Physics Teachers' Perception and Practice of Formative Assessment: The Case of a Secondary School in Addis Ababa City

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Abstract:

This study explored how physics teachers in a Secondary School perceive and practice formative assessment and the challenges. A case study research approach with qualitative analysis technique was employed and the data was collected through the administration of classroom observation and interview. In addition, the questionnaire was used to triangulate the results obtained from the observation and interview. The case was taken from Addis Ababa, secondary schools which have a large teacher population and enough facilities. All the available fifteen physics teachers were taken as sample respondents for the questionnaire and five teachers were observed while teaching in the classroom and the same teachers were interviewed. The findings show that physics teachers fail to assess their students effectively and do not give them enough feedback. Although most of the physics teachers reported that they mostly implement formative assessments in their classrooms, the observation data does not support their claim. Despite this, the teachers mention several factors that hinder them from fully implementing formative assessment practice, such as the overloaded curriculum, big class sizes, and lack of training on assessment. Some of them also blame the students for their lack of interest in being assessed and participating. The main result of this study also shows that physics teachers, regardless of their background, have a fragile grasp of what formative assessment is. This implies that it is essential to address teachers' issues related to their perception which differs from their practice of formative assessment. Further, more research is needed on the physics teacher education curriculum to examine how assessment course is trained and how much formative assessment is incorporated in it to implement formative assessment as they perceive.

Keywords: *Formative Assessment, Assessment Technique, Feedback*

Introduction

Assessment is a significant educational activity that involves gathering and interpreting data to make well-versed decisions about the quality of individuals, objects, groups, or events (Ajuonuma, 2006). In the field of education, assessments serve various purposes and come in different types (Miles, 2022; Miller, 2023). There are two main types of assessment: formative and summative, each occurring at different stages of learning progression (ASCD, 2012).

Formative assessment is a process that involves collecting and analyzing evidence from assessments to determine the proper timing and methods for adjusting instructional activities or learning strategies to accomplish learning goals (Phopam, 2011). When the evidence or information gathered is used to adapt teaching to meet learning needs, it is considered a formative assessment (Black et al., 2003). Formative assessment plays a crucial role in adjusting teaching and learning activities by providing important information for improvement (Asare, 2020). Teachers need to interact continuously with their students in the classroom to assess their progress (Joel & Harold, 2003). According to Joel and Harold (2003), by using formative assessment, teachers can also evaluate the success of their teaching methods.

On the classroom assessment manual developed by the Ethiopian National Education Assessment and Examination Agency (NEAEA), formative assessment and assessment for learning are used interchangeably and are defined as: "Assessment for learning (Formative Assessment) is the process of seeking and interpreting evidence for use by teachers and learners to decide where learners are in there learning, where they need to go and how best to get there." (Mamaru, 2014, p. 31).

Evidence supports a strong correlation between formative classroom assessment and students' achievement. Studies have shown that student's achievement improves significantly when teachers implement formative assessment techniques (Black & Atkin, 1996; Karaman, 2021; Ozan & Kıncal, 2018). Nowadays, it is widely understood that students learn best and become more effective when they are regularly and continuously assessed. Rather than relying on tests or examinations at the end of a course or year, regular and continuous assessment provides a complete and accurate picture of student's performance, including higher-order thinking skills (Heaton, 1990; Keeley, 2015).

The Ethiopian Ministry of Education also recognizes the value of continuous assessment for its formative effect at the classroom level (TGE, 1994). However, there is limited information available on how formative assessment is currently practiced and how the practice is perceived by teachers, particularly in the context of physics education.

Statement of the Problem

The fifth Education Sector Development Program in Ethiopia aimed to improve the quality of general education and equip children with the necessary knowledge, skills, and values to become productive and responsible citizens (MoE, 2015). However, regardless of these efforts, the National Learning Assessment (NLA) scores indicate that students' achievement has remained low for several years. The average scores for grade 10 and 12 students in the subjects of English, Mathematics, Biology, Chemistry, and Physics have consistently remained below 50% (NEAEA, 2010; NEAEA, 2014; NEAEA, 2017), which is the minimum achievement level set by the Ministry of Education (TGE, 1994).

