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# Development of E-LAAS Alternative Assessment to Assess Science Literacy of Generation Z on Coordination System Material

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## ABSTRACT

This study aims to design, develop, evaluate, and analyze the impact of the E-LAAS APP (Electronic Alternative Assessment Application) on Generation Z's scientific literacy. Using the Research and Development (R&D) method with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), the research focused on producing valid and reliable assessment instruments. Conducted from January to April 2024, the study involved 60 students from MAN 2 Bandar Lampung, divided equally into experimental and control groups. Data were collected using quantitative methods through scientific literacy-based multiple-choice tests, and qualitative methods through validation by experts (material, media, language, and assessment), as well as self- and peer assessments. Results showed that the E-LAAS application was feasible for classroom use, with highly positive responses 87.5% from teachers and 92% from students. The experimental class achieved a high average N-gain of 0.81, compared to the control class's moderate gain of 0.56. An independent t-test resulted in a Sig. (2-tailed) value of $0.00 \leq 0.05$, indicating a significant effect of the application on improving scientific literacy. This research supports the recommendation of digital-based alternative assessments to enhance biology learning and better meet the learning needs of Generation Z in the digital era.

**Keywords**: alternative assessment, E-LAAS application, generation z, science literacy, sensory system

## INTRODUCTION

21st century learning brings a paradigm shift marked by the rapid development of science and technology, as well as changes in curriculum, learning evaluation, and learning media. (Rahayu et al., 2022) . This is in line with the view that emphasizes the importance of teachers' understanding of the use of technology in learning to meet students' needs (Palennari et al., 2023) . Advances in information and communication technology, which enable instant and flexible access to information as a characteristic of the 21st century, have shaped Generation Z through the internet and globalization, fundamentally changing the way they learn and interact. These changes also affect efforts to improve essential 21st-century skills for them, including critical thinking, creative thinking, collaboration, and literacy, where science literacy is one important aspect. Given the unique characteristics of Generation Z who tend to require direct learning that is relevant to real-life situations and have a faster

ability to process information presented visually and interactively through technology, especially in understanding often abstract biological concepts, the use of interactive digital media is crucial. This media not only presents material in an interesting way, but also effectively trains and develops the science literacy skills needed by this digital generation .

Therefore, the use of technology is very important in every learning including biology because it can create a more interesting learning environment and allow students to explore their abilities independently (Rahmat Anggi Datiatu, et al, 2023). In this context, scientific literacy becomes increasingly important, as it helps students understand natural phenomena and global issues such as climate change and public health. According to Ridzal and Haswan, scientific literacy can improve students' critical thinking skills, which are key to understanding and applying scientific concepts in everyday life (Ridzal & Haswan, 2023) . Science literacy equips Generation Z to assess and select correct scientific information from incorrect or unreliable information that enables Generation Z to understand the complexity of global problems and issues (climate change, environmental sustainability, and public health), and participate in efforts to resolve them. The ability to understand, interpret, and produce scientific data is a valuable asset in developing solutions to complex problems. Generation Z who have strong science literacy will be better prepared to face the demands of future work, have a strong foundation to explore the fields of science, technology, society, and the environment in personal, local/national, and global contexts (Hendrawati;, 2011; OECD, 2022).

However, the International Organization OECD (Organization for Economic Co-operation and Development) which has been evaluating the literacy skills of Indonesian students every three years since 2000, includes mathematics literacy; reading literacy; and science literacy. The results of PISA (Programme for International Student Assessment) or an international student assessment program to measure the educational achievements of a country, especially Indonesia, in 2022 showed that the assessment results had decreased compared to the results of the previous year's assessment. The PISA 2022 report shows that Indonesia's science literacy score is at level 1a, namely students are only able to use basic knowledge to identify claims or explanations about simple phenomena taken from science, information or evidence of low cognitive understanding. Learners can identify one relevant source of information from among several sources, which is needed to inform action on a particular scientific problem and identify key findings or arguments. Students can choose the most appropriate experimental design to control one variable from several variables by utilizing low-level procedural knowledge (Nabilah, Shofa, 2024). The 2022 PISA science literacy score is 383. This score is down 12 points from 2018 which was 396. This is a special concern, how is the quality of learning in Indonesia. Not only that, the condition of Indonesian students' science abilities is relatively low on the ASEAN scale (OECD, 2022). In 2022, Indonesian students will get a science literacy score of 383 points, ranking 6th out of 8 ASEAN countries.

Another reality in the field based on the results of the needs analysis questionnaire is that so far science literacy has only been trained through learning, learning media, and science literacy-based teaching materials, while science literacy is only assessed through tests, does not involve assessments in the process domain (psychomotor and affective), and

most teachers do not routinely use science literacy tests in their learning, because teachers' mastery of science literacy assessment design is still minimal. The unavailability of science literacy platforms and question banks in schools is the biggest obstacle that makes it even more difficult for teachers to design science literacy tests for students. There are not many studies that apply questions related to everyday phenomena in real-life situations, biology learning assessment instruments have not fully directed at science literacy and high-level thinking skills (Nasution, 2021; Permatasari, 2022; Suparya et al., 2022). Biology teachers at MAN 1 and 2 Bandar Lampung face difficulties in designing and implementing assessments that train science literacy according to the independent curriculum, with an understanding of science literacy that is limited to concepts. Lack of information, age of teachers, and slow school response exacerbate this condition. The use of technology in tests is still dominated by LOTS questions (83%), with few questions that train PISA science literacy competencies. In addition, teachers need a science literacy-based performance assessment instrument that is easy to apply, and understanding of psychomotor and affective assessments is still low. As a result, assessments of the learning process are rarely carried out, and students also have a poor understanding of the existing assessment process, with very limited use of formative or alternative assessments.

