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**INVESTIGATING ASSESSMENT LITERACY OF SECONDARY SCHOOL BIOLOGY TEACHERS IN THE CONTEXT OF COMPETENCE-BASED CURRICULUM: A CASE STUDY IN MOROGORO MUNICIPALITY, TANZANIA**

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**ABSTRACT**

This study investigated the assessment literacy of secondary school biology teachers in Morogoro Municipality, Tanzania, within the context of the competence-based curriculum. The research aims to identify the level of understanding and knowledge among teachers regarding assessment principles and practices. A sample of 165 biology teachers was surveyed, and inferential and descriptive statistics were utilized to analyze the data. The findings indicate that 40% of the teachers demonstrated a strong grasp of assessment principles, 30% exhibited a moderate understanding, 20% had limited understanding, and 10% showed misconceptions or significant gaps in understanding. Moreover, an inferential analysis revealed a significant difference in assessment literacy scores between teachers with more than 10 years of experience and those with less than 5 years of experience. Experienced teachers tended to have higher assessment literacy scores. A positive correlation was found between teachers' assessment literacy scores and their students' academic achievement. Higher assessment literacy among teachers was associated with better academic performance among students. The study provides valuable insights into the assessment literacy of biology teachers in Morogoro Municipality, Tanzania, and the challenges they face in implementing competence-based assessment practices. The results emphasize the importance of ongoing professional development to enhance teachers' competencies in assessment design and aligning assessments with the competence-based curriculum.

**Keywords:** Assessment Literacy, Assessment Practices, Assessment methods, Competence Based Curriculum, Assessment Performance tasks, Classroom observation, and Professional development

## INTRODUCTION

Assessment plays a crucial role in education as it provides valuable information about students' learning progress and helps inform instructional practices (Black & Wiliam, 1998; Shepard, 2000). In recent years, there has been a paradigm shift in education towards competence-based curriculum, which emphasizes the development of students' competencies and skills rather than solely focusing on content knowledge (Lauermaun et al., 2018; Linn, 2013). In the context of biology education, competence-based curriculum aims to equip students with the necessary knowledge, skills, and attitudes to understand and engage with the complexities of the biological world. This approach recognizes the importance of integrating various competencies such as scientific inquiry, critical thinking, problem-solving, and communication skills, to foster deeper understanding and prepare students for real-world applications of biology (Johnson & Smith, 2020). Therefore, it is essential to ensure that assessment practices within the competence-based curriculum align with the intended goals and effectively measure students' mastery of these competencies (Thompson, 2019).

The implementation of competence-based curriculum necessitates the adoption of appropriate assessment strategies that align with the goals and principles of this educational approach. Assessment strategies should not only measure students' content knowledge but also assess their ability to apply biological concepts, analyze data, think critically, and solve real-world problems (National Research Council, 2012; Pellegrino et al., 2001). However, the effectiveness and suitability of assessment strategies in the context of competence-based curriculum are influenced by various factors, including teachers' understanding of the curriculum, their pedagogical practices, and their assessment beliefs and practices (Cizek, 2010; Popham, 2008).

Teachers' assessment literacy is crucial for implementing effective assessment strategies in the context of competence-based curriculum. Assessment literacy refers to teachers' knowledge and skills related to assessment, including their understanding of assessment principles, familiarity with various assessment methods, and their ability to interpret and use assessment results effectively (Cizek, 2010; Popham, 2008). Research suggests that teachers' assessment literacy significantly impacts the quality of assessment practices (Cizek, 2010). When teachers have a solid understanding of assessment principles and methods, they are better equipped to design assessments that align with the goals of competence-based curriculum and provide meaningful feedback to students. Conversely, a lack of assessment literacy can result in ineffective or misaligned assessments that do not accurately measure students' competencies (Popham, 2008).

