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Assessing Students' Numeracy Literacy Level using The Ethnoscience-SSI Integrated Test on Acid-Base Material

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Abstract: *Numeracy skills in the 21st century are essential because these skills not only support data analysis and number-based problem solving but are also needed in various aspects of life that affect the global community. The numeracy literacy of high school students has not been optimally trained, even though both abilities are needed to solve conceptual and contextual daily life problems in working on PISA and AKM items. This study was conducted to assess the numeracy literacy level of high school students in one of the cities in Central Java Province. As a survey with a quantitative approach, this study involved 150 high school students as respondents. The entire population became respondents in this study so the purposive sampling technique was applied. 24 out of 30 test items are empirically valid with a reliability value of 0.89. Data analysis was conducted using descriptive statistics to answer the numeracy literacy category of students. Based on the results, 35.60% was obtained which is included in the knowing level of numeracy literacy. The results of this study suggest more interactive and contextualized learning strategies to facilitate the transition to deeper understanding and application level.*

Keywords: *numeracy literacy, ethnoscience, socio-scientific issue.*

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INTRODUCTION

In the era of 21st-century skills, education must equip students with skills and competencies relevant to 21st-century education. The goal of education in the era of global change towards the Sustainable Development Goal (SDG) 2030 is to improve students' knowledge and skills in 21st-century skills in literacy acquisition, competence, and academic performance (Murugiah, 2020). Literacy skills are the basis for students to adapt and continuously improve their knowledge, skills, and abilities to respond to rapidly changing needs in both the workplace and social life (Hanemann, 2015).

21st-century education can be achieved by taking a holistic approach to the interrelated components of the education system: curriculum, pedagogy, and assessment (Frache *et al.*, 2019). Improving high-quality assessment plays an important role in 21st-century education because it is able to design and provide high-quality learning progressions. Changes in learning that refer to 21st-century education must be accompanied by improvements in the quality of assessments that lead to 21st-century skills (Conley & Hammond, 2015).

The current National Assessment is optimal for improving education quality and measuring literacy. Literacy is a priority skill that students must have because Indonesia's literacy level is low on an international scale. Indonesia is consistently ranked as one of the countries with the lowest PISA results (Majid, 2023). TIMSS and PISA results show that the ability of students to solve problems and analyze the relationship between learning and daily life is still weak, thus special attention is needed to literacy and numeracy aspects in education.

One part of the National Assessment is the Minimum Competency Assessment to measures the cognitive aspects of learners consisting of literacy and numeracy (Machromah *et al.*, 2021). The Minimum Competency Assessment instrument is oriented towards contextual daily life problems and requires learners to use their literacy skills. Test instruments that contain literacy and numeracy need to be developed to support the realization of the classroom-scale Minimum Competency Assessment.

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In Indonesia, numeracy literacy has become one of the main components in the assessment of student competencies, as reflected in the National Assessment designed to replace the National Exam. The National Assessment not only measures students' cognitive abilities but also assesses critical thinking and numeracy skills. Therefore, teachers need to develop learning strategies that not only facilitate the understanding of scientific concepts but also improve students' numeracy literacy skills.

Numeracy literacy includes the ability to reason logically and write mathematical models that require learners to use complex and critical thinking skills, as well as the skills to write mathematical models and scientific reasoning (Ambarita *et al*., 2018). This is related to chemistry which contains the concepts of analysis, problem solving, and mathematical calculations to solve a chemical problem that is contextual in nature. contextual. Aspects of literacy that include the ability to understand issues in everyday life, can be optimized with an approach that raises the Socioscientific context optimized with an approach that raises context of Socioscientific Issues (SSI) in society (Badeo & Duque, 2022). Literacy and numeracy skills can also be optimized with an ethnoscience approach that connects scientific knowledge with people's lives, habits, and local culture. and local culture (Sudarmin *et al.*, 2019).

This study chose chemistry material, namely acid-base material. This is because acid-base material fulfills the basic principles of content selection in PISA, namely contextually relevant to daily life (Andriani *et al*., 2019). The use of tests that integrate these two approaches can help assess students' numeracy literacy levels more comprehensively. This integrative approach not only provides a more meaningful learning experience for students but also improves their ability to apply numeracy and literacy concepts in real life.