This reflects a lack of understanding and training for teachers in implementing diverse assessments that are appropriate to the needs of students (Hilman et al., 2023) . Research by Nur Iman, et al. also shows that many schools have not fully implemented the minimum competency assessment policy which should be an integral part of the learning process (Iman et al., 2021). On the other hand, the feedback given by teachers is currently limited to adding grades without clarification or constructive suggestions. This is contrary to the nature of feedback in the Independent Curriculum which should include stages of clarification, attention, suggestions, and appreciation (Haerazi et al., 2023). Hardianti's research shows that assessments carried out by teachers must reflect a deeper understanding of students' learning styles and provide more meaningful feedback to support the learning process (Hardianti et al., 2023). Thus, to increase the effectiveness of the use of PMM in the learning process, training needs to be provided for teachers in formulating and implementing more diverse assessments that are appropriate to student characteristics. In addition, it is also important to improve students' understanding of the assessment process they are undergoing, so that they can be more actively involved in their own learning (Akbar et al., 2024).

The development of alternative assessment instruments is very necessary to train students' scientific literacy in the form of technology-based applications to train scientific literacy comprehensively starting from the first stage. Alternative assessment tasks and rubrics that are integrated with learning, providing fast and interactive feedback, providing self-assessment , providing peer assessment prizes for students, providing biology materials, especially sensory systems that are packaged based on scientific literacy, scientific literacy tests, students can see direct feedback from teachers regarding the results of the assessments that have been carried out. Strengthening the development of alternative assessment applications is evidenced by the results of the Google Trends mapping. Research on scientific literacy is mostly applied to learning, and has not touched on the development of scientific literacy assessments. The trend of searching for technology-based scientific literacy

assessment research themes was not found in searches in the last five years from 2019 to 2024. This strengthens the novelty of the research to be carried out. In addition, previous studies that developed science literacy assessments were limited to science literacy tests and did not fully involve the psychomotor and affective domains (Alti et al., 2021; Helendra & Sari, 2021; Marlina, 2023; Muliaman et al., 2022; Patriot & Laksono, 2022). The development of science literacy assessments currently still does not integrate technology (Firda & Suharni, 2022), does not use interactive assessment applications, cannot see feedback from teachers quickly on the results of the assessments carried out and become a reflection for students, and the assessment results are not recorded in one container that can be accessed flexibly and across time. The development of technology-based science literacy assessment applications is highly recommended from several previous studies (She et al., 2018).

The E-LOAD APP product was created as a digital version of an alternative assessment product by assessing students holistically. Not only limited to assessment, the E-LOAD APP also provides teaching materials for sensory systems based on scientific literacy as a support. There is a guide to using the E-LOAD APP application for teachers. The integration of religious moderation indicators is also shown in this application, including tolerance, namely by providing space for others to express beliefs, express opinions, work together, and respect equality. Integrating religious values moderately in the deepening of sensory system material based on scientific literacy. In addition, in the E-LAAS application, reporting on the progress of each individual student is given confidentially in accordance with the principles of good assessment. The purpose of the study was to design and develop the E-LAAS APP (Electronic Alternative Assessment ) product, Evaluate the responses of high school students in grade XI to the results of the E-LAAS APP development, Analyze the influence of the E-LAAS APP (Electronic Alternative Assessment ) towards the science literacy of high school students in grade XI in biology. Other advantages of the E-LAAS Application apart from the technological aspect, accuracy of assessment, speed of thinking, ease of use, also the development of alternative assessment applications based on science literacy. It is expected to help the government's program for quality education in 2045 in accordance with the sustainable development goals of the 4th goal pillar in the field of education by training literacy skills for generation Z students starting from learning biology material in the sensory system.

## METHOD

This research is a research and development with the ADDIE model by Robert Maribe Branch. (Robert Maribe Branch, 2010) which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation. The working procedure can be seen in Figure 1.

The first stage is the analysis stage, researchers identify learning needs and characteristics of students at MAN 2 Bandar Lampung school by distributing science literacy test questions to students, distributing questionnaires to analyze the needs of students and teachers, conducting interviews, and documenting at the pre-research stage. Conducting reference studies, seeking the basis for product development through relevant research,

collecting information related to the types of programs that will be used to develop android-based applications, especially developing alternative electronic assessments involving learning assessment tasks and rubrics , assessment as learning, and assessment for learning, analyzing the needs of teachers and students, analyzing learning outcomes in the curriculum, analyzing the implementation of assessments by teachers during the learning process.

