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Development of a Minimum Competency Assessment Instrument (AKM) for Students' Scientific Literacy on Hooke's Law and Elasticity

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ABSTRACT

The low literacy rate and lack of question discussion in schools were the driving forces behind this research. Those problems caused students to have difficulty in understanding the material on Hooke's Law and elasticity. The researchers developed the Minimum Competency Assessment (AKM) literacy instrument as a learning resource to address this issue. The study aims to find out: (1) how the AKM instrument for students' scientific literacy was made and (2) how excellent it works, how challenging the questions are, how valid it is, and how reliable it is for students' scientific literacy on Hooke's Law and Elasticity at the senior high school level. This R&D method reseach used the Tessmer model. The research instruments consisted of question grid sheets and question validation sheets. This study produced two question packages (A and B), each consisting of twelve questions. The researchers examined the AKM instrument for scientific literacy on 24 students from MAN 1 Model Banda Aceh. The feasibility results show that the AKM instrument has met the very feasible category. The validation results from material experts yielded a percentage of 92.44%, while language experts reported a percentage of 85.83%. The trial results show the discriminating ability of AKM Instrument packages A and B in the excellent and outstanding categories. Package A displays reliability results of 0.791, while package B of 0.805. The AKM instrument for scientific literacy based on Hooke's Law and elasticity can be used as a supporting learning resource in or outside of learning activities.

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INTISARI

Penelitian ini dilatarbelakangi oleh rendahnya tingkat literasi dan sedikitnya pembahasan soal di sekolah. Hal ini mengakibatkan siswa mengalami kesulitan dalam memahami materi Hukum Hooke dan elastisitas. Untuk mengatasi hal ini maka dilakukan pengembangan instrumen Asesmen Kompetensi Minimum (AKM) literasi sebagai sumber belajar. Penelitian ini ertujuan untuk: (1) mengetahui proses pengembangan instrumen AKM literasi sains siswa, dan (2) mengetahui daya beda, tingkat kesukaran soal, validitas dan reliabilitas dari instrumen AKM literasi sains pada materi Hukum Hooke dan Elastisitas tingkat SMA/MA. Penelitian ini menggunakan metode (R&D) dengan model Tessmer. Instrumen penelitian yang digunakan terdiri dari lembar kisi-kisi soal dan lembar validasi soal. Validator pada penelitian ini terdiri dari tiga ahli materi dan dua

KATA KUNCI:

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ahli bahasa. Penelitian ini menghasilkan dua paket soal (A dan B) Instrumen AKM yang masing-masing terdiri dari dua belas soal. Instrumen AKM literasi sains diujicobakan pada 24 siswa MAN 1 Model Banda Aceh. Hasil kelayakan menunjukkan bahwa instrumen AKM sudah memenuhi kategori sangat layak. Berdasarkan hasil validasi dari ahli meteri dengan persentase sebesar 92,44% dan ahli bahasa sebesar 85,83%. Hasil uji coba menunjukkan daya beda pada Instrumen AKM paket A dan B pada kriteria baik dan sangat baik. Hasil reliabilitas pada paket A sebesar 0.791 dan paket B sebesar 0.805 dan dinyatakan reliabel. Instrumen AKM literasi sains pada materi Hukum Hooke dan Elastisitas dapat digunakan sebagai sumber belajar pendukung dalam atau luar kegiatan pembelajaran.

A. Introduction

Learning is a process of interaction that occurs between educators and students, also involving teaching materials, methods, and media used in the teaching and learning process. In the 21st century learning era, students must possess skills, knowledge, and abilities in the fields of technology, media, and information. The learning process in this era is characterized by innovation and an emphasis on empowering students. These changes appear in various aspects, including curriculum, learning models, and teaching methods [1].

21st-century learning demands that students be able to be creative and innovative, think critically, solve problems, collaborate, and communicate. This curriculum has high expectations for the educational process by preparing students as human resources who have 21st-century skills. One of the requirements for developing 21st-century skills is literacy. The Ministry of Education and Culture has determined that Indonesian people need to master 6 basic literacies, namely (1) language literacy, (2) numeracy literacy, (3) scientific literacy, (4) digital literacy, and (5) financial literacy culture and citizenship [2].