This research has a strong justification from a scientific and pedagogical perspective, especially in the context of 21st-century education. This research responds to the need for more contextualized science education and is relevant to students' realities. The integration of ethnoscience is appropriate in providing a rich and local cultural context, thus bringing science closer to students' lives and promoting deeper cognitive engagement. Neratania (2024) stated that learning based on local cultural context can improve students' conceptual understanding of science because students are able to see the application of science directly in their culture.

SSI integration offers realistic ethical and social challenges and invites students to develop critical thinking and decision-making skills based on scientific data and moral considerations. Aisy & Trisnowati (2024) stated that Socioscientific issues enable the development of higher critical thinking skills, as students are exposed to real problems that require analysis and scientific data-based solutions.

Numeracy literacy plays an important role in this case because acid-base material involves an understanding of applied mathematics, as well as honing students' ability to interpret scientific data. This approach is also in line with the push to include numeracy literacy dimensions based on social and cultural contexts, as widely recommended in international educational frameworks, such as PISA (Programme for International Student Assessment), which emphasizes the importance of numeracy literacy and problem-solving skills in real contexts. Therefore, the development of this instrument not only enriches the learning of acid-base materials, but also answers the needs of a curriculum that is more adaptive, relevant, and prepares students to face global and local challenges scientifically and ethically.

Based on the description above, the urgency of this research is that a special assessment instrument is needed which is indeed used to detect numeracy literacy skills integrated with Ethno-SSI. This is so that students are accustomed to solving conceptual and contextual problem-based problems. The research questions asked to answer the research objectives are as follows.

1. What is the feasibility of the Ethno-SSI integrated numeracy literacy test used to measure the numeracy literacy level of high school students?
2. What is the level of numeracy literacy of high school students based on the test results?

METHOD

Research Design

This research was conducted as a survey with a quantitative approach. The research was conducted on the level of numeracy literacy students in one city in Central Java Province. A total of 150 students participated in this study. Samples were taken using a purposive sampling technique. A quantitative approach was used to analyze the numerical data generated from the test. This study aims

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to measure students' numeracy literacy level in understanding the concept of acid-base through Ethnoscience and SSI-based tests. In addition, to identify differences in students' numeracy literacy skills after learning with this integrative approach.

Data Collection Technique

Numeracy literacy was measured using an Ethno-SSI integrated test instrument. The test instrument was compiled and designed by the Minimum Competency Assessment framework including the distribution of the number of questions, the proportion of the distribution of the form of questions, and the proportion of the distribution of cognitive levels. The instrument consists of 30 items and 6 discourses that serve as stimulus. The design of the test instrument includes the distribution of the number of questions, the proportion of distribution, and the form of questions. The results of the distribution of each of these components can be seen in Table 1 and Table 2.

Table 1. Distribution of Question Forms

Question Form	Item
Simple Multiple Choice	6,18,27,28,30
Complex Multiple Choice	3,4,8,9,12,13,14,16,19,21,22,25,26
Matchmaking	11
Short Essay	2, 7, 15
Essay	1,5,10,17,20,23,24,29

Table 2. Distribution of Cognitive Levels

Level of Numeracy Literacy	Items	Amount	Precentage
Knowing	2, 3, 4, 8, 9, 13, 18, 22, dan 23	9	30%
Applying	1, 7, 11, 12, 14, 15, 16, 19, 25, 27, 28, dan 30	12	40%
Reasoning	5, 6, 10, 17, 20, 21, 24, 26, dan 29	9	30%

The test instrument was theoretically validated by experts through the Aiken V validation technique and has been empirically tested for validity and reliability. The test grid can be seen in Table 2. The suggestions from the experts were used to improve instrument tests on the material, construction, and language aspects. Nine validators in the field of assessment provided suggestions for improvement to fit the concept of measuring creative thinking.

