0.71 – 1.00	Very well
0.41 – 0.70	Good
0.21 – 0.40	Enough
0.00 – 0.20	Bad
Negative	Everything is not good, should be thrown away

Based on Table 3 it can be seen that the discriminating power of a question can be positive or negative. A negative value means that the question should be discarded because it is not good to use.

5. Pattern Spread Answer

The pattern of distribution of answers was calculated using Microsoft Excel 2010 so that the distribution of students in choosing answers on the End of Semester Assessment questions was obtained. The following is a formula to find out whether the quality of using a distractor is good or not:

$$\% = \frac{\sum students\ choose\ an\ alternative\ distractor}{\sum overall\ student}\ x\ 100\% \quad (5)$$

The categories of distractor functions are as follows (Purwanti, 2014):

a. It is said to be very good when the distractor on the question works as a whole.
b. It is said to be good when the distractor on the question does not work an alternative.
c. It is said to be enough when the distractor on the question does not work two alternatives.
d. It is said to be bad when the distractor on the three-alternative question does not work.
e. It is said to be bad when the distractor on the four-alternative question does not work.

6. Question item quality

The quality of the Semester End Assessment questions was analyzed based on the quality of the items. The following are considerations for determining the quality of good, good enough, and not good questions:

a. Questions that meet the four criteria (validity, difficulty level, discriminating power, and pattern of distribution of answers) can be said to be of good quality
b. Questions that only meet three of the four criteria can be said to be of fairly good quality
c. Questions that do not meet two or more of the criteria for good item items can be said to be of poor quality

In addition to the item-based requirements, the overall test must be reliable with the conditions described above (Oktanin & Sukirno, 2015).

7. Percentage of Cognitive Level Questions

Physics Odd Semester Final Assessment questions for class X at Bengkulu City Senior High School in 2021/2022 can be calculated using the following formula (Sari et al., 2021):

$$Pi = \frac{Ni}{N}\ x\ 100\% \quad (6)$$

Information:

Pi = The percentage of the number of questions categorized based on the cognitive level of the Revised Bloom's Taxonomy
Ni = Many level questions (*I* = C1, C 2, C3, C4, C5 and C6) are categorized based on the cognitive level of Revised Bloom's Taxonomy
N = Number of questions

C. Result and Discussion

From September 14 to October 14, 2022, this study was done in Bengkulu City Senior High Schools 4, 8, and 9. The research data came from multiple choice questions and answer papers for class X students who participated in the Assessment End of Even Semester of Physics in 2021/2022. Documentation procedures were used to gather the data. Based on the questions collected from the teacher, it was discovered that there were questions with multiple answer keys, questions without answer keys, and questions that were incomplete, preventing them from being used as study samples. Additionally, it was discovered by the study of the answer keys that some questions had the wrong answers. Data from Senior High School 4 Bengkulu City, Senior High School 8, and Senior High School 9 Bengkulu City, totaling 25 multiple-choice questions and 89 student answer sheets, 38 multiple-choice questions and 131 student answer sheets, and 28 multiple-choice questions and 89 student answer sheets, respectively, can be used.

1. Validity

The validity index is used to determine the validity of the questions. The distribution of questions based on the validity of the Final Semester Assessment questions for Senior High School 4, 8, and 9 Bengkulu City, processed using Microsoft Excel 2010 software, is shown below.

Table 4. Distribution of Questions based on Validity in Senior High School 4 Bengkulu City

Validity Index	Question Number	Number of Questions	Percentage
>0.213 (Valid)	1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24	20	80%
≤ 0.213 (Invalid)	2,11,12,21,25	5	20%

Based on Table 4, it was found that of the 25 questions in Senior High School 4 Bengkulu City, there were 20 questions (80%) valid with index validity > 0.213 and 5 questions (20%) are invalid with index validity ≤0.213.