Of the five subjects, Physics consistently shows the lowest academic achievement. In the years 2010, 2014, and 2017, the mean scores for grade 10 students in Physics were 31.20%, 35.45%,

and 29.43%, respectively, while the average scores for all five subjects during those years were 36.00%, 40.64%, and 33.30%, respectively. Additionally, research conducted to develop the new education roadmap also indicates that many secondary school students do not acquire the expected knowledge, skills, and attitudes (MoE, 2018). These findings underscore the need for further attention and improvement in the teaching and learning of Physics, as well as overall educational outcomes in Ethiopia.

Research studies have consistently highlighted the effectiveness of formative assessment in improving students' learning and achievement, particularly in science subjects including physics (Black et.al, 1998a; Harlen, 2003; Karaman, 2021; Ozan & Kıncal, 2018; Stiggins, 2005). The implementation of formative assessment has been shown to have a significant impact on students, teachers, and the teaching-learning process, with long-lasting effects (Gayle & Amy, 2009; Khan *et.al., 2020). Black and William* (1998b), for example, found in their study that formative assessment could significantly improve students' achievement. Angelo and Cross (1993) on their book "Classroom Assessment Techniques" provided detailed practical assessments that have been improving students' engagement in physics classes and achievement. Hattie (2019) also found that formative assessment highly impacted students' achievement positively.

According to Tadele and Sitotaw (2018), the use of different assessment techniques in Ethiopian physics classes and teachers' perception are among the factors that influence the quality of education. In its project with the Ethiopian Ministry of Education focusing on the practice of formative assessment in Ethiopia, UNICEF reported that equipping teachers with skills, resources and a supportive environment shifted the teaching-learning process to more engaging and improved learning outcomes (UNICEF, 2019). Therefore, the successful practice of formative assessment is directly related to students' achievement.

Considering the importance of formative assessment, it is crucial to examine its implementation and teachers' perception of their practice in checking students' understanding, especially in teaching physics. Although it is evident that formative assessment improves students' achievement, research indicates that the practice of formative assessment in most Ethiopian Secondary Schools is not satisfactory (Dessie, 2015, Jambo et.al., 2020). Some researchers also explored the conception that teachers have about their formative assessment practices. According to a study made by Dereje and his colleagues (2022), the conceptions that English as a foreign language, teachers in Secondary Schools have about their practice of formative assessment do not reflect their actual practice.

Although there is some research on the practice and effects of formative assessment; there is a scarcity of studies that have specifically investigated the practices of formative assessment in Ethiopian secondary school physics particularly on the perceptions of the teachers on their practice. Therefore, this study aims to investigate how formative assessment is being implemented and perceived in an Ethiopian secondary school, specifically by physics teachers. By examining an exemplary case, the study seeks to shed light on the practical application and

perception of teachers about formative assessment in this particular setting. The study focused on addressing the following research questions:

1. To what extent do physics teachers practice formative assessment?
2. What are the most frequently used formative assessment techniques by physics teachers?
3. How do teachers perceive their practice of formative assessment?
4. What are the factors that influence physics teachers' practice of formative assessment?

By exploring these questions, the study aims to contribute to a better understanding of the current practices; perceptions of teachers' practice, the most frequently used formative assessment practices, and factors influencing the implementation of formative assessment in physics education in an Ethiopian secondary school.

Research Methodology

Description of the Study Area

During the study, a secondary school having a relatively large number of students and teachers in Addis Ababa was chosen as the research site. The case school had a student population of 2,218, which was distributed among 94 classrooms with an average class size of 24 students. It is worth noting that the normal class size in Addis Ababa was typically larger, but due to the COVID-19 pandemic, class sizes were deliberately reduced for safety reasons.