Data Analysis

To answer the questions that support the research objectives, the researcher analyzed the data using descriptive statistics to answer the numeracy literacy category. This analysis was conducted on the data from students' answers. Cognitive levels in numeracy literacy were grouped into three levels including: 1) Knowing; 2) Applying; and 3) Reasoning (Sani, 2021). The achievement of students' cognitive level on numeracy literacy based on the Minimum Competency Assessment cognitive level is measured by using the percentage of the combination of students' answers on each item included in each cognitive level of numeracy literacy.

FINDING AND DISCUSSION

Feasibility of Ethno-SSI integrated numeracy literacy test instrument

The main research tool of this study is a set of Ethno-SSI integrated Minimum Competency Assessment test instruments that play an important role in providing feedback to researchers. Therefore, the quality of the test instrument becomes a very important issue in this development research. Item quality analysis is the process of collecting, summarizing, and using information from learner responses to assess the quality of test items (Sudaryono *et al*., 2019). This analysis allows researchers to observe the characteristics of certain items and can be used to ensure that the items are of an appropriate standard for inclusion in the test, or that the items need to be improved. The aspects that must be met and analyzed to produce good quality items include good item quality include: 1) Content Validity; 2) Level of Item

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Suitability; 3) Reliability; 4) Unidimensionality; 5) Level of Difficulty; 6) Bias Power; and 7) Distinguishing Power.

Content validity is an important source of evidence that is important and must be analyzed in every process of preparing test instruments. This is because content validity can show the extent to which the test instrument contains adequate items and represents the construct to be measured in the research. in research (Delgado *et al*., 2015). This content validity test should be carried out by asking for assessments, opinions, and reviews from experts (judgment experts). The content validity test assessment of this test instrument was carried out using the Aiken V test.

In this study, the content validity test was carried out by 9 experts consisting of six lecturers and three teachers who are competent in their fields. The number of experts The number of experts chosen adjusts to the use of Aiken V content validity used in this study. in this study. One of the variables determining Aiken's validity is the number of validators and the number of criteria determining validity. validators and the number of validity-determining criteria used. The more number of validators, and the greater the number of criteria used, then the standard value for validity will be the standard value for valid will get.

Table 3. The Result of Aiken

Item	V calculate	V Table	Category
1	0,73	0,71	Valid
2	0,76	0,71	Valid
3	0,80	0,71	Valid
4	0,73	0,71	Valid
5	0,73	0,71	Valid
6	0,80	0,71	Valid
7	0,76	0,71	Valid
8	0,76	0,71	Valid
9	0,73	0,71	Valid
10	0,76	0,71	Valid
11	0,78	0,71	Valid
12	0,80	0,71	Valid
13	0,82	0,71	Valid
14	0,76	0,71	Valid
15	0,73	0,71	Valid
16	0,76	0,71	Valid
17	0,73	0,71	Valid
18	0,73	0,71	Valid
19	0,76	0,71	Valid
20	0,73	0,71	Valid
21	0,73	0,71	Valid
22	0,73	0,71	Valid
23	0,73	0,71	Valid
24	0,76	0,71	Valid
25	0,73	0,71	Valid
26	0,73	0,71	Valid
27	0,76	0,71	Valid
28	0,76	0,71	Valid
29	0,73	0,71	Valid

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Item	V calculate	V Table	Category
30	0,80	0,71	Valid

According to Aiken, the minimum limit of V value when involving 9 experts, containing 6 categories, and with a significance level of 0.05 is 0.71. with a significance level of 0.05 is 0.71. Based on the results of Table 3, it shows that 30 literacy items and 30 numeracy items are in the content valid category because they have a value of $V_{calculate} > V_{table}$. This shows that the draft test instrument is valid and ready to use. In addition, the notes and suggestions from the validators were used to improve the existing draft.

Table 4. Instrument Feasibility Results

Item Quaity	Result	Conclusions
Reliability:		
a. Cronbach Alpha	0,83	Good
b. Item Reliability	0,90	Good
c. Person Reliability	0,89	Good
Item Fit	80% item valid	Unsuitable items need to be revised
Unidimensionality	47,9%	Good
Item Measure	47% of items are categorized as medium	Good

Table 4 presents item eligibility based on other categories analyzed by the Item Response Theory (IRT) method using the Rasch model. The results of this test show that the instrument is reliable enough to be used in research.