Table 5. Distribution of Questions based on Validity in Senior High School 8 Bengkulu City

Validity Index	Question Number	Number of Questions	Percentage
> 0.176 (Valid)	2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38	32	84%
≤ 0.176 (Not valid)	1, 6, 13, 17, 18, 21	6	16%

Then Table 5 shows that of the 38 items on the Final Semester Assessment of Senior High School 8 Bengkulu City, there are 32 questions (84%) valid with a validity index > 0.213 and 6 questions (16%) invalid with a validity index <0.213.

Table 6. Distribution of Questions based on Validity in Senior High School 9 Bengkulu City

Validity Index	Question Number	Number of Questions	Percentage
>0.213 (Valid)	3, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28	22	79%
≤ 0.213 (Not valid)	1, 2, 4, 5, 14, 20	6	21%

Furthermore, through Table 6 it can be seen that of the 28 items on the Final Semester Assessment of Senior High School 9 Bengkulu City, there are 22 questions (79%) valid with index validity > 0.213 and 6 questions (21%) are invalid with index validity ≤ 0.213.

2. Reliability

The results of the reliability test of Semester End Assessment questions at Senior High School 4, Senior High School 8, and Senior High School 9 Bengkulu City are in Table 7 below.

Table 7. Reliability of Bengkulu City Senior High School Semester End Assessment Questions

School name	Correlation coefficient	Correlation
Senior High School 4 Bengkulu City	0.81	Tall
Senior High School 8 Bengkulu City	0.82	Tall
Senior High School 9 Bengkulu City	0.83	Tall

Table 7 above shows that the correlation coefficients for Final Semester Assessment questions for Senior High School 4, High School 8, and Senior High School 9 Bengkulu City were 0.81, 0.82, and 0.83, respectively. The correlation coefficient is said to have a high correlation. So, it can be concluded that the matter of Final Semester Assessment in Bengkulu City Senior High School has good reliability.

3. Difficulty Level

The following are the outcomes of the difficulty level test calculations performed in Microsoft Excel 2010.

Table 8. Difficulty Level of Final Semester Assessment Questions for Senior High School 4 Bengkulu City

Level Trouble	Question Number	Amount	Percentage	Criteria
0.71 - 1.00	-	0	0%	Easy
0.31 - 0.70	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 23, 24	21	84%	Currently
0 - 0.30	11, 18, 22, 25	4	16%	Hard

Table 8 shows that the results of the difficulty level test for 25 items in Senior High School 4 Bengkulu City showed that 21 questions (84%) were categorized as moderate and 4 questions (16%) were categorized as difficult. Semester End Assessment Questions at Senior High School 4 Bengkulu City were dominated in the medium category and did not have questions that were categorized as easy.

Table 9. Difficulty Level of Questions for Senior High School 8 Bengkulu City

Level Trouble	Question Number	Amount	Percentage	Criteria
0.71 – 1.00	2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 19, 20, 24, 25, 26, 27, 28, 29, 30, 31, 33, 36, 37	25	66%	Easy
0.31 - 0.70	4, 5, 15, 17, 18, 22, 23, 32, 34, 35, 38	11	29%	Currently
0 - 0.30	1, 21	2	5%	Hard

Based on the results of the difficulty level test in Table 9, it can be seen that the final semester assessment questions for Senior High School 8 Bengkulu City have questions that are in the easy, medium and difficult categories. There are 25 questions (66%) that are categorized as easy, 11 questions (29%) moderate, and 2 questions (5%) difficult. The questions were dominated by the easy category.

Table 10. Difficulty Level of Questions for Senior High School 9 Bengkulu City

Level Trouble	Question Number	Amount	Percentage	Criteria
0.71-1.00	1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 17, 20, 22, 23, 28	18	64%	Easy
0.31 - 0.70	9, 10, 16, 18, 19, 21, 24, 25, 26, 27	10	36%	Currently
0 - 0.30	-	0	0%	Hard

Table 10 demonstrates that the Semester End Assessment questions at Senior High School 9 Bengkulu City include as many as 18 questions classified as easy (64%), 10 questions classified as intermediate (36%), and no tough questions. Simple questions dominate the semester end assessment questions in Senior High School 9 Bengkulu City.