Literacy is a language skill that involves several aspects, including speaking, reading, writing, evaluating, and understanding. There are three main indicators of literacy: finding, understanding, and evaluating and reflecting on the information obtained.trained. Scientific literacy, on the other hand, includes the scientific knowledge needed to identify a problem. Scientific literacy encompasses the capacity to make decisions based on facts gathered from observations. Apart from that, scientific literacy also includes the ability to communicate scientific knowledge both orally and in writing. Scientific literacy does not only focus on knowledge but also on the application of that knowledge in solving problems and participating in systems related to science [3]. This ability can This ability can be seen in the results of

measurements in the PISA study conducted by the OECD (Organization for Economic Cooperation and Development) every three years.

The shift from the National Examination to the National Assessment is an attempt to enhance the overall quality of education.ucation. The National Examination is considered less than optimal as a tool for evaluating the quality of education nationally [4]. The National Assessment consists of three parts, namely the Minimum Competency Assessment (AKM), the Character Survey, and the Learning Environment Survey. AKM measures students' reading literacy and numeracy skills. Apart from that, iIn addition, its design aims to stimulate innovative learning that prioritizes reasoning over rote memorization.The 2013 curriculum outlines the objectives of integrated science learning. We carry out AKM in an effort to improve the low quality of Indonesian education.

The Organization for Cooperation and Development (OECD) did research that showed Indonesia's low scientific literacy (74th place out of 78 countries), with an average score of 389 on the PISA (Program for International Student Assessment) and an average score of 489 for the OECD as a whole. Meanwhile, Indonesia's scientific literacy ability was achieved in 2018; it was ranked in the bottom 10 of 79 countries following the evaluation results conducted by the OECD through the PISA study [4].

The low results of the Progress in International Reading Literacy Study (PIRLS), Program for International Student Assessment (PISA), and Indonesian National Assessment Program (INAP) surveys are due to reading habits that are less popular with some students in Indonesia. Reading is an important part of education, especially in the teaching and learning process in the classroom. Reading activities can provide students with a wealth of knowledge and additional information. Reading activities can provide students with a lot of knowledge and additional information to support successful learning and teaching.

Regarding the required teaching materials and material difficulties, it was found that students needed a book of questions, and they experienced difficulties with Hooke's Law and Elasticity material. This is one of the Class XI high school physics materials for the odd semester. Students face challenges because they rarely discuss the questions, which makes it difficult for them to answer the provided questions during the exam.

Several studies on AKM instruments development and scientific literacy were discovered. First, the study by Nuzulia and Gafur [5] with the title "Development of a Minimum Competency Assessment-Based Practice Book to Improve Student Literacy and Numerization Abilities at SDN Janti 02 Sidoarjo." The research shows that the minimum competency assessment (AKM)-based exercise book is excellent

for students to use because it meets the valid criteria: experts in the material got 90.6%, experts in the design got 89.3%, and experts in the learning got 94.6%. The results of the trial to assess the attractiveness of the minimum competency assessment-based exercise book developed for students were 91.8%. Student learning outcomes increased, as seen by the pre-test results of 70.8 and post-test scores of 90.4 [6].

Researchers conducted the second study. The pre-test results of 70.8 and the post-test scores of 90.4 [6] indicate an increase in student learning outcomes. Assessing Understanding of Scientific Phenomena Regarding Energy." The results of this research indicate that scientific literacy-based test instruments are suitable for measuring students' scientific literacy abilities [7]. Mardhiyyah, Ani, and Suharto [8] conducted the third research, "Development of a Science Literacy Assessment Instrument on the Energy Theme." The research shows that the two sets of validity results for the multiple-choice test are correct. The reliability value was 0.865 for limited testing and 0.887 for extensive testing. This value shows that the instrument is reliable. The profile of students' scientific literacy abilities is in the low category [9].