The level of numeracy literacy skills of high school students

Numeracy literacy in the Minimum Competency Assessment can be said to be as the ability to reason using mathematics. Mathematical literacy is an individual's capacity to formulate, use, and interpret mathematics in various contexts. This includes mathematical reasoning and using mathematical concepts, procedures, facts and tools to describe, explain, and predict phenomena (Ding & Homer, 2020). This literacy helps individuals to recognize the role that mathematics or numeracy plays in the world and to make the reasoned judgments and decisions that are needed by constructive, engaged and reflective citizens.

The cognitive level shows the thinking process that is required or required in order to solve the problem or problem. Cognitive levels in numeracy literacy are grouped into three levels including 1) Understanding information (knowing); 2) Applying; and 3) Reasoning (Yamtinah, Utami, Mulyani, et al., 2022). The achievement of students' cognitive level in numeracy literacy based on AKM cognitive level is measured by using the percentage of a combination of students' answers on each item included in each cognitive level of numeracy literacy. The percentage of achievement of the cognitive level of numeracy literacy of students in each representative school is presented in Figure 1 and 2.

Figure 1 shows a graphical representation of gender differences in numeracy literacy achievement. The results show that there is no significant difference in numeracy literacy between male and female students. Both groups were able to answer the questions well, although there were differences in the way they were solved. Although there is a difference in the percentage of achievement where female students are superior, this percentage difference is not too large.

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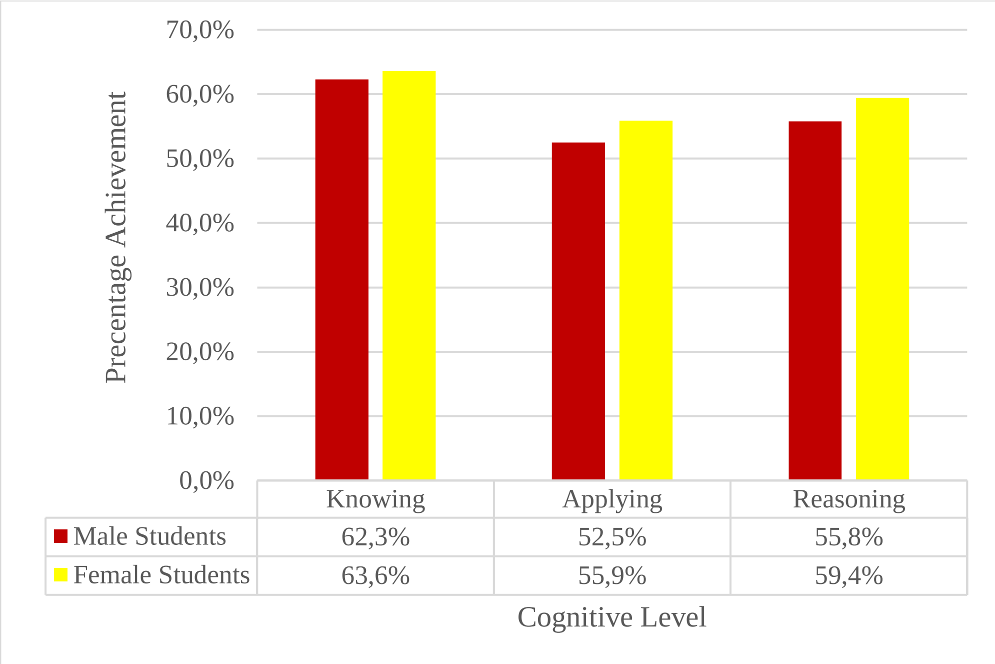

Figure 1. Differences in Numeracy Literacy Achievement in terms of Gender

The percentage of numeracy literacy achievement of female students is slightly higher than that of male students in each of the three aspects. The percentage of female students' level of knowing was 63.6% and male students' was 62.3%. The percentage of applying level for female students was 55.9% and 52.5% for male students. The percentage of female students' reasoning level is 59.4% and male students are 55.8%.

