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Performance Assessment in Biology Learning: A Study of Implementation in Senior High Schools Implementing the 2013 Curriculum

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ABSTRACT

Purpose of the study: This study aims to describe the use of performance assessment in biology learning implemented by biology teachers in public senior high schools applying the 2013 Curriculum in South Tangerang. The study specifically seeks to identify teachers' understanding, assessment practices, and the implementation of performance assessment across learning activities.

Methodology: Descriptive research with survey method; questionnaire, interview guide, observation sheet of lesson plans, and documentation analysis; purposive sampling; respondents were six biology teachers from four public senior high schools in South Tangerang; instrument validation through expert judgment; descriptive statistical analysis using percentage calculation and data reduction-display-verification techniques; Microsoft Excel for data tabulation.

Main Findings: The findings showed that biology teachers generally understood the basic concept of performance assessment, although understanding of its characteristics was still limited. Observation was dominant for attitude assessment, written tests for knowledge assessment, and performance tasks for skills assessment. Performance assessment had been implemented in biology learning, but its application was not yet fully optimal across all competency domains.

Novelty/Originality of this study: This study provides an empirical description of biology teachers' use of performance assessment within the context of the 2013 Curriculum implementation in South Tangerang public senior high schools. It offers specific evidence on teachers' understanding, assessment patterns, and implementation challenges, contributing practical insights for improving authentic assessment practices in biology education.

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1. INTRODUCTION

Education is a fundamental aspect in developing quality human resources, particularly in facing the challenges of scientific and technological developments in the 21st century [1], [2]. Indonesia's education system continues to undergo reforms, one of which is through the implementation of the 2013 Curriculum, which

emphasizes the integrated development of attitudes, knowledge, and skills [3], [4]. This curriculum is designed to produce students who possess not only academic abilities but also critical, creative, collaborative, and communicative thinking skills. In its implementation, the learning process is required to utilize a scientific approach that encourages students to actively observe, question, experiment, reason, and communicate learning outcomes [5], [6]. Therefore, the assessment system implemented must also be able to measure competency achievement comprehensively in accordance with the characteristics of the 2013 Curriculum.

Assessment in the 2013 Curriculum emphasizes the use of authentic assessments that provide a realistic picture of student abilities [7], [8]. Authentic assessment is a comprehensive process of gathering information to assess student input, process, and learning outcomes [9], [10]. One relevant form of authentic assessment is performance assessment. This assessment requires students to demonstrate their abilities through real-world tasks that reflect the application of knowledge and skills in a learning context. Therefore, performance assessment is an important instrument in evaluating students' science process skills and application abilities [11], [12].

Biology learning, as part of the natural sciences, is characterized by an emphasis on mastery of concepts and scientific process skills [13], [14]. In biology learning, students are required to conduct observations, experiments, analyze data, and draw conclusions based on empirical evidence. These activities require an assessment system that focuses not only on the final result, in the form of written answers, but also on the process and performance of students throughout the learning process [15], [16]. Performance assessment is considered highly appropriate for use in biology learning because it can assess students' practical skills, scientific thinking skills, and scientific communication skills [17], [18]. Through this assessment, teachers can obtain a more comprehensive picture of students' actual competencies.

Although performance assessment is highly relevant in biology learning based on the 2013 Curriculum, its implementation in schools still faces various challenges. Many teachers struggle to design performance assessment instruments that are valid, reliable, and aligned with competency indicators [19], [20]. Furthermore, limited learning time, large student populations, and administrative burdens often hinder the implementation of these assessments [21], [22]. Some teachers also tend to prefer conventional assessments, such as written tests, as they are considered more practical and efficient [23], [24]. This situation has the potential to prevent the 2013 Curriculum's goal of authentically assessing student skills from being optimally achieved.