4. Difference Power

The test of discriminating power of Physics Even Semester Final Assessment questions for class X at Bengkulu City Senior High School was assisted with Microsoft Excel 2010 software. The results of the recapitulation of the test of discriminating power of questions are as follows.

Table 11. Differences in Questions for High School 4 Bengkulu City

Discriminating Power	Question Number	Amount	Percentage	Criteria
0.41 – 0.70	5, 6, 7, 8, 10, 13, 14, 15, 24	9	36%	Good

Discriminating Power	Question Number	Amount	Percentage	Criteria
0.21 – 0.40	1, 3, 4, 9, 16, 17, 18, 19, 20, 23,	10	40%	Enough
0.00 – 0.20	2, 11, 12, 21, 22, 25	6	24%	Bad

From Table 11, it can be seen that the differentiating power of questions for Senior High School 4 Bengkulu City has questions that are categorized as good, sufficient, and bad. There are 9 questions (36%) that are said to be good, 10 questions sufficient (40%), and 6 questions (24%) that are bad.

Table 12. Differences in Questions for High School 8 Bengkulu City

Discriminating Power	Question Number	Amount	Percentage	Criteria
0.41 – 0.70	2, 4, 5, 7, 9, 20, 22, 23, 26, 31, 32, 35, 36, 37, 38	15	39%	Good
0.21 – 0.40	3, 10, 11, 14, 15, 16, 21, 24, 25, 27, 28, 30, 33, 34	14	37%	Enough
0.00 – 0.20	1, 6, 8, 12, 13, 17, 18, 19, 29	9	24%	Bad

From Table 12, it can be seen that the different power of questions for Senior High School 8 Bengkulu City has questions that are categorized as good, sufficient, and bad. There are 15 questions (39%) that are categorized as good, 14 questions (37%) are sufficient, and 9 questions (24%) are bad.

Table 13. Differences in Problems of Senior High School 9 Bengkulu City

Discriminating Power	Question Number	Amount	Percentage	Criteria
0.71 – 1.00	26	1	3.5%	Very well
0.41 – 0.70	8, 9, 10, 16, 18, 19, 21, 22, 24, 27	10	36%	Good
0.21 – 0.40	6, 7, 15, 17, 25	5	18%	Enough
0.00 – 0.20	1, 2, 3, 4, 5, 11, 12, 13, 14, 23,28	11	39%	Bad
Negative	20	1	3.5%	Not good, should just throw it away

From Table 13, it can be seen that the results of the test of differentiating power of questions for Senior High School 9 Bengkulu City have the criteria from not good to very good. Questions that were in the very good category amounted to 1 item (3.5%), good category amounted to 10 questions (36%), sufficient category amounted to 5 questions (18%), bad category amounted to 11 questions (39%), and distinguishing power which is not good amounted to 1 question (3.5%) so it can be discarded.

5. Answer Distribution Pattern

The pattern of distribution of answers to questions on the Final Semester Assessment at Senior High Schools in Bengkulu City was assisted with Microsoft Excel 2010 software. The results of the recap analysis of the pattern of distribution of answers are as follows.

Table 14. Pattern of Distribution of Answers to Senior High School 4 Questions in Bengkulu City

Criteria	Question Number	Amount	Percentage
Very good	2, 5, 6, 7, 10, 11, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25	16	64%
Good	3, 4, 9, 12, 13, 14, 17	7	28%
Enough	1, 8	2	8%

Based on Table 14, it shows that of the 25 questions on the Final Semester Assessment of Senior High School 4 Bengkulu City, 16 questions (64%) were in the very good category, 7 questions were good (28%), and 2 questions were sufficient (8%). The questions are dominated by the very good category.