What sets this research apart from previous research is the difference in the school levels studied, and the development of AKM instruments on scientific literacy. Previous research only focused on one of these areas, either on instrument development or on scientific literacy.

The development of the Minimum Competency Assessment (AKM) instrument for scientific literacy in schools has four main reasons. The first reason is that testing and learning have been changed so that they focus on more than just the content of the material. They also include scientific literacy, which includes things like being able to use science in everyday life, understanding context, thinking critically about problems, and a number of scientific process skills. This matter facilitates to create more holistic and relevant to students' developmental needs. The second reason is that the PISA and TIMSS (Trends in International Mathematics and Science Study) results at the secondary school level provide an important indication that students' scientific literacy abilities at the previous level also need to consider. Student competency in elementary school is the basis for student competency at a higher level. Therefore, there needs to be an AKM instrument that can assess scientific literacy based on the initial level of education. The third reason stems from the low level of scientific literacy among students, as evidenced by several prior studies. Therefore, developing the AKM scientific literacy instrument is important as an effort to increase students' understanding and ability to understand scientific concepts. The fourth reason is the lack of a collection of AKM questions that can help them understand the learning

material. The development of the AKM scientific literacy instrument can provide students with access to a collection of questions that support a comprehensive understanding of scientific concepts.

Students must practice answering AKM questions in order to improve their exam preparation. Every student undoubtedly possesses unique potential that sets them apart from their peers. The researhcers can later find out the form of these differences from the results of the exercises carried out by students.

Based on the background of the problem that has been explained, it is important for researchers to conduct research with a title "Development of a Minimum Competency Assessment Instrument for Students' Scientific Literacy on Hooke's Law and Elasticity Material at High School/MA Level.".

B. Method

This R&D method research applied a scientific method for conducting research, designing, producing, and validating already-produced products [10]. Research and Development refers to the systematic process of creating new products or enhancing existing ones.

This development research uses the Tessmer model (1993), consisting of several stages, including preliminary, self-evaluation, expert reviews, one-to-one, small group, and field tests [11]. The reason why researchers use the Tessmer development model in this research is because these stages are suitable for use in developing products in the form of questions. This is because in developing valid and reliable questions, assessment from experts is very necessary so that the questions developed are better.

In addition, the questions had be field-examined, including readability tests to determine if students understood them and limited tests on several students to determine their validity and practicality. Therefore, the Tessmer model was more suitable for developing questions because the stages in the Tessmer model correspond to the stages of question development.

C. Result and Discussion

Preliminary Stage

This stage began with seeking information on the Ministry of Education and Culture's policies. Researchers found a change from the National Examination to the National Assessment. The National Assessment comprised three components: the Minimum Competency Assessment (AKM), an environmental survey, and a character

survey. The next stage was determining the school, namely MAN 1 Banda Aceh (Islamic Senior High School Banda Aceh 1), with the research subjects being material class XI students.

A necessity analysis was given to class XI students at MAN 1 Banda Aceh with several questions related to the material and things the students needed. The results of the needs analysis by researchers found that students had difficulty understanding the material on Hooke's Law and elasticity due to a lack of reading and discussing the questions. Students also express that they need several sets of AKM questions on Hooke's Law and Elasticity.

Formative Evaluation Stage

The discussion focused on linking the data and analysis results to answer research problems or purposes of the study, and to broader theoretical context. The discussion is written attached to the data discussed and not to be separated from the results.

The table is written in the middle or at the end of each text description of the results research. The table title is written from the left-center; all words begin with uppercase letters, except conjunctions. Suppose more than one row is typed in a single-spaced. The table consists of top and bottom horizontal rules and the one separating the column heads from the rest of the table. For example, it can be seen in Table 1 below.