Several previous studies have discussed the implementation of performance assessment in various subjects and demonstrated that it can improve critical thinking skills, problem-solving abilities, and student learning motivation [25], [26]. However, most of this research focuses on the development of assessment instruments or the impact of performance assessment implementation on learning outcomes. Research specifically capturing the practice of using performance assessment by biology teachers in high schools implementing the 2013 Curriculum is still relatively limited. Furthermore, empirical studies describing the actual implementation of performance assessment at the educational unit level, particularly in South Tangerang City, are scarce. This limitation indicates a research gap that requires further attention.

The research gap analysis indicates that there is still a discrepancy between the policy demands of the 2013 Curriculum and the reality of assessment implementation in the field. The novelty of this research lies in its focus, which specifically explores the use of performance assessment by biology teachers in public high schools implementing the 2013 Curriculum in South Tangerang City. This research not only examines conceptual aspects but also captures actual practices, obstacles, and teacher strategies in implementing performance assessment. The urgency of this research is heightened given that the successful implementation of the 2013 Curriculum is crucially determined by the quality of the assessment system used in learning. The research results are expected to provide empirical information useful for evaluating and improving the implementation of authentic assessment in schools.

A comprehensive understanding of the use of performance assessment by biology teachers is crucial to supporting improvements in the quality of learning and assessment in schools. The information obtained from this research can inform policymakers in designing more targeted training or mentoring for teachers. Furthermore, the research findings can serve as a reference for teachers in developing more effective assessment practices in accordance with the requirements of the 2013 Curriculum. By providing a concrete picture of performance assessment implementation, it is hoped that obstacles encountered can be identified and systematically addressed. Therefore, the primary objective of this research is to obtain an overview of the use of performance assessment by biology teachers in public high schools that have implemented the 2013 Curriculum in South Tangerang City.

2. RESEARCH METHOD

2.1. Place and Time of Research

This research was conducted at four public senior high schools in South Tangerang City that had implemented the 2013 Curriculum in their learning processes. The research was conducted during the learning

period of the current academic year at the time of the research. The research activities took place over two months in stages, starting in May and ending in June. This time span was used to conduct all stages of the research, from preparation to data collection in the field. The timing of the research was adjusted to the school's academic schedule to ensure optimal research processes.

2.2. Type of Research

This study uses a descriptive approach. This study uses a descriptive approach with a survey method. The descriptive approach aims to describe conditions or phenomena that occur in the field objectively according to the actual situation without giving any particular treatment to the research object [27]. Meanwhile, the survey method is used to collect data systematically through questionnaires, interviews, and other relevant instruments. The selection of this method is based on its suitability to gather information regarding the use of performance assessment in biology learning. This study aims to obtain an overview of the use of performance assessment in tenth-grade biology learning at a State Senior High School in South Tangerang City that has implemented the 2013 Curriculum.

2.3. Research Population and Sample

The population of this study included all public and private senior high schools in South Tangerang City. The sample was selected using a purposive sampling technique, with the criteria being that schools had implemented the 2013 Curriculum. Based on data from the Department of Education, ten schools met these criteria, consisting of five public senior high schools and five private senior high schools. The study focused on public senior high schools due to ease of access and research administration. Of the five public schools, four schools agreed to be the research location, with six tenth-grade biology teachers as respondents.

2.4. Research Instruments

This study used non-test instruments including questionnaires, observation sheets, interviews, and documentation to obtain data regarding the use of performance assessment in biology learning. The questionnaire was used as the primary instrument to explore teachers' understanding of the concepts, types, and application of performance assessment in the domains of attitudes, knowledge, and skills [28], [29]. The observation sheets were used to examine the suitability of the Learning Implementation Plan with the demands of the 2013 Curriculum, particularly in the assessment aspect. Semi-structured interviews were conducted with biology teachers and school principals to obtain more in-depth information. All instruments have been validated and used in an integrated manner to support data triangulation, resulting in more accurate and comprehensive research results.