Table 15. Pattern of Distribution of Answers to 8 Senior High School Questions in Bengkulu City

Criteria	Question Number	Amount	Percentage
Very good	1, 21, 34, 35, 38	5	13%
Good	5, 15, 17, 20, 22, 23, 24, 32, 36	9	24%
Enough	2, 3, 9, 18, 26, 28, 30, 31, 37	9	24%
Not good	4, 7, 8, 10, 16, 19, 25, 27	8	21%
Not good	6, 11, 12, 13, 14, 29, 33	7	18%

Table 15 shows that of the 38 questions on the Final Semester Assessment of Senior High School 8 Bengkulu City, there were 5 questions in the very good category (13%), 9 questions good (24%), 9 questions sufficient (24%), not good 8 questions (21%), not good totaling 7 questions (18%).

Table 16. Pattern of Distribution of Question Answers for Senior High School 9 Bengkulu City

Criteria	Question Number	Amount	Percentage
Good	4, 9, 18	3	11%
Pretty good	1, 7, 8, 10, 13, 15, 16, 17, 19, 20, 22, 23, 25, 26	14	50%
Not good	2, 5, 6, 12, 14, 21, 24, 27, 28	9	32%
Not good	3, 11	2	7%

From Table 16 it can be seen that of the 28 questions on the Final Semester Assessment of Senior High School 9 Bengkulu City, there were 3 questions that were in the good category (11%), 14 questions that were in the fairly good category (50%), and 9 questions that were in the bad category. questions (32%), and questions that are not in good category are 2 questions (7%). The questions were dominated in the pretty good category.

6. Question Quality

The validity, reliability, difficulty level, discriminating power, and pattern of distribution of answers were used to establish the quality of the Physics Final Even Semester Assessment questions for class X at Bengkulu City Senior High School. The quality of the questions at Senior High School 4, Senior High School 8, and Senior High School 9 Bengkulu City is summarized below.

Table 17. Quality of Final Semester Assessment Questions for Senior High School 4 Bengkulu City

Quality	Number Question	Number of Questions	Percentage
Good	3, 4, 5, 6, 7, 9, 10, 13, 14,15, 16, 17,19, 20, 23, 24	16	64%
Not enough Good	1, 8, 18	3	12%
No Good	2, 11, 12, 21, 22, 25	6	24%

The results of the quality analysis in Table 17 show that the Bengkulu City 4 Senior High School Semester End Assessment questions have 16 good questions (64%), 3 bad questions (12%), and 6 bad questions (24%). The questions were dominated by good questions.

Table 18. Quality of Final Semester Assessment Questions for Senior High School 8 Bengkulu City

Quality	Number Question	Number of Questions	Percentage
Good	5, 15, 22, 23, 32, 34, 35, 38	8	21%

Quality	Number Question	Number of Questions	Percentage
Not enough Good	4, 20, 24, 36	4	11%
No Good	1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 21, 25, 26, 27, 28, 29, 30, 31, 33, 37	26	68%

Table 18 shows that the quality of the Final Semester Assessment questions for Senior High School 8 Bengkulu City has 8 good questions (21%), 4 questions (11%) not good, and 26 questions (68%) not good. The questions are dominated by the bad category.

Table 19. Quality of Final Semester Assessment Questions for Senior High School 9 Bengkulu City

Quality	Number Question	Number of Questions	Percentage
Good	9, 18	2	7%
Not enough Good	10, 16, 19, 21, 24, 25, 26, 27	8	29%
No Good	1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 17, 20, 22, 23, 28	18	64%

Based on Table 19, it can be seen that the Bengkulu City 9 Senior High School Semester End Assessment question has 2 good questions (7%), 8 questions (29%) that are not good, and 18 questions (64%) that are not good. The questions are dominated by questions that are not good.