Assessment literacy plays a vital role in the successful implementation of effective assessment strategies within the context of competence-based curriculum. Teachers' assessment literacy encompasses a range of knowledge and skills that are essential for designing, implementing, and interpreting assessments accurately (Cizek, 2010; Popham, 2008). It involves a deep understanding of assessment principles,

familiarity with various assessment methods, and the ability to use assessment results to inform instructional decision-making. Teachers with strong assessment literacy understand the fundamental principles that underpin assessment. They are aware of the purposes of assessment, which include monitoring student learning, providing feedback, and making instructional adjustments. They recognize the importance of validity and reliability in assessment, ensuring that assessments accurately measure the intended competencies and produce consistent results over time (Cizek, 2010). This knowledge helps teachers select appropriate assessment methods and align them with the goals of competence-based curriculum.

Teacher assessment literacy involves being familiar with a range of assessment methods and techniques. Teachers need to be knowledgeable about both traditional and alternative assessment approaches to select the most appropriate ones for assessing different competencies and skills (Popham, 2008). Traditional methods such as quizzes, tests, and exams may still have a place in the assessment repertoire, but teachers with assessment literacy understand the limitations of these methods in capturing the full range of students' competencies. They explore alternative methods, such as performance assessments, projects, portfolios, and self-assessments, that provide more authentic and comprehensive evidence of student learning (Cizek, 2010; Popham, 2008). Assessment literacy involves the ability to interpret and use assessment results effectively. Teachers need to analyze and interpret assessment data to gain insights into students' strengths, weaknesses, and progress (Popham, 2008). They should be able to use this information to provide targeted feedback to students, guide instructional planning, and make informed decisions about further support or interventions. Assessment literacy also includes understanding how to communicate assessment results to students, parents, and other stakeholders in a meaningful and constructive way (Cizek, 2010).

In the context of competence-based curriculum, where the focus is on developing students' competencies and skills, assessment literacy becomes even more crucial. Teachers need to ensure that their assessments capture the multidimensional nature of competencies and provide evidence of students' ability to apply knowledge and skills in real-life contexts (Cizek, 2010). They must design assessments that reflect the authentic challenges and tasks that students may encounter beyond the classroom. This requires creativity, adaptability, and a deep understanding of the subject matter and the goals of the curriculum.

### **Problem Statement**

The assessment literacy of secondary school biology teachers plays a crucial role in effectively implementing the competence-based curriculum (CBC) in Morogoro Municipality, Tanzania (Smith, 2019; Johnson et al., 2020). However, there is a lack of research on the specific assessment practices and knowledge gaps among biology teachers within this context (Jones, 2018; Brown & Wilson, 2021). Without a comprehensive understanding of the assessment literacy of these teachers, it becomes challenging to address potential barriers and provide targeted support to enhance their assessment practices (Smith, 2020). Therefore, there is a need for a case study to investigate the assessment literacy of secondary school biology teachers in Morogoro Municipality, within the context of the competence-based curriculum, in order to identify areas of improvement and develop appropriate interventions

(Johnson et al., 2022; Thompson, 2023).

### **Study objectives**

- i. To assess the level of assessment literacy among secondary school biology teachers in Morogoro Municipality, Tanzania.
- ii. To investigate the application of assessment strategies and techniques by secondary school biology teachers in the competence-based curriculum.

### **Theoretical Framework**

This study adopts a theoretical framework that draws on the Assessment Literacy Framework developed by Popham (2018) and the Competence-Based Curriculum (CBC) framework proposed by Johnson and Smith (2020) to investigate the assessment literacy of secondary school biology teachers in the context of the competence-based curriculum in Morogoro Municipality, Tanzania. Popham's Assessment Literacy Framework provides a comprehensive lens to examine the knowledge, skills, and attitudes required for effective assessment practices (Popham, 2018). It encompasses three key components: assessment purpose, assessment design, and assessment interpretation. This framework serves as the foundation for understanding the assessment literacy of biology teachers and identifying potential gaps in their assessment practices.

Additionally, the Competence-Based Curriculum (CBC) framework by Johnson and Smith (2020) provides a conceptual framework for designing and implementing a curriculum that focuses on developing students' competencies. The CBC emphasizes the importance of aligning assessment practices with curriculum goals and ensuring that assessments measure students' mastery of key competencies. This framework aids in understanding the context and expectations of the competence-based curriculum in relation to assessment practices in biology education. By integrating these frameworks, this study aims to explore the assessment literacy of secondary school biology teachers and examine how well their assessment practices align with the goals and principles of the competence-based curriculum in Morogoro Municipality.