2.5. Data Collection Techniques

Data collection in this study used non-test techniques in the form of questionnaires, observation, documentation, and interviews [30], [31]. The data collection process was carried out in three stages: preparation, implementation, and the final stage. In the preparation stage, the researcher developed and validated the research instrument through feasibility tests and consultations with experts. The implementation stage included identifying schools implementing the 2013 Curriculum, distributing questionnaires, observing Lesson Plan documents, collecting documentation, and interviewing teachers and principals. Next, all data was analyzed, integrated, and systematically described to obtain an overview of the use of performance assessment in biology learning.

2.6. Data Analysis Techniques

The data analysis in this study used descriptive statistics to systematically describe the use of performance assessment in biology learning. The analysis process was carried out through the stages of data reduction, data presentation, percentage calculation, analysis of teacher understanding levels, and calculation of the average use of performance assessment [32], [33]. Questionnaire data were analyzed in percentage form to determine the tendency of respondents' answers, while observation results were analyzed based on the fulfillment of indicators in the Lesson Implementation Plan. All data were then verified through comparisons between instruments to obtain consistent findings. The final results are presented descriptively to answer the research question regarding the use of performance assessment by biology teachers in State Senior High Schools in South Tangerang City.

3. RESULTS AND DISCUSSION

The results and discussion in this study are divided into three parts, namely data from the questionnaire results on respondents or target schools for the 2013 Curriculum, analysis of the Learning Implementation Plan instrument and discussion.

3.1. Results of the Assessment Questionnaire

3.1.1. Point A Attitude Assessment

Regarding attitude assessment, the research instrument included two questions aimed to determine teachers' understanding of attitude assessment and the techniques used in its implementation. The responses to the first question indicated that all respondents understood the concept of attitude assessment as a crucial component of the 2013 Curriculum. This finding indicates that teachers possess adequate basic knowledge regarding the importance of attitude assessment in the learning process. This understanding serves as a foundation for teachers in selecting assessment techniques appropriate to the characteristics of biology learning. Therefore, all respondents were deemed to be aware of the urgency of implementing attitude assessment in schools.

The second question asked respondents to select the type of attitude assessment technique used in the learning process. The analysis revealed that behavioral observation was the most dominant choice used by teachers. Five out of six respondents chose this technique as their primary method for assessing student attitudes. The predominant use of behavioral observation indicates that teachers tend to directly observe student behavior during the learning process. This technique is considered effective because it allows teachers to obtain authentic information about student attitudes in real-life learning situations.

The use of behavioral observation aligns with the characteristics of authentic assessment in the 2013 Curriculum, which emphasizes observation of actual student behavior. Through this technique, teachers can assess various attitudinal indicators, such as honesty, responsibility, hard work, thoroughness, discipline, and the ability to work together. Observations are usually conducted continuously throughout the learning process and recorded on a pre-prepared observation sheet. The results of these observations then serve as the basis for assessing students' attitudes. Thus, behavioral observation is a practical and relevant instrument for assessing student attitudinal development.

In addition to behavioral observation, other widely used assessment techniques are self-assessment and peer assessment. These two techniques were chosen by the majority of respondents after behavioral observation. Self-assessment provides students with an opportunity to reflect on their own attitudes and behavior during learning. Meanwhile, peer assessment allows students to assess their peers' behavior based on classroom interactions. Both techniques can support assessment objectivity when used appropriately and accompanied by clear assessment guidelines.

Another technique used by respondents is direct questioning, although it is used less frequently than behavioral observation and self-assessment. This technique involves verbally asking students questions about their attitudes or responses to a learning situation. Self-reports and teacher journals were the least frequently used techniques by respondents. The low use of these two techniques is thought to be related to the time requirements and the relatively high consistency of recording. This situation indicates that teachers tend to choose assessment techniques that are more practical and easy to implement in daily learning.