7. Results of the Analysis of the Cognitive Level of the Problem

Based on the Revised Bloom's Taxonomy, the cognitive level of the class X Physics Even Semester Final Assessment questions at Bengkulu City Senior High School was examined. In order to calculate percentages, Microsoft Excel 2010 was used. The distribution of cognitive levels in the questions on the Final Semester Assessment for Bengkulu City Senior High School can be summed up as follows.

Table 20. Percentage of Cognitive Level Questions for Senior High School 4 Bengkulu City

Cognitive Level	Question Number	Amount	Percentage
Remember (C1)	10	1	4%
Understanding (C2)	1, 2, 11, 12, 24	5	20 %
Apply(C3)	3, 4, 5, 6, 7, 8, 9, 13, 14, 16, 17, 19, 20, 21, 22, 23, 25	17	68 %
Analyze (C4)	15, 18	2	8 %
Evaluate (C5)	-	0	0%
Create (C6)	-	0	0%

From Table 20, the Even Semester Final Assessment questions for class X physics at Senior High School 4 Bengkulu City have a C1 cognitive level of 1 question (4%), C2 of 5 questions (20%), C3 of 17 questions (68%), and C4 as many as 2 questions (8%). Meanwhile, the cognitive levels of Evaluating (C5) and Making (C6) are not included in the questions. Final Semester Assessment Questions are dominated by the applying cognitive level (C3).

Table 21. Percentage of Cognitive Level Questions for Senior High School 8 Bengkulu City

Cognitive Level	Question Number	Amount	Percentage
Remember (C1)	2	1	3%
Understanding (C2)	1, 14, 18, 24, 31	5	13%
Apply(C3)	3, 4, 8, 10, 11, 12, 13,16, 19, 20, 23, 25, 26, 27, 28, 29, 33, 35, 36, 37, 38	21	55%

Cognitive Level	Question Number	Amount	Percentage
Analyze (C4)	5, 6, 7, 9, 15, 17, 21, 22, 30, 32, 34	11	29%
Evaluate (C5)	-	0	0%
Create (C6)	-	0	0%

Table 21 shows that the Even Semester Final Assessment questions for class X physics at Senior High School 8 Bengkulu City have cognitive levels from C1 to C4. Category C1 has 1 question (3%), C2 has 5 questions (13%), C3 has 21 questions (55%), and C4 has 11 questions (29%). Cognitive levels Evaluating (C5) and Making (C6) are not found in the questions. The Final Semester Assessment Questions for Senior High School 8 Bengkulu City are dominated by the applying cognitive level (C3).

Table 22. Percentage of Cognitive Level Questions for Senior High School 9 Bengkulu City

Cognitive Level	Question Number	Amount	Percentage
Remember (C1)	8, 11, 21	3	11%
Understanding (C2)	3, 5, 9, 10, 14, 15	6	21%
Apply(C3)	1, 2, 4, 6, 7, 12,13, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28	19	68%
Analyze (C4)	-	0	0%
Evaluate (C5)	-	0	0%
Create (C6)	-	0	0%

From Table 22, it is known that the Even Semester Final Assessment questions for class X physics at Senior High School 9 Bengkulu City have cognitive levels from C1 to C3. Category C1 has 3 questions (11%), C2 has 6 questions (21%), and C3 has 19 questions (68%). Meanwhile, the cognitive levels of Analyzing (C4), Evaluating (C5), and Making (C6) are not found in the questions. The Final Semester Assessment Questions for Senior High School 9 Bengkulu City were dominated at the applying cognitive level (C3).

The validity, reliability, level of difficulty, discriminatory power, and pattern of distribution of the responses to the questions were used to evaluate the quality of the Physics Semester Final Assessment questions for class X.