Many factors, including environment and culture can influence gender differences in math performance. There are differences in the thought processes, ways of responding and absorbing the content presented between male and female students (Nurhikmayati & Juandi, 2022). eading ability also needs to be considered because numeracy literacy questions also contain reading as a stimulus. This finding suggests that considering students' performance in reading, especially some of the specific reading sub-areas on tests such as PISA, is important in interpreting students' numeracy literacy skills (Ding & Homer, 2020). The reading ability of female students is superior to male students which has an impact on reading comprehension. The ability to understand reading has an effect on solving problems in numeracy problems.

Figure 2 provides a graphical representation of the percentage distribution of cognitive levels of numeracy literacy of students in representative schools. The cognitive level of understanding (knowing) became the percentage of numeracy literacy cognitive level that was most mastered by the high representative school at 69.2%. The second order is followed by the reasoning level at 66.7%. The last cognitive level mastered by high representative schools was applying at 59.0%.

In medium representative schools, the distribution of the percentage of achievement of cognitive level of numeracy literacy of students who are most mastered is understanding (knowing) of 65.0%. This percentage is smaller than the results obtained by high representative schools. The second order is the same as the high representative school, because the next cognitive level mastered is the reasoning level at 60.4%. The last cognitive level mastered by medium representative schools was applying at 46.8%.

In low representative schools, the distribution of the percentage of achievement of numeracy literacy cognitive level of learners tends to have the lowest percentage of cognitive level compared to the other two representative schools. In the low representative school, the distribution of percentage achievement of numeracy literacy cognitive level of learners that is most mastered is understanding (knowing) at 54.2%. The second order of numeracy literacy cognitive level mastered by the low representative school is different from the other two representative schools. The applying cognitive level ranked second with a percentage of 50.0%. The last cognitive level mastered by the low representative school was reasoning at 46.8%.

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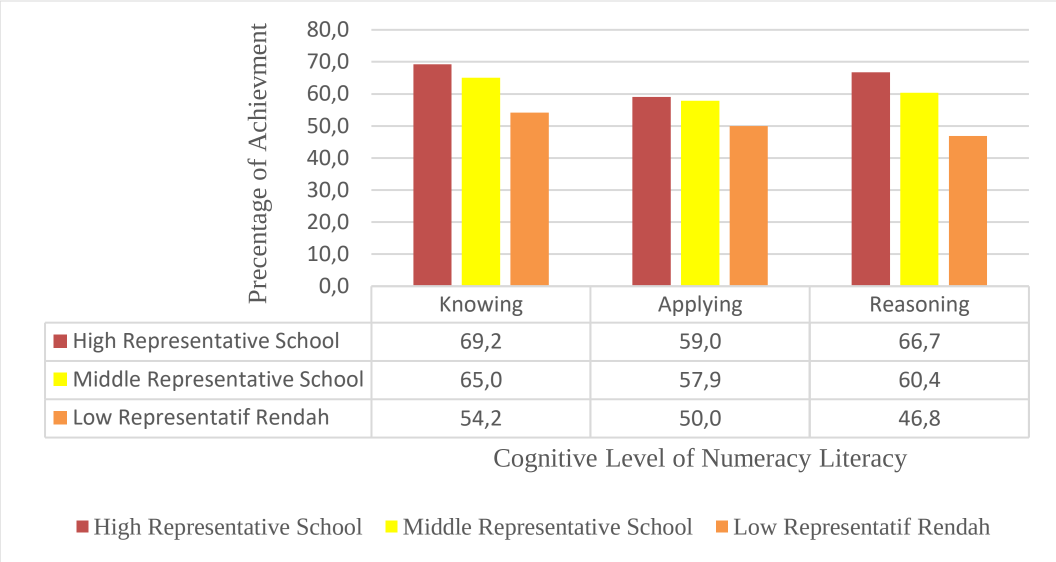

Figure 2. Percentage of Achievement of Cognitive Level of Numeracy Literacy

Based on these results, it shows that the overall cognitive level that is most mastered is understanding (knowing) because it gets the highest average achievement compared to other numeracy literacy cognitive levels. As for the overall cognitive level that is less mastered is the application (applying) because it gets the lowest average achievement compared to other numeracy literacy cognitive levels. The cognitive process of numeracy literacy begins with producing factual knowledge (knowing), applying knowledge in the context of real life (applying), so as to explain phenomena or the ability to think in relation to statements or premises that connect the truth that has been found to produce conclusions or decisions (reasoning) (Teig *et al*., 2020).