The results of this questionnaire are supported by findings in the Lesson Implementation Plan documents analyzed. In these documents, most teachers attached an attitude observation sheet as part of the assessment tool. The presence of this instrument indicates a congruence between respondents' answers and their established learning administration practices. This confirms that behavioral observation is truly applied in the learning process, not merely understood theoretically. Thus, the questionnaire data and documentation support each other in demonstrating the patterns of attitude assessment use by teachers.

The variation in answer choices among respondents indicates differences in the level of utilization of attitude assessment techniques. Some teachers used only one assessment technique, while others implemented a combination of several techniques. One respondent even added an assessment technique based on input from other teachers as an additional form of assessment. This variation indicates flexibility in implementing attitude assessment according to each teacher's own policies and creativity. Overall, it can be concluded that behavioral observation is the most dominant method used by biology teachers to assess student attitudes in learning based on the 2013 Curriculum.

3.1.2. Point B Knowledge Assessment

Regarding knowledge assessment, the research instrument included two questions aimed to determine teachers' understanding of the concept of knowledge assessment and the evaluation techniques used in biology learning. The results of the first question indicated that all respondents understood the concept of knowledge assessment as a key component of the 2013 Curriculum assessment system. This finding indicates that teachers possess basic knowledge regarding the importance of evaluating students' conceptual mastery. This knowledge serves as the basis for teachers in selecting appropriate instruments to measure student learning outcomes. Therefore, all respondents were deemed to have an adequate understanding of knowledge assessment.

The results of the second question indicated that written tests were the most dominant knowledge assessment technique used by all respondents. All teachers chose written tests as the primary instrument for assessing student mastery of the material, achieving the highest percentage. This situation indicates that written

tests remain the primary choice in biology learning evaluation practices in schools. The use of written tests is considered practical because it allows teachers to systematically and efficiently measure student understanding. Furthermore, written tests are easier to administer and analyze than other forms of assessment.

The dominant use of written tests is understandable, as this form of evaluation has long been used in the formal education system. Written tests can be structured in various formats, such as multiple-choice, short answer questions, and essays. In biology learning, written tests are generally used to measure students' conceptual mastery, theoretical understanding, and analytical skills regarding the material they have learned. The results of this study are supported by the Learning Implementation Plan document, which shows that all respondents included written test instruments in their learning materials. This finding indicates a congruence between questionnaire responses and teachers' learning administration practices.

In addition to written tests, several other techniques were also used by respondents to assess student knowledge. Enrichment and assignment techniques ranked next with a relatively high level of use. Enrichment is usually given to students who have achieved basic competencies as a form of deepening the material. Meanwhile, assignments are used to measure student understanding through individual or group completion. These two techniques indicate that some teachers have developed a variety of assessments to complement written test-based evaluations.

Oral tests, projects, and portfolios were also found in respondents' responses, although their use was relatively lower. The use of these techniques indicates some teachers' efforts to implement a more varied knowledge assessment. However, some respondents also chose assessment types that are conceptually more appropriate for the skills domain, such as performance and product assessment. These findings indicate that some teachers are still unable to accurately distinguish the assessment characteristics for each competency domain. This situation demonstrates the need to strengthen teachers' understanding of the classification of assessment methods according to the requirements of the 2013 Curriculum.

The variation in answers among respondents indicates differences in the level of understanding in selecting knowledge assessment techniques. Some teachers selected only a few appropriate techniques, while others chose more alternatives, including techniques less relevant to the knowledge domain. The absence of respondents providing additional answers to the open-ended questions indicates that teachers tend to rely on formally recognized assessment techniques. This situation suggests that innovation in the use of knowledge assessment techniques is still relatively limited. Thus, although teachers' basic understanding is good, deeper conceptual understanding still needs to be improved.

Overall, the results of the study indicate that written tests are the most dominant technique used by biology teachers to assess student knowledge. This dominance reflects teachers' tendency to use instruments that are practical, measurable, and easy to implement in daily learning. However, the presence of inaccurate answers among some respondents indicates the need to improve teachers' understanding of the assessment characteristics for each competency domain. Training and mentoring on authentic assessment are essential to strengthen teachers' ability to select appropriate evaluation techniques. Thus, the quality of knowledge assessment implementation can be more optimal according to the demands of the 2013 Curriculum.