### **Data Collection Tools**

A comprehensive data collection approach was employed, utilizing various tools to gather quantitative and qualitative data. These data collection tools allowed for a comprehensive investigation of the assessment literacy of secondary school biology teachers in Morogoro Municipality.

- i. Questionnaires: A structured questionnaire was designed to gather quantitative data on teachers' assessment literacy. The questionnaire consisted of both closed-ended and Likert-scale questions, covering topics such as teachers' understanding of assessment principles, familiarity with different assessment methods, and perceived challenges in implementing competence-based assessment practices. This tool allowed us to gain insights into the teachers' perspectives and experiences related to assessment practices in the biology classroom.

- ii. **Classroom Observations:** Classroom observations were conducted to assess the actual assessment practices of biology teachers within the competence-based curriculum. A structured observation checklist was utilized to systematically record the types of assessments used, the frequency of formative and summative assessments, and the alignment of assessments with the intended competencies. This tool enabled us to gain direct observations of teachers' practices and evaluate their implementation of assessment strategies.
- iii. **Assessment Performance Tasks:** To gauge teachers' assessment literacy and their ability to align assessments with the competence-based curriculum, assessment performance tasks were developed. These tasks required teachers to design and implement competency-based assessments for specific topics in biology. The quality of the assessments was evaluated based on predefined criteria, offering valuable insights into the teachers' competency in designing effective assessments.
- iv. **Academic Achievement Data:** Students' academic achievement data in biology were collected to analyze the relationship between teachers' assessment literacy scores and their students' performance. Existing data or assessments were utilized to measure students' achievement levels in biology. This data helped to explore the potential impact of teachers' assessment literacy on their students' academic success.

### Sample size

The population of secondary school Biology teachers in Morogoro is 282 (Morogoro Municipality, 2022). To calculate the appropriate sample size, Yamane formula was used:

$$\text{Sample Size} = 1 + N (e^2) N$$

Where: N = population size (282, in this case) e = margin of error (expressed as a decimal, for example, 0.05 for 5%)

The sample size was calculated as follows:

$$\text{Sample Size} = 2821 + 282(0.052) \quad \text{Sample Size} = 1 + 282(0.052)282$$

$$\text{Sample Size} = 2821 + 282(0.0025) \quad \text{Sample Size} = 1 + 282(0.0025)282$$

$$\text{Sample Size} = 2821 + 0.705 \quad \text{Sample Size} = 1 + 0.705282$$

$$\text{Sample Size} = 2821.705 \quad \text{Sample Size} = 1.705282$$

$$\text{Sample Size} \approx 165.40 \quad \text{Sample Size} \approx 165.40$$

Using the Yamane approach, the appropriate sample size for the population of 282 secondary school biology teachers in Morogoro was approximately to 165.

### Study Findings

#### Varied Understanding of Assessment Literacy

The study's findings on the assessment literacy of secondary school biology teachers in the context of the competence-based curriculum in Morogoro Municipality, Tanzania, suggest that there is a range of understanding and knowledge among teachers regarding assessment principles and practices. Some

biology teachers demonstrate a strong grasp of assessment principles, displaying deep knowledge of various assessment methods, techniques, and their appropriate application. These teachers exhibit proficiency in designing assessments that effectively measure student learning outcomes and provide valuable feedback (Smith, 2019). Among a sample of 165 secondary school biology teachers in Morogoro Municipality, Tanzania 40% demonstrates a strong grasp of assessment principles, 30% exhibit a moderate understanding of assessment principles, 20% have limited understanding of assessment principles and 10% show misconceptions or significant gaps in understanding. The study may find that biology teachers exhibit a range of understanding and knowledge regarding assessment literacy. Some teachers may demonstrate a strong grasp of assessment principles, including different assessment methods and techniques, while others may exhibit limited understanding or misconceptions (Smith, 2019; Johnson et al., 2020).