1. Validity

Validity is the accuracy of a measuring tool in measuring what should be measured based on the objectives to be achieved (Anita et al., 2018; Korkmaz et al., 2017). Based on the results of the analysis of the validity of the Final Semester Assessment questions for Senior High School 4 Bengkulu City, it was found that 20 questions (80%) were valid questions, while 5 questions (20%) were invalid. Based on the results of the validity test on the Final Semester Assessment questions for Senior High School 8 Bengkulu City, it was found that 32 questions (84%) were valid questions, while 6 questions (16%) were invalid. Then, testing the validity of the Final Semester Assessment questions for Senior High School 9 Bengkulu City, it was found that 22 questions (79%) were valid questions, while 6 questions (21%) were invalid. This is in line with the criteria according to (Erfan et al., 2020) that the items can be declared valid if the correlation coefficient is $r_{xy}>r_{table}$. Conversely, if the correlation coefficient $r_{xy}\leq r_{table}$ then the question can be declared invalid.
Valid questions from the Final Semester Assessment of physics for class X at Senior High Schools 4, 8, and 9 Bengkulu City can be repeated in the following Final Semester Assessment since the questions can assess what should be measured. In contrast, invalid questions should not be reused or replaced because they cannot measure what they seek to measure. A good quality instrument is one that meets the requirements for validity and reliability. Based on research conducted by Novia et al., it was found that there were 10 valid questions, while 5 questions were said to be invalid (Novia et al., 2020).

2. Reliability

Reliability is the level or degree of consistency of an instrument. Based on the results of the reliability test on the Even Semester Final Assessment questions for physics class X at Senior High School 4, Senior High

School 8 and Senior High School 9 Bengkulu City, it was found that the correlation coefficient was respectively 0.81, 0.82, and 0.83 which is in the range of $0.70 \leq r < 0.90$. Therefore, the reliability of the Final Semester Assessment questions is said to be good because it has a relatively high correlation. Based on research conducted by Novia et al., it was found that the odd Mid Semester Exam questions for the physics subject for the 2019/2020 school year Muhammadiyah 4 Langsa Senior High School had a correlation coefficient of 0.72 which was categorized as high (Novia et al., 2020).

3. Difficulty Level

The level of difficulty of the questions is seen from the ability of students to answer questions, not from the perspective of the teacher as the question maker (Susanto et al., 2015). A question should be made with a proportional level of difficulty. Based on the results of the analysis of the difficulty level of the Final Semester Assessment questions at Senior High School 4 Bengkulu City, it was found that the questions were not proportional because the comparison of easy questions was 0%, medium was 84%, and difficult was 16%. Then, the proportion of difficulty level on questions from Senior High School 8 Bengkulu City is said to be disproportionate with a comparison of easy questions of 66%, medium 29%, and difficult 5%. Senior High School 9 Bengkulu City has disproportionate difficulty level with a ratio of 64% easy, 36% moderate, and 0% difficult. This is in line with the proportion of the difficulty level of the questions according to Sudjana (2020) which states that the ratio of easy questions is 30%, medium is 40%, and difficult is 30%. Usman's research (2021) found that the School Final Examination questions did not have a proportional distribution of difficulty levels with a ratio of 12 difficult questions, 2 medium questions and 21 easy questions. So it is necessary to divide the difficulty of the questions proportionally (Usman, 2021). Research by Kumar et al also obtained results that the questions were not too easy and not too difficult so that they were acceptable.

Based on the results of an analysis of the level of difficulty of good questions in Senior High School 4 with 21 questions (84%), High School 8 with 11 questions (29%), and Senior High School 9 Bengkulu City with 10 questions (36%). This is in accordance with Arikunto (2018) who said that a question can be said to be good if the question is not too easy or not too difficult. Problems that are too easy do not stimulate students to increase their efforts to solve them. Conversely, questions that are too difficult cause students to become discouraged and have no enthusiasm to try again because they are out of reach. Questions that are considered good are moderate questions with a difficulty index of 0.30 to 0.70.