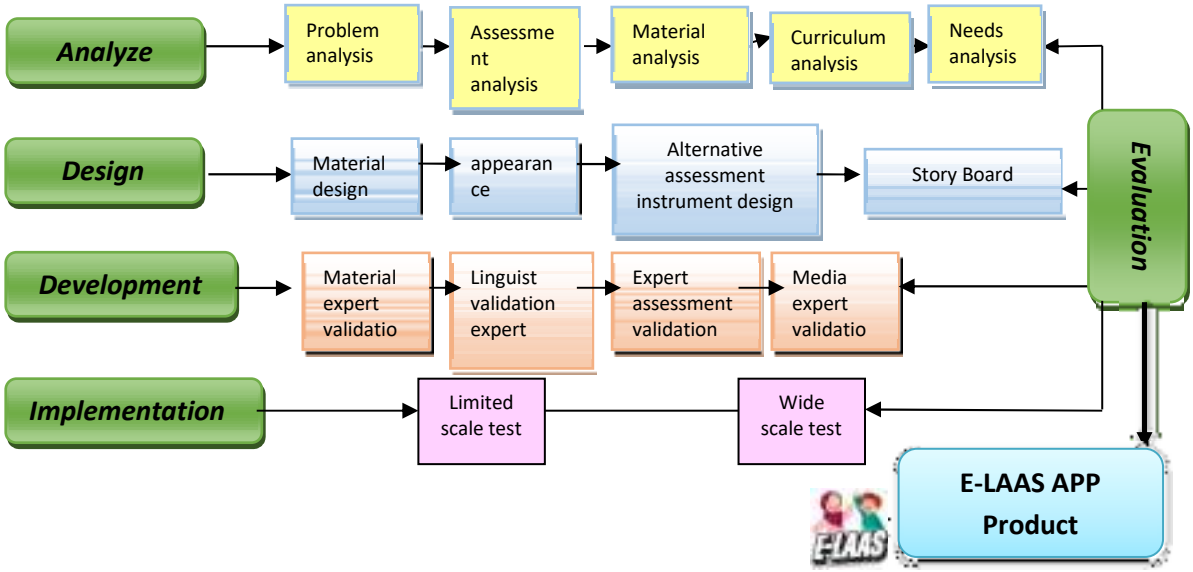


Figure 1. Stages of E-LAAS application development using the addie model

The second stage is the design, including the design of the Alternative Assessment of the E-LAAS Application, considering the type, quality and quantity of alternative assessments that will be substituted into the application, also adjusted to the learning objectives of the Sensory System material, Making a product prototype in the form of a story board product, Looking for references for using the E-LAAS APP product creation program, Making validation instruments for media experts, language experts, material experts, and assessment experts as well as student and teacher response questionnaires.

The third level includes the development of sensory system materials that will be substituted into the E-LAAS APP product by referring to the applicable independent curriculum, mapping the scope of materials according to the Learning Outcomes and Learning Objectives of the sensory system material, determining tasks and alternative assessment rubrics to be used, designing tasks, and preparing follow-up plans. in the form of Student Worksheets for practicums, Student Discussion Sheets, peer assessments, self-assessments , Science Literacy Questions that have been adjusted to the learning objectives of the sensory system material, designing a grid of science literacy questions that will be substituted into the E-LAAS APP learning product and adopting PISA conformity, conducting a review of the products, materials, alternative assessment instruments developed, whether the application can be installed properly according to the specifications of the type of Android Smartphone that is set to approach conformity and can be implemented on a scale of 100% in the early stages. Determining the number, name and expertise of product conformity validators including language, material, media and assessment experts.

The fourth stage of Implementation includes the application of products made for expert testing and school trials. Collecting student and teacher responses at the research location school, by distributing response questionnaires to the E-LAAS APP product. The collection of student and teacher responses was carried out on a limited and large scale. Collecting data on scientific literacy results based on the application of the E-LAAS APP product with questions, to analyze its effectiveness in improving students' scientific literacy.

The fifth level of evaluation includes the implementation of product evaluation and reflection based on all stages of Analysis, Design, Development and implementation at school. Carrying out product revisions. Reflecting on product deficiencies and development stages carried out. Displaying the final product that has gone through the development stages using the ADDIE model and displaying the E-LAAS APP application access link.

Data collection in this study used expert feasibility questionnaires, teacher and student response questionnaires, pre-test and post-test sheets of scientific literacy. All supporting instruments in this study include sensory system teaching materials, student worksheets, student discussion sheets, performance assessment rubrics, self-assessments, peer assessments. All product feasibility questionnaires by experts, response questionnaires, and scientific literacy test questions have previously been validated by expert validators before conducting empirical tests to analyze the main questions in the form of validity tests, reliability tests, discrimination tests, difficulty level tests, and distraction level tests. The research data were analyzed using the feasibility test formula with the E-LAAS APP validity criteria and student responses were determined from the average score obtained from each expert validator, teacher, and student. The data from the expert validation questionnaire were analyzed using the feasibility percentage formula (Sudijono, 2013):

$$\mathbf{P = \frac{S}{N} X\ 100\%}$$

Where the information 'p' is the percentage of the score sought, S is the value obtained, and N is the maximum value. The percentage value obtained from the validation results is then interpreted according to Table 1.

Table 1. Eligibility criteria (Suharsimi, 2009)

| Percentage | Criteria |
|---|---|
| < 21% of total | Less qualified |
| 21% - 40% | Not eligible |
| 21% - 60% | Quite decent |
| 61% - 80% | Meet the requirements |
| 81% - 100% | Very valuable |

E-LAAS Biology based on scientific literacy is declared theoretically feasible if the percentage of feasibility is more than 61%. Then using the same formula to calculate the results of student and teacher responses, which are then interpreted into the attractiveness criteria in Table 2 below. A product is said to be attractive if the percentage of its value is more than 70%.