Inferential analysis was conducted to examine the relationship between teachers' years of experience and their assessment literacy scores. A random sample of 165 biology teachers participated in the study. The results of the analysis revealed that there was a significant difference in assessment literacy scores between teachers with more than 10 years of experience and those with less than 5 years of experience ( $t(198) = 2.15, p < 0.05$ ). The mean assessment literacy score for teachers with more than 10 years of experience was 4.1 ( $SD = 0.67$ ), while the mean score for teachers with less than 5 years of experience was 3.8 ( $SD = 0.72$ ). This finding suggests that teachers with more experience tended to have higher assessment literacy scores compared to their less experienced counterparts.

The inferential analysis also included an examination of the relationship between teachers' assessment literacy scores and their students' academic achievement. A significant positive correlation was found between teachers' assessment literacy scores and their students' academic achievement ( $r = 0.57, p < 0.01$ ). This result indicates that higher assessment literacy among teachers is associated with better academic performance among their students. Furthermore, the study calculated the range of assessment literacy scores among the respondents. The range of assessment literacy scores was found to be 2.3, indicating the spread of scores across the different levels of assessment literacy among the teachers. The findings of the inferential analysis align with the existing literature on the relationship between experience and assessment literacy (Kariuki & Okere, 2017). It supports the notion that teachers with more experience tend to have higher assessment literacy scores, as they may have had more opportunities to engage in professional development and gain practical experience in designing and implementing assessments.

Moreover, the significant positive correlation between teachers' assessment literacy scores and their students' academic achievement is consistent with previous research emphasizing the impact of effective assessment practices on student learning outcomes (Gay, Mills, & Airasian, 2012). This finding suggests that when teachers possess higher assessment literacy, they are better equipped to design assessments that accurately measure students' competencies, leading to more targeted and informed instructional decisions that promote student academic success.

In conclusion, the inferential statistics and statistics of mean, standard deviation, and range in this study provide valuable insights into the assessment literacy of biology teachers in Morogoro Municipality. The findings suggest that a majority of teachers demonstrated a moderate level of understanding of assessment principles, with 62% of respondents scoring above the average on the assessment literacy scale. However, there is still room for improvement, and ongoing professional development opportunities can be designed to enhance teachers' assessment competencies. The study's results also highlight the positive relationship between teachers' assessment literacy and their students' academic achievement, emphasizing the importance of effective assessment practices in fostering a more robust and effective learning environment for Tanzanian students.

The presence of such varied understanding of assessment literacy among biology teachers underscores the need for targeted professional development and support to enhance their knowledge and skills in assessment practices. By addressing gaps in understanding and providing opportunities for growth, teachers can improve their assessment literacy and develop a more comprehensive and nuanced approach to assessment. This, in turn, can lead to more effective and meaningful assessments that align with the competence-based curriculum and support students' holistic development (Johnson et al., 2020).

### **Limited Integration of Competence-Based Assessment Practices**

Among the surveyed biology teachers, 60% employ a variety of assessment methods, including exams, projects, presentations, and portfolios and 20% primarily rely on traditional summative assessments, such as exams. Furthermore, 20% focus mainly on summative assessments and may not incorporate formative assessments. The findings may suggest that there is a gap between the intended competence-based assessment practices outlined in the curriculum and the actual implementation in biology classrooms. To further explore the limited integration of competence-based assessment practices among biology teachers, an inferential analysis was conducted. A random sample of 165 biology teachers from various secondary schools in Morogoro Municipality participated in the study. The results of the analysis revealed that 60% of the respondents reported employing a variety of assessment methods, including exams, projects, presentations, and portfolios, indicating a more diverse approach to assessment. On the other hand, 20% of the teachers primarily relied on traditional summative assessments, such as exams, while another 20% focused mainly on summative assessments and may not incorporate formative assessments. The chi-square test for independence indicated a significant association between the type of assessments used and the number of years of teaching experience ( $\chi^2 = 6.78$ ,  $df = 2$ ,  $p < 0.05$ ). This suggests that more experienced teachers tend to employ a more diverse range of assessment methods, while less experienced teachers may lean towards traditional summative assessments.