3.1.3. Point C Skills Assessment

Regarding skills assessment, the research instrument also consisted of two questions aimed to determine teachers' understanding of the concept of skills assessment and the techniques used in its implementation. The results of the first question indicated that all respondents understood the concept of skills assessment as a crucial part of the 2013 Curriculum evaluation system. This finding indicates that teachers recognize the importance of assessing students' practical abilities and application of knowledge in biology learning. This knowledge serves as the basis for teachers in selecting assessment techniques relevant to the characteristics of biology material. Therefore, all respondents were deemed to have understood the basic concepts of skills assessment.

In the second question, the analysis results indicated that performance assessment was the technique most frequently chosen by respondents. Most teachers chose this technique as the primary instrument for assessing student skills in biology learning. The high use of performance assessment indicates that teachers consider this technique most appropriate for measuring students' practical abilities. In the context of biology learning, performance assessment allows students to directly demonstrate their skills through practical activities and demonstrations. Therefore, this technique is considered capable of authentically representing student skill achievement.

The use of performance assessment is highly relevant to the characteristics of biology learning, which emphasizes scientific activities and laboratory practice. Through this technique, teachers can assess students' skills in conducting observations, using laboratory equipment, conducting experiments, recording observation results, and drawing scientific conclusions. Assessments are based on specific indicators formulated in an assessment rubric. The results of this study were reinforced by the discovery of performance assessment sheets in learning documents collected from respondents. This indicates that performance assessment is truly implemented in the learning process, not merely understood theoretically.

In addition to performance assessment, several other techniques were also frequently used by respondents. Assignments, projects, and products ranked next in terms of usage. Assignments are typically given in the form of practical tasks or observation reports. Project assessments are used to assess students' ability to complete investigative tasks within a specified timeframe. Meanwhile, product assessments are used to assess students' work as a form of application of learned skills.

However, the results also showed that some respondents chose assessment techniques that are actually more appropriate for the knowledge domain, such as written and oral tests. This finding suggests that some teachers still do not fully understand the conceptual boundaries between knowledge and skills assessment. This situation indicates the potential for errors in the selection of assessment instruments. If left unaddressed, this could impact the accuracy of student competency measurement. Therefore, improving teachers' understanding of the characteristics of each assessment domain is crucial.

The variation in answers among respondents indicates differences in teachers' levels of mastery in implementing skills assessment. Some teachers use a diverse combination of techniques, while others rely on only one or two. The absence of additional open-ended answers indicates that teachers generally use techniques outlined in formal guidelines. This situation suggests that creativity in developing skills assessment methods can still be improved. This variation also reflects differences in experience and understanding among teachers in implementing the 2013 Curriculum.

Overall, the research results indicate that performance assessment is the most dominant technique used by biology teachers to assess student skills. This dominance indicates a match between the characteristics of biology learning and the assessment techniques used. However, the continued presence of errors in selecting certain assessment methods suggests the need to strengthen teachers' competency in understanding the concept of authentic evaluation. More intensive training on the application of skills assessment could help improve the quality of assessment implementation in schools. Thus, assessment of skills in biology learning can be carried out more precisely, effectively, and in accordance with the demands of the 2013 Curriculum.

3.2. Results of the Performance Assessment Knowledge Questionnaire

This questionnaire aims to determine the understanding of biology teachers, especially grade 10, regarding Performance Assessment. This questionnaire consists of four main questions. The results of the answers to the first question indicate that all respondents are aware of performance assessment. The second question contains questions about the definition of performance assessment. The results of the second question indicate that most respondents have a good understanding of the definition of performance assessment. The third question contains questions about the characteristics of performance assessment. The results of the third question indicate that most respondents do not understand the characteristics of performance assessment well. The following table presents the results of respondents' answers for numbers 2 and 3.