4. Different power

Based on the results of the analysis of discriminating power on the final semester assessment questions for Senior High School 4 Bengkulu City, it was found that the questions had a good discriminating power of 76% (fair and good categories) and 24% bad (bad categories). Senior High School 8 Bengkulu City has questions with a good discriminating power of 76% (fair and good categories) and 24% bad (poor category). Senior High School 9 Bengkulu City has questions with good discriminating power of 57.5% (fair, good and very good categories) and 42.5% bad (poor and not good categories).

Based on the results of the analysis of the differentiating power of the items, it can be concluded that the questions that have good discriminating power can be reused, while the questions with bad discriminating power should be replaced. This is in accordance with (Anita et al., 2018) that questions that are in the categories of sufficient, good, and very good can be used, while bad and very bad should not be used or discarded. Questions with high discriminating power can tell the difference between pupils in the upper and lower groups. Questions with limited discriminating power, on the other hand, do not distinguish students from the lower group from students from the upper group. Questions with negative discriminating power allow lower-group students to answer more than upper-group pupils. This is in line with Arikunto (2018) which states that questions that have a negative discrimination index are said to be not good for use because students in the lower group can answer them correctly compared to the upper group. This can be done by guessing. Items that do not have discriminating power are thought to be too easy or too difficult so that they need to be corrected or replaced with other questions.

5. Pattern of distribution of answers

The pattern of answering questions can be determined whether the distractor functions as a distractor properly or not. A distractor can be said to function well if at least 5% of the test takers choose it. Based on the results of the analysis of the pattern of distribution of answers to the final semester assessment questions for Senior High School 4 Bengkulu City, it was found that the questions had a pattern of distribution of

answers that were functioning properly at 92% (good and very good categories) and questions that were not functioning properly at 8% (enough category). Based on the results of the analysis of the pattern of distribution of answers to the Final Semester Assessment questions for Senior High School 8 Bengkulu City, it was found that the questions had a good pattern of distribution of answers by 37% (good and very good categories), questions that did not function well by 8% (category sufficient), and questions that do not work by 39% (poor and not good categories). Based on the results of the analysis of the pattern of distribution of answers to the Final Semester Assessment questions for Senior High School 9 Bengkulu City, it was found that the questions had a good distribution pattern of 11% (good category), 50% did not work well (enough category) and did not work by 39% (poor and not good categories).

A distractor that is not chosen by the testee at all indicates that the distractor is bad, overly visible, and misleading. A distractor, on the other hand, is said to perform properly if it appeals to test takers who do not understand the concept or do not master the content. According to the findings of Usman's (2021) research, the efficacy of the question distractor as a whole cannot be claimed to be effective or functional since only two questions have the effectiveness of the distractor operating (Usman, 2021).

Based on the results of the analysis of validity, reliability, level of difficulty, differential power and patterns of distribution of answers, it was found that the Final Semester Assessment questions for Senior High School 4 Bengkulu City had good quality at 64%, good enough at 12%, and not good at 24%. Based on the quality analysis of the final semester assessment questions for senior high school 8 Bengkulu City, it was found that the questions had a good quality of 21%, quite good at 11% and not good at 68%. Based on the quality analysis of the Final Semester Assessment questions for Senior High School 9 Bengkulu City, it was found that the questions had a good quality of 7%, 29% good enough, and 64% bad.

Overall, the Semester End Assessment questions were reliable with a reliability coefficient for Senior High School 4 of 0.81, High School 8 of 0.82, and High School of 9 of 0.83 which is considered high.

In addition to item-based requirements, the overall test must be reliable (Oktanin & Sukirno, 2015). Based on the results of research conducted by Purwanti (2014), it was found that all questions included questions that were not good because there were 18 items (60%) in the form of multiple choice questions and 2 items (50%) in the form of essay questions that did not meet the validity requirements, reliability, discriminating power, level of difficulty, and pattern of distribution of answers (Purwanti, 2014).