Table 2. Attractiveness criteria (Carroll & Rosson, 2014; Gee, 2003)

| P Value | Interpretation |
|---|---|
| < 21% of total | Very uninteresting |
| 21% - 40% | Less attractive |
| 21% - 60% | Quite interesting |
| 61% - 80% | Interesting |
| 81% - 100% | Very interesting |

Effectiveness test to determine the effect of E-LAAS Application on increasing science literacy using inferential statistical analysis. Answering the prerequisite test, namely the normality test and the homogeneity test. After the data is known to be normal and homogeneous, an independent t- test is then carried out to determine whether the product developed has an effect on increasing science literacy. To determine the increase in science literacy scores based on the pre-test and post-test using the n-gain score.

## RESULTS AND DISCUSSION

The E-LAAS application development research uses research and development stages with the ADDIE model with five stages. Analysis, Design, Development, Implementation and Evaluation include:

### Analysis Stages

This analysis process involves needs analysis at MAN 2 Bandar Lampung, literature study, and curriculum analysis. The results of the needs analysis indicate that the current assessment of biology learning has several obstacles, such as the lack of holistic assessment from teachers who still focus on cognitive aspects through traditional paper and pencil tests. Alternative assessments and student involvement in assessing themselves and their peers are not optimal, even though this is important in an independent curriculum. Teachers are also limited in the variety of assessment instruments due to lack of knowledge and difficulty adapting learning materials. Summative assessments based on written tests dominate, while assessments of student processes and performance are still limited. Overall, authentic assessments have not been consistently implemented, and students feel the lack of assessments that involve scientific literacy and tend to measure low-level thinking skills. In addition, the use of online tests and special assessment applications has never been felt by students.

Based on this problem, researchers offer an alternative solution for scientific literacy-based assessment in biology subjects presented in digital format, an approach that is very relevant to the characteristics of Generation Z who grow up and interact intensely with digital devices and platforms in everyday life. Generation Z's fluent ability to use digital technology makes digital assessment platforms a familiar and potential medium to increase engagement and the effectiveness of the assessment process. Thus, the use of digital formats in this scientific literacy assessment is in line with Generation Z's preferences and learning habits, so it is expected to optimize research results in improving understanding and application of scientific concepts.

**Design Stages**

The planning or design steps in the research include material planning, assessment planning, media design, and language planning. In planning the scientific literacy question grid by developing the PISA scientific literacy questions (OECD, 2022). Table 4 illustrates the mapping of the PISA scientific literacy dimensions that will be included in the scientific literacy question instrument in the form of 30 multiple-choice questions and 25 validated questions that can be used for students. The scientific literacy test grid for the Indra system material is listed in Table 4.

Table 4. Science literacy test grid for sensory system material
(Hendrawati;, 2011; OECD, 2017, 2022)

| No | Dimensions of Scientific Literacy | Components of Science Literacy | Learning Objectives (TP) | Question Item No |
|---|---|---|---|---|
| 1 | Context of Science | Personal Phenomenon | | |
| 2 | Science Competence (process) | Explaining phenomena scientifically | Analyze scientific statements regarding the relationship between the structure and function of organs in the human sensory organ system. | 1,2,3,4,5 |
| | | Analyzing scientific data and evidence | Plan a scientific investigation to collect data on the effects of lifestyle on abnormalities in the structure and function of sensory system organs in humans. | 6, 7, 8, 9, 10 |
| | | | Interpret data and evidence from scientific investigations regarding the effects of lifestyle on abnormalities in the structure and function of sensory system organs in humans. | 11,12,13,14,15 |
| | | Evaluating and designing scientific investigations | Evaluate conclusions through comparison of the results of human sensory organ system data analysis. | 16,17,18,19,20,21,22,23 |
| | | | Explain the contents of the investigation results in full | Date 24, 25, 26, 27, 28, 29, 30 |
| 3 | Science Content | Explaining knowledge about health and disease in the sensory system | | |

The scientific literacy instruments used in the research according to the grid in Table 4, have gone through the expert validator test stage and empirical tests which include validity tests, reliability tests, differential power tests, difficulty level tests, and distractor level tests, so that 25 questions were declared suitable for use in research.

Next, design an e-assessment design (E-LAAS Application Product), namely the e-assessment developed has the name E-LAAS (Electronic Alternative Assessment) in the form of an application. Using the Times New Roman font in the initial design, where in the application the font and size can be changed. E-LAAS has 2 servers that can be used by teachers and students. The server managed by the teacher can add classes, students, discussion groups and practicums, add or edit materials, self-assessments, peer assessments, assessment rubrics, multiple choice questions, Student Discussion Sheets (LDPD), Student Worksheets (LKPD) and other assignments, add images, videos and links if needed. Teachers can change the font type, font size, right alignment, left alignment and center on each existing menu. Teachers can download and export in Excel every assignment that has been completed by students, and can view and download the results of peer assessments and multiple choice questions for science literacy tests by knowing the values and categories of values generated by students automatically. And teachers can provide written feedback in the form of notes to students during the use of assignments in the sensory system learning process. Meanwhile, language planning includes language that is easy for students to understand according to their level of language understanding and in accordance with PUEBI and EYD.