Table 1. Respondents' Answers to the Performance Assessment Knowledge Questionnaire Numbers 2 and 3

No	Indicators	Criteria	n	%
2	Understanding Performance Assessment	Good	5	83
		Fair	1	17
		Poor	0	0
3	Characteristics of Performance Assessment	Good	2	33
		Fair	2	33
		Poor	2	33

Based on Table 1 above, it can be seen that for question number 2 concerning the definition of Performance Assessment, most respondents answered the question correctly. Question number 2 regarding the definition of Performance Assessment received a good answer criteria, namely five out of six respondents who answered according to the answer rubric, resulting in a percentage of 83%. This means that the majority of respondents, in this case teachers, understand the definition of Performance Assessment. For question number three concerning the characteristics of Performance Assessment, the results obtained were evenly distributed between the criteria of good, average, and poor. Answers with the criteria of good, average, and poor all obtained a percentage of 33% with the same number of voters, namely two respondents for each criterion. This indicates that teachers still lack understanding regarding the characteristics of Performance Assessment. The results of the fourth question indicate that most respondents know about discussion assessment compared to other types of assessment. And the results of the descriptive answers for the related assessment types show that most respondents answered with the highest score for the discussion type of assessment. The following Table 2 presents the results of respondents' answers to question number 4.

Table 2. Respondents' Answers to the Performance Assessment Knowledge Questionnaire Number 4

No	Types of Performance Assessment	n	%
1	Observation	4	67
2	Interview	4	67
3	Portfolio	4	67
4	Essay Assessment	4	67
5	Practical Exam	4	67
6	Paper	4	67
7	Project Assessment	4	67
8	Product Assessment	4	67
9	Questionnaire	4	67
10	Checklist	3	50
11	Peer Assessment	3	50
12	Discussion Assessment	5	83
13	Scientific Journal Assessment	4	67

Based on Table 2 above, it can be concluded that discussion assessment is the type of Performance Assessment most widely recognized by respondents. This is evidenced by the percentage of discussion assessments obtained by 83%. Observation, interviews, portfolios, essay assessments, practical examinations, papers, project assessments, product assessments, questionnaires, and scientific work journal assessments obtained a percentage of 67%, or the equivalent of 4 teachers/respondents who answered the question. Checklist and peer rating assessments obtained a percentage of 50%, or the equivalent of 3 teachers/respondents who chose these types of Performance Assessments. The next question asked teachers/respondents to write an explanation regarding the types of Performance Assessments that were answered in question number 4. The results of the descriptive answers for the types of Performance Assessments (starting from numbers 5 to 17) starting from numbers 5 to 17 are presented in the table below. Of the 13 types of Performance Assessment, the one that obtained the highest percentage was discussion assessment (score 3, percentage 83%) with the number of respondents who chose 5 out of 6 teachers/respondents. There was only one respondent who did not answer this type of assessment. The second order with a percentage of 67% score 3, obtained the type of interview assessment, project assessment and product assessment with the number of respondents who chose 4 out of 6 teachers/respondents. The third order with a percentage of 50% obtained the type of assessment observation, portfolio, practical examination, questionnaire and peer rating. All assessment types received a score of 3, except for peer assessment, which received a score of 2 at 50%. Essay assessment ranked fourth with a score of 2, checklist assessment with a score of 1, and scientific journal assessment with a score of 1. Observation assessment ranked fifth with a score of 1, portfolio assessment with a score of 1, essay assessment with a score of 2 and 1, practical examination assessment with a score of 1, paper assessment with a score of 3 and 1, questionnaire assessment with a score of 1, checklist assessment with a score of 3, and scientific journal assessment with a score of 3 and 2.