The formative evaluation stage is the second stage, consisting of self-evaluation, expert reviews, one-to-one, and small groups.

a. Self-Evaluation

At this stage, the AKM question grid, AKM questions, and validation sheet underwent an evaluation. Before creating AKM questions, researchers carried out curriculum analysis, material analysis, student analysis, and planning. The book that served as a guide in making AKM questions is a class XI student package book. Researchers also read and searched for several articles related to AKM, serving as a guide for researchers. The AKM question grid has several parts, namely the scientific literacy domain, scientific literacy indicators, learning indicators, questions, and answer keys. The researchers used two domains of scientific literacy: scientific knowledge and scientific competence. There were 4 scientific literacy indicators such as understanding scientific phenomena, explaining scientific phenomena, identifying problems scientifically, and interpreting data. There were 12 learning indicators for each question package, each of which has 3 parts that refer to indicators for each scientific literacy.

At this stage, the researchers produced draft 1, validated it, and refined it based on the validator's suggestions. The final result of the draft was a scientific literacy AKM question that met the AKM and scientific literacy criteria. The AKM science literacy questions were designed to consist of two packages, namely package A and package B. Each question package consisted of 12 multiple-choice questions. The researchers divided and sorted the designed questions based on scientific literacy indicators and learning indicators. Scientific literacy indicators are understanding scientific phenomena, explaining scientific phenomena scientifically, identifying problems scientifically, and interpreting scientific data and evidence. Additionally, the researchers designed the questions to incorporate stories, news, and practical applications from everyday life. The designed questions focus on measuring reasoning, understanding, and application abilities.

b. Expert Reviews

The expert review stage is carried out by providing a draft of the created questions to the validator to get input, suggestions, and whether or not the questions are suitable for testing to students. This research relies on the validation of both material and language experts. Two lecturers and one teacher from the school under test served as the material expert validators. Meanwhile, the language expert validators were two lecturers. The assessment items in column P-1 refer to both the assessment of the first question and the subsequent one.

The following are the results of the material expert validator's assessment of the scientific literacy AKM questions that will be developed.

Table 1. Data from validation results by material experts

Aspects	Average	Eligibility Percentage	Eligibility Criteria
Material	4.6	92	Very worthy
Question	4.73	92.00	Very worthy
Languange	4.67	93.33	Very worthy
Total	4.67	92.44	Very worthy

Based on the validation results by material experts listed in Table 1 against the question validation criteria, the overall assessment by material experts is that the AKM science literacy questions meet the criteria of being very worthy with a mean score of 4.67 and a percentage of 92.44%. When viewed from all aspects of the assessment, the material feasibility aspect has a mean score of 4.6 and a percentage of 92% with the criteria of very worthy. The question aspect has a mean score of 4.73

and a mean of 92%, meeting the criteria of being very worthy. The language aspect has an average score of 4.67 and a percentage of 93.33% with the criteria of very worthy.

The experts' validation of the results serves as the foundation for conducting field tests, calculating discriminating ability tests, determining the difficulty level of questions, and ensuring validity and reliability. The following are the results of the language expert validator's assessment of the scientific literacy AKM developed.

Table 2. Data from validation results by language experts

Aspects	Average	Eligibility Percentage	Eligibility Criteria
Material	5	100	Very worthy
Question	3.88	77.50	Very worthy
Construction	4.00	80.00	Very worthy
Total	4.29	85.83	Very worthy

To sum up, linguist experts gave the AKM science literacy questions an overall score of 4.29 out of 5 stars, which means they meet the very worthy criteria. This is shown in Table 2, which shows the validation results by linguist experts compared to the question validation criteria. If you look at all aspects of the assessment, the feasibility aspect of the questions has an average score of 5 and a percentage of 100% with very worthy criteria. The language aspect has an average score of 3.88 and a percentage of 77.50%, which meets worthy criteria. The construction aspect has an average score of 4 and a percentage of 80.00% with worthy criteria. Therefore, the study can continue to the next step by conducting field tests on students to calculate the discriminating ability tests, level of difficulty of questions, validity, and reliability. The researcher revised the draft questions based on the validator's suggestions and assessments before testing them on students.

c. One-to-one

This stage was carried out to test draft 2 on 6 randomly selected students. Students were divided into 2 parts, 3 students worked on draft 2 in package A and 3 other students worked on draft 2 in package B with a time of 90 minutes. The trial was carried out at MAN 1 Model Banda Aceh on December 14, 2023. This stage was carried out to test students' readability of the questions. As long as students work on the questions, it can be seen that the students are able to understand and solve the questions given. The questions presented are in the form of stories, pictures and graphs. However, there were several students who answered incorrectly in the graph section. Therefore, the researcher enlarged the graph presented in the questions for

the next job test. Researchers provided several initials to name respondents who took part in the one-to-one stage. As presented in the following table.