**Development Stages**

Development of E-LAAS APP product in biology subject by choosing sensory system as important material that will be integrated with science literacy, because sensory system is one of the biology materials that studies physiological processes in the body. The complex human body system can work because of the relationship between millions of cells that form a series of tissues and organs with certain functions. (Siti Robiah et al., 2024) , so this material is very important because it includes studying a person's body holistically, namely the sensory organs that are important for the human body (such as the senses of the eyes, ears, tongue, nose, skin). The integration of scientific literacy motivates students to learn through the phenomena of the sensory system. Learning activities such as discussions, questions and answers, presentations, practicums, and literature studies train decision-making. Assessments that are aligned with learning help teachers provide feedback for improvement. (Black & Wiliam, 1998; Fuadiah et al., 2024; Nancy Frey, 2011; Puteri et al., 2023). The following shows the E-LAAS (electronic alternative assessment application) that was developed.

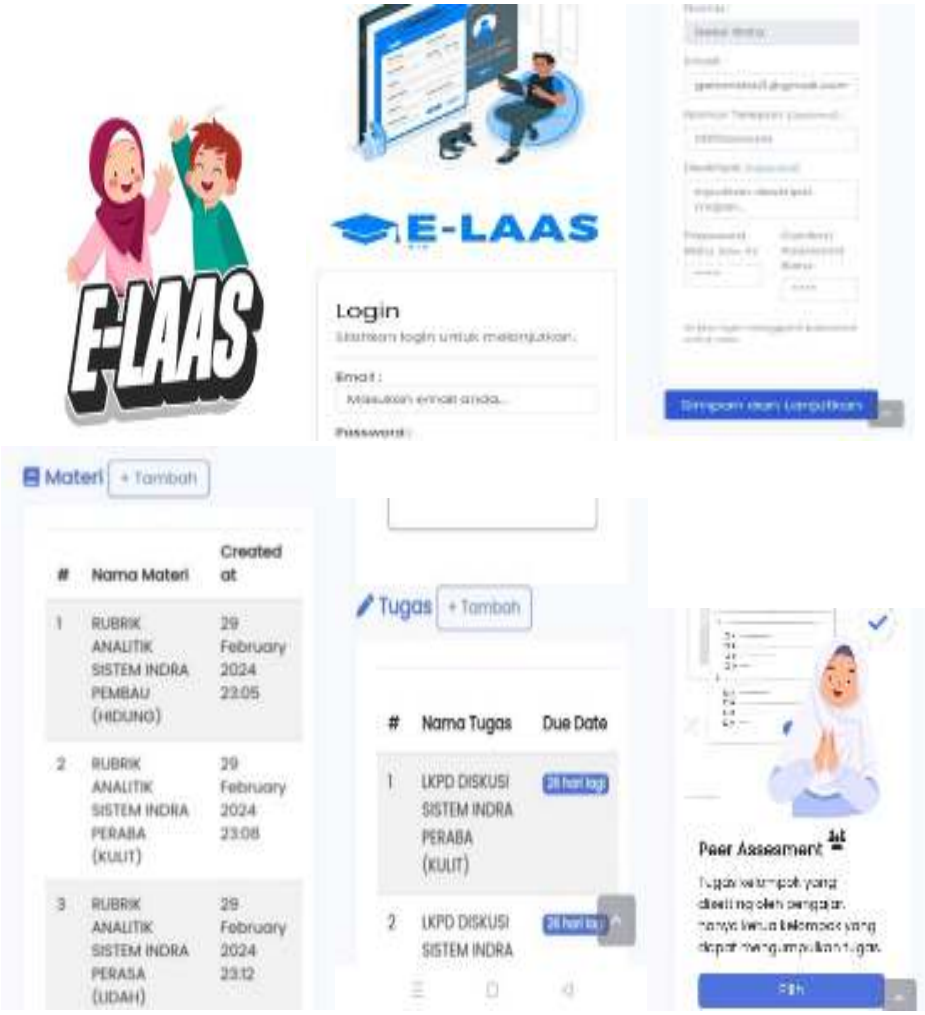


Figure 2. Display of the teacher account E-LAAS application

Based on Figure 2 and Figure 3, it is known that the visualization of the E-LAAS APP prototype can be accessed using a teacher account and a student account. The teacher account can be used by teachers to plan assessments that will be carried out in the learning process that trains scientific literacy. The use of this application is integrated with the stages of biology learning. E-LAAS APP uses performance assessment with dissertation formative assessment components, namely peer assessment, self-assessment, and feedback. Various assessment alternatives in research use process-based performance assessments including LKPD, LDPD, scientific literacy question instruments, sensory system teaching materials. Meanwhile, the assessment rubric used consists of a discussion assessment rubric, practicums designed using an analysis rubric. When students use E-LAAS APP, it will greatly assist the learning process, but must still be under the control of the teacher, so that learning is directed.