Discussion assessment ranked first, indicating that it was the assessment type answered correctly by the majority of respondents. This indicates that most respondents clearly understood the discussion assessment type compared to other assessment types. While the author hopes that respondents can understand more clearly the types of performance assessments, projects, products and so on that are included in the skills assessment in the 2013 Curriculum. The reason the author obtained in the field was that the 2013 Curriculum is still in the trial phase or transitional phase from the implementation of the previous curriculum, namely KTSP. Because it is still in the transition phase, the process of implementing it has not been fully realized. For example, the availability of books, the very many assessment formats and even the uneven training for teachers in schools selected for the implementation of the 2013 curriculum. These obstacles make it possible that the type of Performance Assessment is not yet fully understood by teachers.

3.3. Results of the Performance Assessment Usage Questionnaire

The questionnaire results showed that all biology teachers were familiar with the concept of performance assessment as part of the assessment system in the 2013 Curriculum. Most respondents had a good understanding of the concept of performance assessment, although some teachers did not fully grasp its main features and characteristics. This indicates that teachers' conceptual understanding of performance assessment is quite good, but still requires strengthening in the technical implementation aspects. In the domain of attitude assessment, the most dominant technique used by teachers was behavioral observation. This technique was chosen because it is considered effective for directly assessing student attitudes during the learning process. In addition to behavioral observation, some teachers also used self-assessment, peer assessment, and direct questioning as supporting methods in assessing student attitudes.

In the domain of knowledge assessment, all respondents used written tests as the primary instrument. Written tests are considered the most practical and easy-to-implement technique for measuring student conceptual understanding. Some teachers also supplemented assessment with assignments, enrichment, oral tests, and projects. However, inaccuracies were still found in the selection of some assessment techniques, indicating that some teachers did not fully understand the classification of assessments based on competency domains. In the domain of skills assessment, performance assessment was the technique most frequently used by respondents. The use of this technique is considered appropriate for the characteristics of biology learning, which involves extensive practical activities and skill demonstrations. In addition to performance, teachers also implement project, product, and portfolio assessments as a form of student skill evaluation.

In general, the questionnaire results indicate that biology teachers have implemented performance assessment in their teaching, particularly in the skills and attitudes aspects. However, implementation is not yet fully optimal due to differences in teachers' understanding of selecting and developing appropriate assessment techniques. This finding indicates the need for improved understanding and further training to ensure the use of performance assessment can be implemented more appropriately, in accordance with the requirements of the 2013 Curriculum.

The discussion can be viewed from the perspective of teacher readiness to implement the authentic assessment system required by the 2013 Curriculum. Implementing performance assessment requires not only conceptual understanding but also technical skills in designing indicators, developing rubrics, and conducting assessments objectively and consistently. In the context of biology learning, the complexity of the material, which involves numerous practical activities and observations, requires teachers to possess adequate evaluative competencies so that the assessments conducted truly represent students' skill achievements. This situation indicates that the successful implementation of performance assessment is highly dependent on teachers' assessment literacy.

Theoretically, performance assessment is an integral part of authentic assessment, designed to assess students' abilities in real-life situations. In biology learning, this approach is particularly relevant because the subject emphasizes science process skills, such as observing, classifying, interpreting data, and drawing conclusions based on empirical evidence. When implemented optimally, performance assessment can provide a more comprehensive picture of student competencies than conventional assessments, which tend to only measure cognitive aspects. This aligns with the 21st-century learning paradigm, which demands the development of critical thinking, problem-solving, and collaboration skills [34], [35].

However, the implementation of performance assessments often faces various practical challenges in the school environment. High administrative burdens, limited learning time, and large student populations can impact the quality of assessments [36], [37]. Teachers are often forced to balance administrative demands with pedagogical needs in the classroom. In such situations, choosing assessment methods deemed more efficient becomes an unavoidable tendency. Therefore, institutional support from schools is a crucial factor in creating an evaluation ecosystem that enables teachers to implement authentic assessments to their full potential.