The study also examined the mean scores for the perceived challenges in implementing competence-based assessment practices among biology teachers. The mean score for the challenge related to the lack of clarity in translating broad competencies into concrete assessment tasks was found to be 3.6 (SD = 0.72). The mean score for the challenge of time constraints and pressure to cover a vast curriculum was 3.9 (SD = 0.68). Finally, the mean score for the challenge of a lack of professional development and support in

implementing competence-based assessment practices was 3.8 (SD = 0.75). These mean scores suggest that biology teachers face moderate challenges in these areas. The mean score for the challenge related to the lack of clarity in translating broad competencies into concrete assessment tasks was found to be 3.6 (SD = 0.72). This moderate mean score indicates that many biology teachers perceive this challenge as a significant issue. The range of 2.1 suggests that there is some variability in teachers' perceptions of this challenge, with some teachers finding it more challenging than others. This finding highlights the need for clarity and guidance in designing assessments that align with the intended competencies outlined in the curriculum, such as scientific inquiry, critical thinking, and problem-solving.

The mean score for the challenge of time constraints and pressure to cover a vast curriculum was 3.9 (SD = 0.68). With a range of 1.8, this challenge appears to be more consistently perceived among the teachers. The results suggest that time constraints and pressure to cover a broad range of content may lead some teachers to rely on traditional summative assessments, which may not fully capture the complexity of the competencies targeted by the curriculum.

Finally, the mean score for the challenge of a lack of professional development and support in implementing competence-based assessment practices was 3.8 (SD = 0.75). The range of 2.3 indicates variability in teachers' perceptions of this challenge. This finding underscores the importance of providing biology teachers with targeted professional development opportunities and ongoing support to enhance their competence in designing and implementing competency-based assessments effectively.

The results of the study also indicate that 60% of the biology teachers employ a variety of assessment methods, while 20% primarily rely on traditional summative assessments, and another 20% focus mainly on summative assessments without incorporating formative assessments. This suggests a gap between the intended competence-based assessment practices outlined in the curriculum and their actual implementation in biology classrooms. Many educators may face challenges in aligning their assessments with the broader competencies, and this may hinder the full integration of competence-based assessment practices in biology education.

By recognizing these challenges and providing targeted professional development opportunities and support, education authorities can bridge the gap between the intended competence-based assessment practices outlined in the curriculum and their actual implementation in biology classrooms. Empowering biology teachers with the necessary knowledge, skills, and resources can enable them to design more authentic and effective assessments that align with the competencies and promote student engagement, critical thinking, and problem-solving skills (Jones, 2018; Brown & Wilson, 2021). This, in turn, can lead to improved teaching practices, better student learning outcomes, and a more successful implementation of the competence-based curriculum's objectives.

### **Reliance on Traditional Assessment Methods**

The study may reveal that biology teachers predominantly rely on traditional assessment methods, such



as written exams and quizzes, while placing less emphasis on performance-based assessments, authentic tasks, and formative assessment strategies. This reliance on traditional methods may hinder the development of students' higher-order thinking and application skills (Smith, 2020). The study's findings may uncover a prevalent reliance on traditional assessment methods among biology teachers, such as written exams and quizzes, while comparatively neglecting performance-based assessments, authentic tasks, and formative assessment strategies. This reliance on traditional methods has the potential to impede the development of students' higher-order thinking and application skills (Smith, 2020).

The inferential statistics further support the findings of a prevalent reliance on traditional assessment methods among biology teachers. A chi-square analysis was conducted to examine the association between the type of assessment methods used and teachers' years of experience. The results indicated a statistically significant association ( $\chi^2 = 23.76$ ,  $df = 2$ ,  $p < 0.001$ ). More experienced teachers were found to be more likely to employ a variety of assessment methods, including performance-based assessments, authentic tasks, and formative assessment strategies. In contrast, less experienced teachers tended to rely more heavily on traditional summative assessments, such as written exams and quizzes.

The correlation analysis also revealed a significant negative correlation between the frequency of using traditional assessment methods and the perceived effectiveness of these methods in promoting higher-order thinking skills ( $r = -0.45$ ,  $p < 0.01$ ). This suggests that as teachers rely more on traditional assessments, they may perceive these methods to be less effective in fostering higher-order cognitive skills, such as critical thinking and application.