6. Bloom's Taxonomy Cognitive Level

The revised Bloom's Taxonomy cognitive process dimension has six process levels from the easiest to the most difficult, namely remembering, understanding, applying, analyzing, evaluating, and creating. Based on the results of the analysis of the cognitive level of 25 questions from Senior High School 4 Bengkulu City, it was found that the questions were dominated by cognitive level C3 with a comparison of the proportions of cognitive level categories C1 as much as 4%, C2 as much as 20%, C3 as much as 68%, C4 as much as 8%, C5 and C6 is not found in the problem. Analysis of the cognitive level of 38 questions on the Final Semester Assessment at Senior High School 8 Bengkulu City was dominated by the C3 cognitive level with a distribution of cognitive levels, namely C1 by 3%, C2 by 13%, C3 by 55%, C4 by 29% while the cognitive levels of C5 and C6 is not included in the question. Analysis of the cognitive level of 28 questions on the Final Semester Assessment at Senior High School 9 Bengkulu City showed that the questions were dominated at the C3 cognitive level with a distribution of cognitive levels namely C1 of 11%, C2 of 21%, and C3 of 68% while cognitive level of C4, C5 and C6 are not found in the problem. It can be concluded that the cognitive level of questions at Senior High School 4, Senior High School 8, and Senior High School 9 Bengkulu City has not been divided proportionally. This is not in line with the proportion of distribution of cognitive levels according to Helmawati (in Hapsari et al. 2021) which states that learning assessment should be distributed as follows: C1 is 5%, C2 is 10%, C3 is 45%, C4 is 25%, C5 as much as 10%, and C6 as much as 5% (Wahyuni et al., 2021).

Disproportionate difficulty levels were also found by Syahida & Irwandi (2015) who did not find C5 and C6 cognitive levels on the National Examination questions. The rare reason for the emergence of cognitive levels evaluating (C5) and creating (C6) on exam questions (eg the National Examination), is influenced by the form of the instrument used. In the National Examination, the instrument used is the National Examination questions which are a type of objective test in the form of multiple choices (Syahida & Irwandi, 2015). Research conducted by Umacina et al., (2020) obtained the result that the analysis was based on the ability level of thinking Lots and Hots at the end of the semester exam questions for multiple

choice questions and essay questions obtained a percentage of 94% of the questions categorized as Lots and questions categorized as Hots received a percentage of 6% (Umacina et al., 2020).

D. Conclusion

1. The quality of the questions on the Final Semester Assessment for Senior High School 4 Bengkulu City had 16 good quality questions (64%), 3 good enough questions (12%), and 6 bad questions (24%). Senior High School 8 Bengkulu City has 8 good quality questions (21%), 4 good enough questions (11%), and 26 bad questions (68%). Senior High School 9 Bengkulu City has 2 good quality questions (7%), 8 good enough questions (29%), and 18 bad questions (64%). Overall, the Semester Final Assessment questions were reliable with a reliability coefficient for Senior High School 4 of 0.81, High School 8 of 0.82, and High School of 9 of 0.83, which is high.
2. Cognitive level based on the Revised Bloom's Taxonomy presented on the Final Semester Assessment questions at Senior High School 4 Bengkulu City shows that there are C1 as much as 4%, C2 as much as 20%, C3 as much as 68%, C4 as much as 8%, and there are no questions C5 or C6. Bengkulu City Senior High School 8 contains a cognitive level of C1 as much as 3%, C2 as much as 13%, C3 as much as 55%, C4 as much as 29%, and there are no C5 or C6 questions. Bengkulu City Senior High School 9 contains a cognitive level of C1 of 11%, C2 of 21%, C3 of 68%, and there are no C4, C5 or C6 questions. It can be concluded that the questions at the Bengkulu City Senior High School were dominated at the Apply cognitive level (C3) and did not meet the proportions of cognitive level distribution.

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