As reinforcement in explaining the achievement of cognitive levels of numeracy literacy is done by interviewing students related to each question of the most mastered and least mastered cognitive levels. This process is referred to as a cognitive interview to analyze the numeracy literacy skills of students using the thinking-aloud method. This method is used as a cognitive process to explore and analyze learners' understanding of numeracy literacy items. This process involves four learners and each learner has a different level of ability. Learner A is representative of advanced ability, learner B of proficient ability, learner C of basic ability, and learner D of ability needs special intervention.

The first cognitive level is the level most mastered by students, namely understanding (knowing). The cognitive level of understanding (knowing) is identifying problems in context and formulating problems mathematically based on the concepts and relationships that exist in the problem. The basic skills needed are to simplify, organize, and create a more appropriate situation in accordance with knowledge. The knowing level is related to basic mathematical knowledge which includes facts, formulas, and procedures, where students are expected to be able to recognize and remember information, perform simple calculations, and identify mathematical concepts that are already known in a simple context (Ekawati *et al*., 2020).

Item 28 includes items of understanding (knowing). In this question, learners can first identify and understand the information in the discourse, so that they can answer the question. After finding the information obtained, learners can formulate problems mathematically based on concepts and relationships in the discourse. In this problem, learners must first formulate and identify the nature of the sample in each natural indicator. After that, students can formulate the exact pH range of each sample based on the concept that has been formulated earlier. The question item 28 can be seen in Figure 4.15.

As reinforcement in explaining the achievement of this cognitive level of numeracy literacy is done by interviewing students A, B, C, and D. The following are the results of interviews with the four students related to how students can work with item 28.

Student A: In the question, there is already experimental data. We then matched the data with the color of each natural indicator. The results are then matched with those in the answer choices. So here we don't bother calculating, but reading the data and showing the results of the data

Student B: I easily understood what was asked and the experimental data was easy to understand. So just match it to the answer choices.

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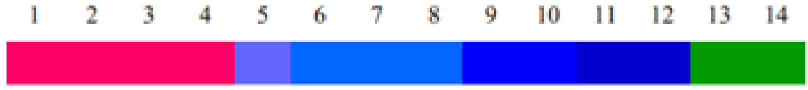
Student C: The sentence asked in the question and the known data I can immediately understand and help me determine the answer.I just need to match the results with the answer choices

Student D: There is no calculation just reading the data. What is asked is clear and the data is also not complicated. Only because there are two natural indicators so you have to be careful. There is already a pH and color change for each natural indicator so just match it.

28. Plants in Indonesia can not only be used as tea. These plants can be used as natural acid-base indicators. Natural indicators are acid-base indicators that already exist naturally. Generally, they come from plant parts (roots, tubers, stems, leaves, flowers, fruits and seeds). Natural indicators are made through an extraction process with the addition of a customized solvent. Plant extracts contain color pigments in the form of anthocyanin compounds that can change color at a certain pH. Typical Indonesian plants that can be used as acid-base natural indicators are Telang Flowers and Kencana Ungu Flowers. The following is the pH range and color changes of Telang Flowers and Kencana Ungu Flowers.



pH Color of Telang Flower

pH Color of Kencana Ungu Flower

Both natural indicators can be used to determine the acid-base nature of a substance based on color changes. The following is experimental data on natural indicators of bay flowers and purple kencana flowers on several samples.

Sample	Indicator of Telang Flower	Indicator of zkencana Ungu Flower
HCl Solution	Pink	Pink
NaOH Solution	Green	Greenish Yellow
Vinegar Solution	Pink	Light Pink
Detergent Solution	Green	Greenish Yellow

Based on the above information, the exact pH range of each sample is....