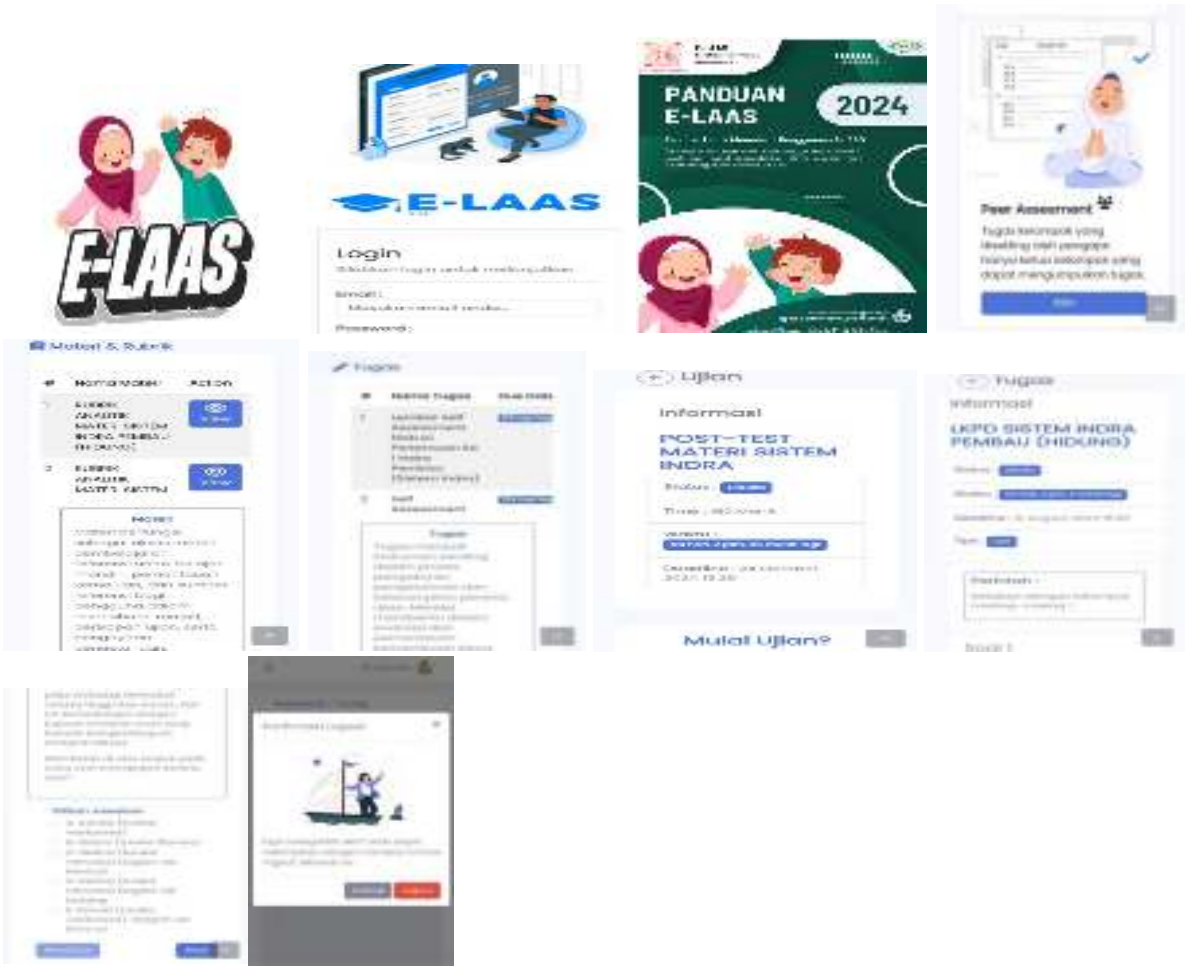


Figure 3. Student account display on e-laas application

The validation results of the E-LAAS APP show a very feasible category as depicted in Figures 4 and 5.