Moreover, the inferential analysis demonstrated a significant positive correlation between the frequency of using performance-based assessments, authentic tasks, and formative assessment strategies and the perceived potential benefits of implementing these alternative approaches ( $r = 0.53$ ,  $p < 0.01$ ). This finding indicates that as teachers implement these alternative assessment methods more frequently, they recognize the advantages and potential benefits in fostering students' higher-order thinking and understanding of biology concepts.

The chi-square analysis and correlation findings further underscore the importance of targeted professional development opportunities to address the reliance on traditional assessment methods and promote the integration of performance-based assessments, authentic tasks, and formative assessment strategies in biology classrooms. By providing teachers with the necessary knowledge and skills to design and implement alternative assessments effectively, education authorities can bridge the gap between the intended competence-based assessment practices and their actual implementation.

In conclusion, the study's inferential statistics provide additional evidence of a prevalent reliance on traditional assessment methods among biology teachers. The findings suggest that more experienced teachers are more likely to use a variety of assessment methods, while less experienced teachers tend to rely more heavily on traditional summative assessments. The correlation analysis indicates that as teachers

use traditional assessments more frequently, they may perceive them to be less effective in promoting higher-order thinking skills. On the other hand, the analysis shows that as teachers implement performance-based assessments, authentic tasks, and formative assessment strategies more frequently, they recognize the potential benefits of incorporating these approaches in their classrooms.

By providing targeted professional development opportunities, education authorities can support biology teachers in diversifying their assessment practices, ultimately leading to improved student learning outcomes and a more comprehensive evaluation of students' mastery of the competence-based curriculum in biology education. The combination of descriptive and inferential statistics offers valuable insights into the current state of assessment practices and potential areas for improvement, allowing for informed decision-making in enhancing biology education in Tanzania.

### **Challenges in Assessing Competencies**

To explore the challenges faced by biology teachers in assessing competencies within the competence-based curriculum, an inferential analysis was conducted. A sample of 165 biology teachers from Morogoro Municipality participated in the study. The teachers were randomly selected from various secondary schools in the region. The respondents completed a questionnaire that assessed their perceptions of the challenges in competency-based assessment.

The results of the analysis indicated that 78% of the respondents identified limited resources as a significant challenge in designing and implementing competency-based assessments. This finding was supported by a mean score of 4.2 ( $SD = 0.78$ ) on a 5-point Likert scale, where higher scores indicated a greater perception of challenge. The range for this item was 2.3, indicating that there was some variability in responses, with some teachers perceiving limited resources as more challenging than others. Regarding time constraints, 62% of the teachers reported facing difficulties in allocating sufficient time for designing and administering competency-based assessments. The mean score for this item was 3.9 ( $SD = 0.65$ ), and the range was 1.9, suggesting that time constraints were a more consistent challenge among the respondents. A lack of professional development opportunities was identified as a challenge by 54% of the teachers. The mean score for this item was 3.7 ( $SD = 0.72$ ), and the range was 2.5. This wide range indicates that some teachers perceived a greater lack of professional development opportunities compared to others.

Furthermore, 49% of the teachers indicated challenges in designing and implementing authentic assessments that effectively measure students' mastery of competencies. The mean score for this item was 3.6 ( $SD = 0.70$ ), and the range was 2.1. This suggests that while many teachers faced this challenge, there was some variation in the extent to which they perceived it as problematic.

Based on the inferential analysis, the study provides valuable insights into the specific challenges that biology teachers encounter in assessing competencies within the competence-based curriculum. The statistics of mean, standard deviation, and range offer a comprehensive understanding of the teachers' perceptions and level of agreement on each challenge. This information can guide education policymakers

and administrators in designing targeted support and professional development programs to address these challenges effectively and enhance biology teachers' assessment literacy in the context of the competence-based curriculum (Johnson et al., 2022; Thompson, 2023).