☐ HCl solution pH is in the range of 1 to 4
☐ Detergent solution pH is in the range of 11 to 12
☐ NaOH solution p His in the range 13 to 14
☐ pH of HCl and vinegar solutions is in the range of 1 to 6.
☐ pH of the vinegar solution is in the range greater than 8

Figure 2. Item 28

Based on the results of the interviews, the factors that caused the questions to be easily answered by students were 1) experimental data that was easy to understand; 2) students were able to interpret the data well; 3) the question sentences were easy to understand; and 4) the answer choices in the questions helped students adjust their formulation results.

The next cognitive level is the level that is least mastered by students, namely applying. At this level learners are required to apply knowledge, mastery, and relationships of mathematical symbols and operations, develop new strategies and approaches to solve problems. Learners must have the ability to apply problem solving to various situations which includes the ability to use mathematical concepts and procedures, apply appropriate strategies to solve given problems, and use mathematical tools and representations to solve problems (Lailiyah, 2017).

Item 9 includes applying items. In this question, students are first given a picture of the process of making mordant and fixation solutions along with the required composition. In item 9, learners are

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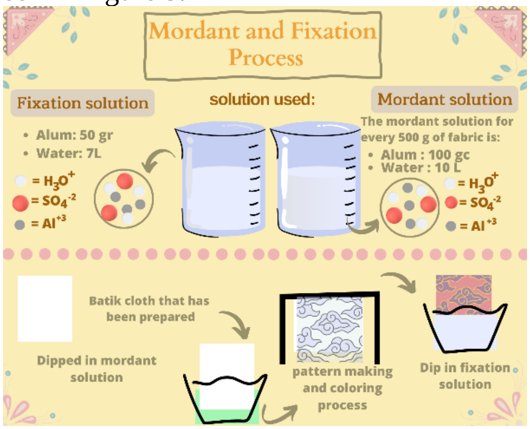
asked to calculate the concentration of mordant solution and fixation solution on a different fabric weight from the picture and what if the weight of the fabric is doubled. Understanding the problem, making calculation models, and developing strategies and approaches to solve problems are needed to answer this question. Item 9 can be seen in Figure 3.



9. Ana is a grade XI student who was participating in Zie Batik's industrial visit in Malom Village. Ana was taught to color batik cloth using natural dyes. One of them taught Ana to make a mordant and fixation solution using alum. The recipe for the ingredients is the same as in the picture above. Calculate the concentration of mordant solution for 500 grams of cloth and the concentration of fixation solution for 1000 grams of cloth. If the weight of the fabric is doubled, identify the molarity of the two solutions.

- ☐ Molarity of the fixation solution is 0.02M
- ☐ Molarity of the mordant solution is 0.03M
- ☐ Molarity of the fixation solution and the mordant are the same
- ☐ The weight of the fabric is doubled so the molarity remains the same
- ☐ Fabric weight is doubled hence molarity is different

Figure 3. Item 9

As a reinforcement in explaining the achievement of this cognitive level of numeracy literacy is done by interviewing students A, B, C, and D. The following are the results of interviews with the four students related to how students can work with item 9.

Student A: This question is very difficult. The form of the question is a story problem and there is a picture so you have to understand what it means first. After that I had a little trouble determining the calculation steps and linking what was known in the problem with the formula that I knew.

Student B: I had difficulty interpreting the sentences in the problem and predicting the steps that should be used. We also have to read the problem carefully and thoroughly to understand what is meant in the problem. I have also never done this type of problem.

Student C: I was not careful in reading and understanding the problem. I can't analyze and relate what is known in the problem with the calculation.

Student D: I could not understand the meaning of this problem, I failed to analyze it so I did not know what formula to use and how to calculate it.

The results of the interview showed that the factors causing very low achievement in item 9 were 1) lack of thoroughness and accuracy in reading; 2) the problem requires the ability to interpret the results of the analysis to predict and make decisions; 3) never worked on this form of problem; and 4) could not determine the formula or strategy used to solve the problem.