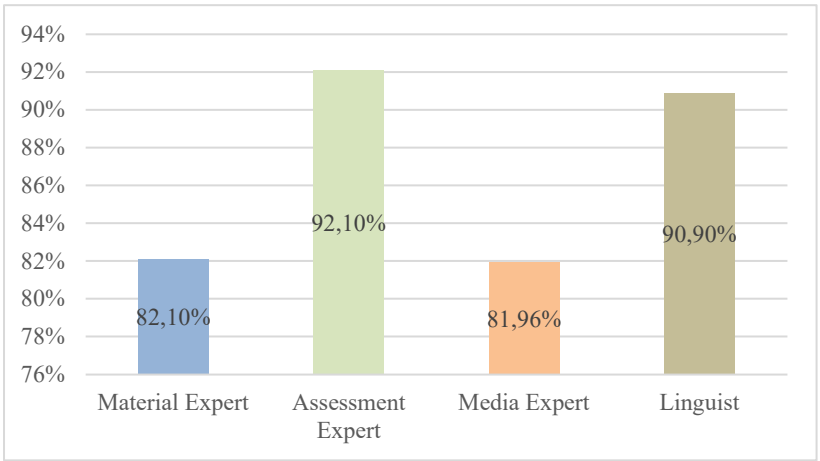


Figure 4. Validation results by experts

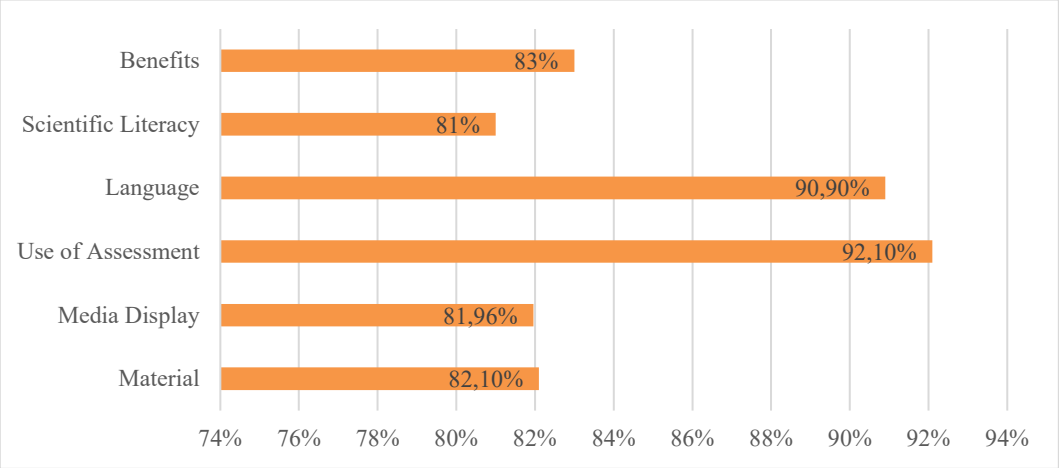


Figure 5. E-LAAS application component validation results

Based on Figure 4, it is known that the E-LAAS Application obtained assessment results from the validator of material, language, assessment and media with very feasible criteria. In more detail, each component of the E-LAAS Application, starting from the usefulness in learning, integration and practice of scientific literacy, use of language, use of assessment, appearance of the E-LAAS Application, and sensory system material obtained an average score of very feasible. This means that based on the results of expert tests and limited scale responses from teachers and students, this product is said to be very relevant in helping to facilitate the implementation of biology learning, with its attractive, flexible, interactive nature, making it easier for students to use assessments, being able to learn to assess peers and conduct self-assessments, to seeing the assessment rubric so that the assessment takes place openly (Wiliam, 2011). In particular, the use of technology in the E-LAAS Application facilitates the use of assessments in learning, trains students to assess their peers more easily using one access, and the appeal of learning with technology makes learning more enjoyable (Ashari et al., 2023; Juhanda et al., 2015; Pursitasari et al., 2022; Sumanik et al., 2024). With the characteristics of generation Z as "digital natives", the E-LAAS Application is able to package learning digitally, training generation Z to access the internet with positive benefits. Scientific literacy that is trained together with learning and closely related to assessment can grow very well based on research findings (Priyambodo & Saputri, 2021; Pujiono, 2021; Sakitri, 2021) . Strengthened by the results of large-scale trials in five learning meetings on the Sensing System material, it is known that the average n-gain score of the Experimental class was 0.81, a high criterion (Hake, 1999), which can be seen in Figure 6. More details regarding the increase in all dimensions of scientific literacy trained during the learning process can be seen in Figure 7.

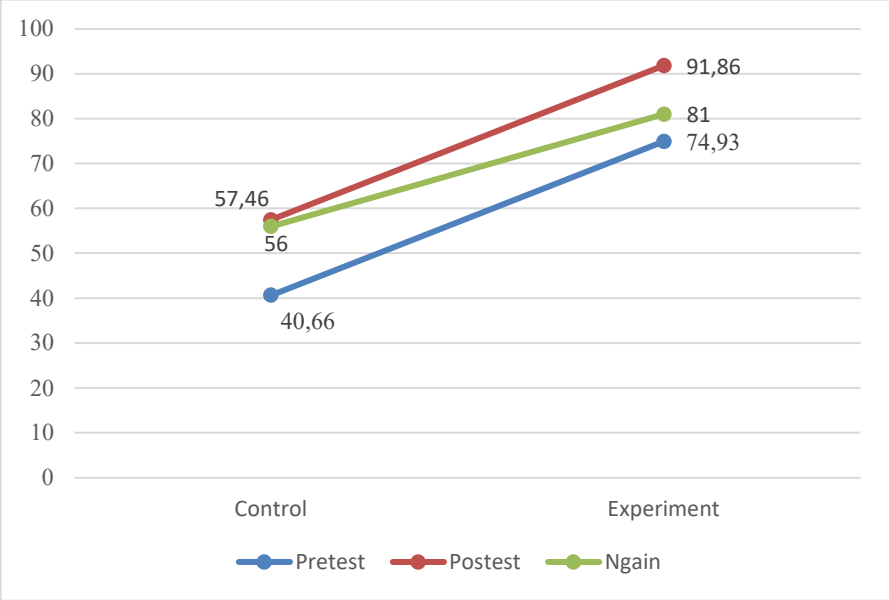


Figure 6. Data from the results of the E-LAAS application product effectiveness test