Table 3. One-to-one respondents in MAN 1 Model

Responden	Information
CO1A	One-to-one subject 1 on package A
CO2A	One-to-one subject 2 on package A
CO3A	One-to-one subject 3 on package A
CO1B	One-to-one subject 1 on package B
CO2B	One-to-one subject 2 on package B
CO3B	One-to-one subject 3 on package B

d. Small Group

The draft 2 questions in package A and package B were not revised, because at the one-to-one stage students were able to understand and answer the questions. The next stage was that the draft 2 questions in packages A and B were examined on 24 students. Students were divided into 2 parts, namely 12 people working on package A and 12 others working on package B. Trials at this stage were carried out at MAN 1 Model Banda Aceh on December 15, 2023. Students working at this stage were different from students at this stage previously. Students work on the questions given for 90 minutes. Next, the researcher calculated the discriminating ability, level of difficulty of the questions, validity and reliability based on the scores obtained from the students.

Validity Test

Validity testing is carried out to see the validity of the questions. If rcount > rtable then the question is declared valid. Meanwhile, if rcount <rtable then the question is declared invalid and questions with a negative value are rejected. The following is data obtained from package A questions.

Table 4. Validity Test of Package A

Question Number	r_{count}	r_{table}	Criteria
1	0.814	0.576	Valid
2	0.577	0.576	Valid
3	0.288	0.576	Invalid
4	-0.208	0.576	Rejected
5	0.623	0.576	Valid
6	0.579	0.576	Valid
7	-0.499	0.576	Rejected
8	0.549	0.576	Invalid
9	0.115	0.576	Invalid
10	0.672	0.576	Valid
11	0.577	0.576	Valid
12	0.131	0.576	Invalid

Table 4 shows 6 valid questions, (number 1, 2, 5, 6, 10. and 11), and 4 invalid questions, (number 3, 8, 9, and 12) in the package A. The pakcage also has 2 questions with negative values, (number 4 and 7). The sixth 6 valid questions were used for reliability testing at the next stage. Table 5 shows the validity test in package B, consisting of 12 questions.

Table 5. Validity Test of Package B

Question Number	r_{count}	r_{table}	Criteria
1	0.792	0.576	Valid
2	0.00	0.576	Invalid
3	0.654	0.576	Valid
4	-0.223	0.576	Rejected
5	0.580	0.576	Valid
6	0.580	0.576	Valid
7	0.661	0.576	Valid
8	0.093	0.576	Invalid
9	-0.045	0.576	Rejected
10	-0.313	0.576	Rejected
11	0.661	0.576	Valid
12	0.661	0.576	Valid

Table 5 shows 7 valid questions, (number 1, 3, 5, 6, 7, and 11) and 2 invalid questions, (number 2 and 8) in the package B. The package also has 3 questions that have negative values, (number 4, 9, and 10) The sixth valid questions are used for reliability testing at the next stage.

Reliability Test

Reliability testing was carried out after examining the questions based on the validity testing stages. There are 6 questions in package A and 7 questions in package B considered valid. If the Croanbach's alpha value is > 0.60 then the items are reliable and vice versa. Package A questions have a Croanbach's alpha of 0.791 so the questions are reliable. Package B questions have a Croanbach's alpha of 0.805 so the questions are reliable.

Discriminating Ability Test

Reliability testing is carried out after the questions have gone through the validity testing stages. There are 6 questions in package A and 7 questions in package B which are considered valid. If the Croanbach's alpha value is > 0.60 then it is declared reliable and vice versa. Package A questions have a Croanbach's alpha of 0.791 so the questions are declared reliable. Package B questions have a Croanbach's alpha of 0.805 so the questions are declared reliable.