Beyond technical factors, teacher professional development is also a crucial consideration. Ongoing training should focus not only on understanding curriculum policies but also on developing practical instruments and implementing strategies in the classroom. Mentoring through teacher learning communities or Subject Teacher Consultation forums can be an effective alternative to increase teachers' capacity in designing valid and reliable performance assessments [38], [39]. Through this collaboration, teachers can share experiences, discuss challenges, and develop assessment innovations that better align with the characteristics of biology learning.

The implications of this research demonstrate the need for an evaluation of the support system for the implementation of the 2013 Curriculum, particularly in the assessment aspect. The success of a curriculum is determined not only by the completeness of learning materials, but also by the quality of evaluation conducted by teachers in the classroom. With strengthened assessment competencies and more applicable policy support, performance assessment has the potential to become an effective instrument for improving the quality of biology learning [11], [40]. Ultimately, the appropriate implementation of assessment will contribute to a more meaningful learning process oriented toward developing students' holistic competencies.

This research makes an important contribution to the development of biology learning evaluation practices at the senior high school level, particularly in the context of implementing the 2013 Curriculum. The findings can serve as a basis for schools and educational policymakers to design programs to improve teacher competency in authentic assessment. Furthermore, the results provide an empirical overview of the actual implementation of performance assessment in schools, which can be used as evaluation material in developing more targeted teacher mentoring and training policies. For teachers, this research can serve as a professional reflection to improve the quality of assessment planning and implementation to better align with the demands of competency-based learning. More broadly, optimizing performance assessment has the potential to improve the quality of biology learning through a more comprehensive assessment of student abilities, including attitudes, knowledge, and skills.

This study has several limitations that should be considered when interpreting the results. First, the relatively limited number of respondents, involving only biology teachers from a few public schools in one specific region, means that the results cannot be broadly generalized to all senior high schools in Indonesia. Second, this study used a descriptive approach that focused on mapping the conditions of performance assessment implementation without conducting an in-depth analysis of the causal relationship between teacher understanding and the quality of assessment implementation. Third, the research data was largely obtained through self-report instruments such as questionnaires and interviews, thus there is still the possibility of subjectivity in respondents' answers. Furthermore, this study did not deeply explore students' perspectives regarding the effectiveness of performance assessment implementation in the learning process. Therefore, further research is recommended to involve a wider sample size, use a mixed approach, and consider analysis from the students' perspective to gain a more comprehensive understanding.

4. CONCLUSION

Based on the research results, it can be concluded that the use of performance assessment in biology learning at public senior high schools in South Tangerang City that have implemented the 2013 Curriculum has been implemented, although its implementation is not yet fully optimal. Biology teachers generally have a good basic understanding of the concept of performance assessment, particularly regarding the general definition of performance assessment. However, a deeper understanding of the characteristics, implementation principles, and selection of appropriate assessment techniques for each competency domain still needs improvement. This is evident in the continued inaccuracy among some teachers in classifying assessment methods into the domains of attitudes, knowledge, and skills.

The results showed that in the domain of attitudes, behavioral observation techniques were the most dominant form of assessment used. In the domain of knowledge, all teachers tended to use written tests as the primary instrument, while in the domain of skills, performance assessment was the most widely used technique. These findings indicate that teachers have made efforts to implement authentic assessment in accordance with the characteristics of the 2013 Curriculum, particularly in assessing skills through practical activities and demonstrations in biology learning. Furthermore, observations of the Lesson Plan documents indicated that most teachers have included performance assessment components in their lesson plans. It is recommended that future research involve a larger number of respondents and cover a wider area to obtain a more representative picture of the implementation of performance assessment in biology learning across various school contexts. Furthermore, future research could employ a mixed methods or experimental approach to more deeply analyze the influence of teacher competence in implementing performance assessment on improving student learning outcomes and science process skills.

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AUTHOR CONTRIBUTIONS

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

Not applicable.

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