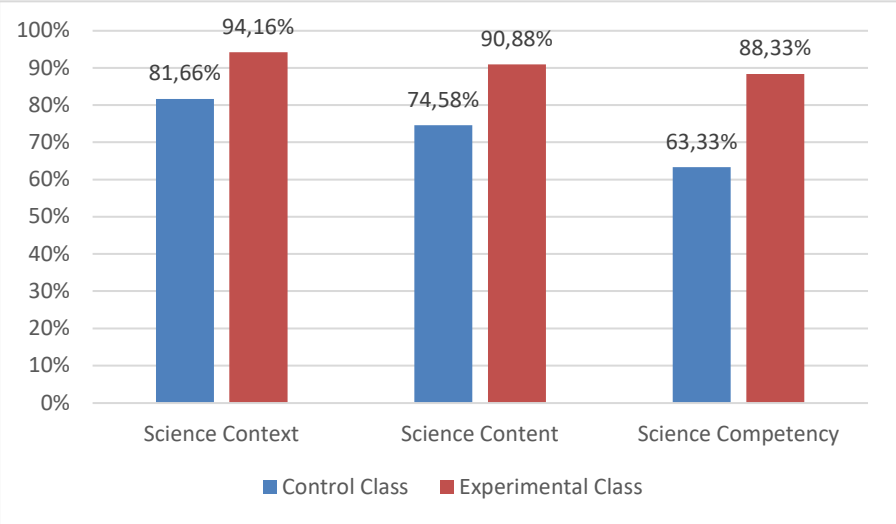


Figure 7. Results of scientific literacy dimension values based on sensory system learning with the E-LAAS application

The research that has been conducted has new findings related to the development of E-LAAS APP, which is an alternative form of technology-based assessment that integrates scientific literacy and involves performance assessment components and formative assessments in the form of peer assessment, self-assessment, and feedback. The E-LAAS APP product integrates performance assessment (discussion, practicum) and formative assessment components (self-assessment, peer assessment, teacher and student feedback) as an alternative assessment in biology learning. This integration is based on Klenowski's (2009) view of assessment as a continuous practice.

The implementation of the E-LAAS APP through large-scale testing has successfully trained teachers and students in carrying out performance assessments well, supported by the fulfillment of prerequisites in the assessment, teacher, student, and context categories

(Kippers et al., 2018; Lee & Coniam, 2013; Nurkamto & Sarosa, 2020). The assessment categories applied include curriculum integration, providing detailed feedback (McMillan, 2024; Roberts, 2006), integration with learning (monitoring, feedback, correction), and teacher understanding of the assessment concept.

The use of integrated performance assessments in the E-LAAS APP has proven to be relevant for various levels of education (Nurkamto & Sarosa, 2020) and is in accordance with the trend of implementing formative assessments in independent curricula (Mulyana, 2022). The integration of alternative assessments, especially performance assessments through the E-LAAS APP, has a positive impact on improving the quality of learning (Wiliam, 2015) and students' scientific literacy. Thus, the E-LAAS APP has proven to be effective as a technology-based assessment innovation that can train scientific literacy in biology learning, has the potential to improve students' 21st century skills and contributes to improving Indonesia's PISA scientific literacy scores.

The effectiveness of the E-LAAS APP product has been proven to be able to improve and train scientific literacy, also proven that the class showed n-gain results analyzed using an independent t-test to answer the research hypothesis proven to improve. This shows that the development of the E-LAAS APP product can be accepted as an Electronic Alternative Assessment innovation in biology learning that trains scientific literacy with the results of teacher and student responses who answered the questionnaire that the E-LAAS APP product has very good appeal. E-LAAS APP can be accessed via the product's Instagram. The video tutorial link for using the E-LAAS APP can be accessed on the youtube link. The E-LAAS APP download link is on google drive. E-LAAS APP Web Link. In principle, the use of assessments that can improve the quality of student learning must still be accompanied by learning approaches/strategies/models/methods that can foster scientific literacy. Holistically (Alti et al., 2021; Andhani et al., 2022; Anditha et al., 2024; Hanifah & Hamid, 2021; I'anatul Azizah et al., 2023; Jeramat et al ., 2024; Juhanda et al., 2015; Sumanik et al., 2024; wilhelminari Br Saragih; Natalia Sihombing, 2021) . The E-LAAS application is used as a solution so that Generation Z can use smartphones and internet access wisely, so that it can reduce the negative impact of internet use by increasing the positive impact of using technology-based assessments in learning. The use of electronic assessment instruments can also train students' skills in using electronic devices, surfing the internet, and being skilled at accessing electronic assessment applications and websites. Students are required to be skilled in using electronic devices in learning and using assessments, because the 21st century is closely related to the era of technology that can be used online and offline. This is evident from the good benefits of distance learning during the pandemic (Andhani et al., 2022; Maryanti et al., 2022), inevitably teachers and students are required to be able to operate technology-based learning devices, therefore along with the increasing digital literacy of the Indonesian people today (Citra & Dedi, 2021) . The use of alternative electronic assessments makes it easier for students and teachers to carry out more effective assessments. Researchers are optimistic that the use of the E-LAAS Application will run effectively and efficiently and can be utilized by teachers and students in 21st century learning.

## CONCLUSION

Based on the results of the research and data processing that has been done, it is known that the development of E-LAAS APP uses five stages of the ADDIE model (analysis, design, development, implementation, evaluation) using alternative assessments in the form of performance assessment, peer assessment, self-assessment, and feedback integrated with good science literacy in use tasks, assessment rubrics, and science literacy tests. The results of the assessment of the material validator, language validator, media validator, and assessment validator indicate that the E-LAAS APP product is very feasible to use, as well as the results of the effectiveness of the E-LAAS APP product are met based on the results of the independent t- test . It is known that the use of E-LAAS APP in learning sensory system material can improve students' science literacy as evidenced by the average n-gain value of 0.81 with high criteria compared to classes using traditional assessments ( paper and pencil test ) with n-gain 0.56 in moderate criteria.

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