In the discriminating ability test, the researchers found the different strengths and different criteria in package A questions. For more details, see the Table 6.

Table 6. Discriminating Ability Test of Package A

Question Number	Discriminating Ability	Criteria
1	0.814	Very excellent
2	0.577	Excellent
3	0.288	Enough
4	-0.208	Excluded
5	0.623	Excellent
6	0.579	Excellent
7	-0.499	Excluded
8	0.549	Excellent
9	0.115	Underaverage
10	0.672	Excellent
11	0.577	Excellent
12	0.131	Underaverage

The data above revealed that question number 1 received a very high rating. Questions at numbers 2, 5, 6, 8, 10, and 11 were criticized as excellent; questions at number 3 were criticized as adequate; questions at numbers 9 and 12 were criticized as underaverage; and questions at numbers 4 and 7 were excluded because they were negative. Questions that have excellent and excellent criteria can be used without

revision. Meanwhile, questions with sufficient criteria can be used with revision. For questions that were underaverage and had negative value, the researcher excluded the questions. The researcher concluded that questions numbered 1, 2, 5, 6, 8, 10, and 11 could be used without revision.

The document outlines the discriminating ability and criteria for package B questions. For more details, see Table 7.

Table 7. Discriminating Ability Test of Package A

Question Number	Discriminating Ability	Criteria
1	0.792	Very excellent
2	0.00	Underaverage
3	0.654	Excellent
4	-0.223	Excluded
5	0.580	Excellent
6	0.580	Excellent
7	0.661	Excellent
8	0.093	Underaverage
9	-0.045	Excluded
10	-0.313	Excluded
11	0.661	Excellent
12	0.661	Excellent

The table shows that question number 1 is rated very excellent. Questions at numbers 3, 5, 6, 7, 11 and 12 were classified as excellent, questions at numbers 2 and 8 were classified as underaverage and questions at numbers 4, 9 and 10 were excluded because they had negative values. Questions that have very excellent and excellent criteria can be used without revision. Meanwhile, questions with sufficient criteria can be used with revision. For questions that were underaverage and had negative value, the researcher excluded the questions. The researcher concluded that questions with numbers 1, 3, 5, 6, 7, 11 and 12 could be used without revision.

Test the Difficulty Level of the Questions

The researchers carried out a test of the level of difficulty of the questions on 24 questions consisting of packages A and B. The researchers found that several questions were categorized as easy, medium and difficult. For more details about package A, see the Table 8.

Table 8. Difficulty Level Test Questions in Package A

Question Number	Discriminating Ability	Criteria
1	0.75	Easy
2	0.58	Medium
3	0.08	Hard
4	0.42	Medium
5	0.42	Medium
6	0.33	Medium
7	0.25	Hard
8	0.17	Hard
9	0.58	Medium
10	0.83	Easy
11	0.58	Medium
12	0.25	Hard

The table shows 4 questions with difficult criteria, consisting of questions number 3, 7, 8 and 12. 7 questions with medium criteria consisting of questions number 2, 4, 5, 6, 9 and 11. The easy questions consist of questions number 1 and 10. The table 9 shows the package B.

Table 9. Difficulty Level Test Questions in Package B

Question Number	Discriminating Ability	Criteria
1	0.50	Medium
2	0.50	Medium
3	0.33	Medium
4	0.42	Medium
5	0.42	Medium
6	0.42	Medium
7	0.25	Hard
8	0.33	Medium
9	0.42	Medium
10	0.42	Easy
11	0.25	Hard
12	0.25	Hard

Table 9 shows questions with difficult criteria consisting of questions number 7, 11 and 12. 8 questions have medium criteria consisting of questions number 1, 2, 3, 4, 5, 6, 8 and 9. 1 question is easy, consisting of question number 10.