Based on observations, it shows that most students have difficulty understanding this material. The concept of acid-base solution is fundamental for students to understand. This concept becomes prerequisite knowledge for many chemical topics which have abstract concepts and often cause misconceptions in students. This is because abstract concepts are difficult for students to understand (Yamtinah, Utami, Masykuri, *et al*., 2022).

Based on the proportion above, it shows that the form of essay questions is greater than simple multiple choice questions. The complex multiple choice form has the highest proportion of 40%. The purpose of this research is useful for analyzing the numeracy literacy skills of students which are related

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to complex thinking skills that do not only measure the concept dimension. Simple multiple choice is more useful for measuring factual and conceptual dimensions with free response question models and short answer types. Essay-type free-response question model to measure metacognitive dimension (Anis *et al*., 2020). Complex multiple choice is the choice of question form that facilitates higher order thinking skills (Rustanto *et al*., 2023).

The main characteristic of this product is the integration of the competencies measured. This means that the instrument not only measures learners' numeracy literacy skills in one domain, but also integrates aspects of Ethno-SSI in one test. Ethno-SSI issues refer to the intersection between ethnoscience (the study of how different cultures classify and understand the natural world) and socioscientific issues (controversial social issues with scientific components). The instrument can be used both for formative assessment, which aims to provide feedback to learners and teachers on learning progress, and for summative assessment, which evaluates student achievement at the end of a learning period. In addition, because of its focus on reading and numeracy literacy, the instrument is highly relevant to the skills needed in today's digital age, where the ability to think critically about digital and numerical information is important.

Each question item constructed by the author consists of a stimulus (discourse) and a question. The discourse is given as a stimulus for students' thinking, so that students can process the information and relate it to the question. This stimulus is in the form of reading text, cases/problems, images, tables and graphs that are integrated with Ethno-SSI and based on the content of solution materials and acid-base equilibrium. Learners answer questions based on their thinking skills in processing initial information, not based on their memorization of material concepts. The characteristics of the test questions, one of which is literacy and numeracy, require students to explore their thinking process by linking and constructing information in the test to make a decision or solve problems in the question.

Qualitative questions are more able to identify learners' understanding of the special meaning contained in material concepts than quantitative questions. Contextual questions mean that the phenomena or problems presented in the questions are related to the context of everyday life. Contextual questions are important to present so that students realize that phenomena in chemical concepts are close to everyday life and can be applied in technology which can ultimately be used for the ease of human life (Ritdamaya & Suhandi, 2016).

The causes of learners being at a low level of applying and reasoning are grouped into two, namely factors from within learners (internal factors) and factors that come from the environment of learners (external factors) (Sanjiwani *et al*., 2020). internal factors include several things, among others, related to the low ability, motivation, and reading attitude of students (Çalışkan & Ulaş, 2022), students are not familiar with the form of questions given (Huryah *et al*., 2017), and low understanding of material concepts (Fajri & Yusmaita, 2021). External factors are thought to be due to several things, including learning methods that have not required students to use their reasoning, negative influences from peers when taking tests, and conditions and learning times that are not conducive (Priliyanti *et al*., 2021).

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the Ethno-SSI integrated test is suitable for measuring numeracy literacy skills based on expert assessment and empirical tests. The feasibility of the instrument based on content validity was determined through expert agreement with the calculation of the Aiken index. The results of the content validity of the numeracy literacy AKM instrument obtained the results of 30 valid question items with a value ≥ 0.71 which $V_{calculat}$e> V_{table}. It can be concluded that the instrument is feasible and can be used to measure the level of numeracy literacy. The achievement of cognitive levels of numeracy literacy at the knowing level was 62.8%, the applying level was 55.6%, and the reasoning level was 58.0%. Generally the most mastered cognitive level is knowing because it gets the highest average achievement compared to other numeracy literacy cognitive levels. The least mastered cognitive level is applying because it gets the lowest average achievement. In addition, the results of this study provide suggestions for consideration for further research as a means to improve the quality and competence of teachers. High school chemistry teachers in Indonesia still need guidance to improve the skills demanded by the 21st century, especially numeracy literacy skills. For chemistry teachers, this can be done with a learning approach that uses local wisdom as a context for chemistry learning.

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