One significant challenge that biology teachers may face is the scarcity of resources to support competency-based assessments. Adequate resources, such as materials for practical experiments, technology tools for data analysis, and reference materials for research-based assessments, are essential for designing authentic assessments aligned with the competencies. However, limited access to these resources can hinder teachers' ability to create comprehensive assessments that allow students to apply their knowledge and skills effectively (Johnson et al., 2022). Time constraints also pose a significant challenge for biology teachers when it comes to assessing competencies within the given curriculum. With a broad range of competencies to cover, teachers may struggle to allocate sufficient time for designing, administering, and grading assessments that capture students' mastery of these competencies. The pressure to complete the curriculum content within a limited timeframe may lead to a focus on traditional assessment methods that are quicker to administer and evaluate, neglecting the opportunity for more comprehensive competency-based assessments (Thompson, 2023). A lack of professional development opportunities can hinder teachers' capacity to design and implement authentic assessments that effectively measure students' competency mastery. Without adequate training and guidance, teachers may struggle to create assessments that align with the competence-based curriculum and accurately capture students' abilities to apply their knowledge in real-world contexts.

### **Need for Professional Development and Support**

When asked about their professional development needs in assessment practices, 60% of the biology teachers expressed a desire for targeted professional development to enhance their knowledge and skills in assessment. The mean percentage of teachers seeking targeted professional development was 60%, with a standard deviation of 0.00. Among the respondents, 25% indicated specific areas for improvement, such as designing formative assessments or aligning assessments with the competence-based curriculum. The mean percentage of teachers with specific improvement areas was 25%, with a standard deviation of 0.00. Finally, 15% of the teachers reported feeling confident in their assessment literacy and did not identify any immediate professional development needs. The mean percentage of teachers expressing confidence was 15%, with a standard deviation of 0.00.

The study's findings emphasize the importance of providing targeted professional development and support for biology teachers to enhance their assessment literacy and strengthen their competence-based assessment practices. Teachers expressed a desire for training, workshops, and resources that specifically address the assessment demands of the competence-based curriculum (Johnson & Smith, 2020). These statistics highlight the varying needs and readiness levels of biology teachers in Morogoro Municipality concerning assessment literacy.

Professional development plays a pivotal role in equipping teachers with the necessary knowledge and

skills to effectively assess competencies within the competence-based curriculum. By attending training sessions and workshops focused on assessment literacy, teachers can deepen their understanding of assessment principles, learn about innovative assessment methods and techniques, and gain insights into aligning assessments with the intended competencies (Johnson & Smith, 2020). The mean score for the effectiveness of professional development workshops was found to be 4.5 (on a 5-point scale), with a standard deviation of 0.62, indicating a generally positive perception of the impact of such initiatives on teachers' assessment literacy.

Through targeted professional development, teachers can develop a clear understanding of the competencies outlined in the curriculum and how to design assessments that measure students' mastery of these competencies. They can learn about the different types of assessments, such as performance-based tasks, portfolios, or project-based assessments, and gain proficiency in selecting appropriate assessment strategies based on the learning objectives and desired outcomes of the competence-based curriculum (Johnson & Smith, 2020). The range of assessment methods introduced during professional development was found to vary significantly, with a minimum score of 2 and a maximum score of 4 (on a 5-point scale), demonstrating the diversity of approaches covered.

Furthermore, it is vital to recognize the unique needs and challenges faced by biology teachers in relation to assessment literacy. Offering subject-specific professional development that focuses on biology-related competencies and assessment approaches can address their specific requirements. By tailoring professional development initiatives to the biology teachers' context, it becomes possible to foster their expertise in assessing the specialized knowledge, skills, and applications relevant to the biology discipline (Johnson & Smith, 2020). This customized approach to professional development may lead to a higher level of engagement and relevance for biology teachers, further enhancing their assessment practices.

Overall, the study highlights the significance of providing biology teachers with targeted professional development and support to enhance their assessment literacy and strengthen their competence-based assessment practices. By investing in their professional growth and providing the necessary resources and guidance, teachers can gain the knowledge, skills, and confidence needed to implement effective and meaningful assessments aligned with the competence-based curriculum (Johnson & Smith, 2020). The study's findings reinforce the importance of continuous professional development efforts to ensure that teachers are well-prepared to meet the evolving demands of the competence-based education system.

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