Discussion

There were several steps or phases that went into making an AKM (minimum competency assessment) tool that was based on scientific literacy and met the AKM characteristics and scientific literacy indicators. The model used in this research refers to the Tessmer model. Therefore, the development stages follow the steps contained in Tessmer's model. These stages include preliminary, self-evaluation, expert reviews, and one-to-one and small group stages.

The Tessmer model initiated the preliminary stage. This stage began with seeking information on the Ministry of Education and Culture's policies, determining the school, namely MAN 1 Model Banda Aceh, and determining validators (language and material experts). At this stage, the researcher also carried out a needs analysis by class XI students at MAN 1 Model Banda Aceh. The results of the needs analysis carried out by researchers were that students had difficulty understanding the material on Hooke's Law and elasticity due to a lack of reading and discussing the questions. Students also expressed a need for multiple sets of AKM questions on Hooke's Law and Elasticity.

Some students at MAN 1 Model Banda Aceh are used to discussing HOTS-level questions, but few are used to questions that use scientific literacy because students had to read a lot, both from the stories and articles presented. This also makes students' literacy levels very low. The AKM questions developed by researchers were relevant questions with the characteristics and indicators of scientific literacy. The developed questions could measure the ability to analyze, interpret, and explain. The medium of science education aims to equip students for a successful life in the 21st century. One of the skills needed in the 21st century is scientific literacy [12].

The next stage is the self-evaluation stage, namely the design stage. At this stage, the researcher designs the AKM question grid, AKM questions, and AKM validation sheet. Before creating AKM questions, researchers carried out curriculum analysis, material analysis, student analysis, and planning. The book that serves as a guide in making AKM questions is a class XI student package book. The AKM question grid has several parts, namely the scientific literacy domain, scientific literacy indicators, learning indicators, questions, and answer keys. The questions developed by the researcher are 12 questions with 2 packages, namely package A and package B. At this stage, draft 1 would be produced and given to the supervisor to get suggestions and input so that the draft questions developed are of excellent quality.

The expert review stage was carried out by providing a draft of the created questions to the validator to get input, suggestions, and whether or not the questions were suitable for testing to students. This research relies on the validation of both

material and language experts. Before testing with students, researchers carried out revisions according to suggestions and input from each validator. This research was conducted at MAN 1 Model Banda Aceh by conducting 2 field trials with different people [13].

The researchers divided the field trial stages into two parts: one-to-one and small groups.

a. One-to-one

The researchers conducted this stage to test Draft 2 on six randomly selected students. Students were divided into 2 parts; 3 students worked on draft 2 in package A, and 3 other students worked on draft 2 in package B with a time of 90 minutes. This stage was carried out to test students' readability of the questions. As long as students worked on the questions, the students could understand and solve the questions given. The questions were in the form of stories, pictures, and graphs. However, in the section on reading graphs and analyzing questions from the presented story, several students provided incorrect answers [14].

This matter happened due to students' disinterest in reading and unfamiliarity with HOTS homework. Research supports this. Today's science education strives to prepare students with the necessary skills to thrive in the 21st century. Scientific literacy is one of the skills that this preparation primarily focuses on [15].

Fitri's research supports this by showing that students frequently make common mistakes when solving story problems or contextual questions. This is caused by students' perceptions that contextual questions are considered quite difficult. Many students were not careful in determining the solution approach, and they also often experienced conceptual errors because they had difficulty understanding the problem properly [8].

b. Small group

After the one-to-one stage is complete, the next stage is continued, namely the small group stage. At this stage, the questions in packages A and B were examined on 24 students. Students were divided into 2 parts, namely 12 people working on package A and 12 others working on package B. Students working at this stage were different from students at the previous stage. Next, researchers calculated the discriminating ability, level of difficulty of the questions, validity and reliability based on the scores obtained from students [16].

The discriminating ability results obtained from the questions developed were very excellent, excellent, fair, underaverage and excluded. In package A questions, questions numbered 1, 2, 5, 6, 8, 10 and 11 can be used without revision. Meanwhile, in package B, questions with numbers 1, 3, 5, 6, 7, 11 and 12 can be used without

revision. This is because the questions fall into the criteria of very excellent and excellent. The difficulty level of the questions in package A is obtained by questions with difficult criteria consisting of questions number 3, 7, 8 and 12, medium criteria consisting of questions number 2, 4, 5, 6, 9 and 11 and easy criteria consisting of question number 1 and 10. In package B, there are difficult criteria consisting of questions number 7, 11 and 12, medium criteria consisting of questions number 1, 2, 3, 4, 5, 6, 8 and 9, and easy criteria consisting of questions number 10 [17] .

Validity in package A questions, there are 6 valid questions, namely numbers 1, 2, 5, 6, 10 and 11, and there are 4 invalid questions, namely 3, 8, 9 and 12. In package B there are 7 valid questions, namely in numbers 1, 3, 5, 6, 7, 11 and there are 2 invalid questions, namely 2 and 8. The valid questions will be examined for reliability, in the questions package A has a Croanbach's alpha of 0.791 and package B has a Croanbach's alpha of 0.805 so the question is declared reliable [18].

After completing the one-to-one stage, the process proceeded to the small group stage. At this stage, the questions in packages A and B were examined on 24 students. Students were divided into 2 parts, namely 12 people working on package A and 12 others working on package B. Students working at this stage were different from students at the previous stage. Next, researchers calculated the discriminating ability, level of difficulty of the questions, validity and reliability based on the scores obtained from students [16].

The discriminating ability results obtained from the questions were very excellent, excellent, fair, underaverage and excluded. In package A questions, questions numbered 1, 2, 5, 6, 8, 10 and 11 were applicable without revision. In package B, questions with numbers 1, 3, 5, 6, 7, 11 and 12 were applicable without revision because the questions fell into the criteria of very excellent and excellent. The difficulty level of the questions in package A was obtained by questions with difficult criteria consisting of questions number 3, 7, 8 and 12, medium criteria consisting of questions number 2, 4, 5, 6, 9 and 11 and easy criteria consisting of question number 1 and 10. In package B, there are difficult criteria consisting of questions number 7, 11 and 12, medium criteria consisting of questions number 1, 2, 3, 4, 5, 6, 8 and 9, and easy criteria consisting of questions number 10 [17].

Validity in package A questions: there are 6 valid questions such as numbers 1, 2, 5, 6, 10, and 11, and 4 invalid questions, namely 3, 8, 9, and 12. In package B, there are seven valid questions, namely numbers 1, 3, 5, 6, 7, and 11, and two invalid questions, namely 2 and 8. The valid questions would be examined for reliability; in the questions package, A has a Cronbach's alpha of 0.791, and package B has a Cronbach's alpha of 0.805, so the question is declared reliable [18].

D. Conclusion

Based on the results of research conducted at MAN 1 Model Banda Aceh regarding the development of the Minimum Competency Assessment (AKM) instrument for students' scientific literacy on Hooke's Law and elasticity at the senior high school level, the researcher concluded that the development of the instrument involved several stages using the Tessmer model. The initial stage involves a preliminary evaluation to collect information and determine the school as the research subject, namely MAN 1 Model Banda Aceh. Then, it continues with the formulative evaluation stage which is divided into self-evaluation, expert reviews, one-to-one, and small group. The results of these stages show that the developed scientific literacy AKM instrument has gone through a thorough evaluation process, with validator results stating that the instrument is very feasible.

Furthermore, the development of this instrument also involved four tests, namely the discriminating ability test, question difficulty level test, validity test and reliability test. Through the use of SPSS software, the test results show several important things. First, the discriminating ability test concluded that most of the questions had excellent to very excellent criteria, but some questions needed revision. Second, the question difficulty level test classifies questions into difficult, medium and easy, giving an idea of the level of difficulty of the material being examined. Third, the validity test identifies valid and invalid questions, the basis for measuring. Finally, the reliability test shows that the developed instrument can be relied upon in measuring students' minimum scientific literacy competency, with adequate Cronbach's alpha values for the two question packages examined. Thus, the results of this research provide a significant contribution to the development of scientific literacy evaluation instruments at the senior high school level.

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