The total population of teachers in the school was not specified in the available information, because the case only considers physics teachers in the school. The study then focused on all the available 15 physics teachers as the participants of the study. These physics teachers had an average teaching load of about 18 periods (lessons) per week, which was considered manageable in the Ethiopian context.

By conducting the study in this particular high school, the researchers aimed to gather insights into the teachers' perception and practice of formative assessment specifically in the physics education context. The reduced class sizes due to the pandemic may have influenced the dynamics of teaching and assessment during the study period.

Research Design

The study followed a case study design, which aims to provide a detailed description of the current practice of physics teachers in assessing students in the specific high school under investigation. The researchers sought to gain an understanding of how formative assessment was being implemented by these teachers.

In addition to describing the current practice, the study also aimed to identify the teachers' perception of their practice of formative assessment and the most frequently used formative assessment methods by physics teachers. This information would shed light on the strategies and techniques that were commonly employed in assessing students' understanding and progress in physics.

Furthermore, the study also investigated the challenges faced by teachers in implementing formative assessments. This part of the research aimed to identify any barriers or difficulties that hindered the effective implementation of formative assessment methods in the physics classroom. By understanding these challenges, recommendations, and strategies were developed to overcome them and amplify the practice of formative assessment.

Overall, the case study design allowed the researchers to delve into the specific context of the study school, examine the practices of physics teachers in assessing students, identify commonly used formative assessment methods, and explore the challenges faced in implementing these methods.

Methods of Data Collection and Analysis

The researchers in this study employed combined data collection methods to address the research questions. As the study required both quantitative and qualitative descriptions of the level of physics teachers' practice of formative assessment, multiple instruments were utilized, including questionnaires, observations, and interviews.

i. Questionnaire

The questionnaire was developed by the researchers after a careful study of the literature based on the research questions and validated by experts. The questionnaire includes issues like the type of assessment that teachers use and the frequency; the stage they mostly use to assess; feedback provision; challenges and others. After reviewing the questionnaire based on the comments of the experts, it is pilot-tested and Cronbach's alpha result of 0.82 was found. The questionnaire was used to gather quantitative data and provide a comprehensive overview of the practices of physics teachers in formative assessment. It allowed for the collection of numerical data that could be analyzed using statistical measures such as mean, frequency, percentage, and standard deviation. These quantitative measures helped to describe the overall situation and provide numerical insights into the practices being investigated.

It was employed to gather general views and perceptions of teachers regarding their current practice of formative assessment, the challenges they faced, and their use of feedback to improve performance. It consisted of both closed and open-ended questions, along with five-point Likert scale questions to assess the frequency of the usage of different types of formative assessment.

ii. Observation

Classroom observations were also conducted to capture qualitative data related to the level of physics teachers' practice of formative assessment which was also accompanied by brief discussions after the observations to clarify the incidents in the classroom. To ensure the validity issue, the researchers conducted a thorough literature review to identify relevant research and clearly defined and operationalized the key variables (types of assessments used, frequencies, feedback provision, students' motivation and involvement, and related issues) and prepared the checklist. After the teacher educator's review, the correction was made based on the comments before the data collection. The researchers then collected and checked each other's data and the

analysis of the data for credibility. Through direct observation in the classroom, researchers gained a deeper understanding of the actual implementation of formative assessment methods and identified specific practices and strategies used by the teachers. This is used to validate and supplement the data obtained from the questionnaire. The researchers observed physics lessons to assess whether teachers were effectively implementing formative assessment practices at each stage of instruction. Five Physics lessons were observed (two from grade 10, two from grade 11, and one from 12). The main issues considered during the observation were the techniques of assessment used by teachers and the way feedback is provided to the students in the teaching-learning process.

iii. Interview

Additionally, interviews were conducted to further explore and gather qualitative data. Five teachers were interviewed. This method allowed researchers to engage in conversations with the physics teachers, providing an opportunity to delve into their experiences, perceptions, and challenges regarding the implementation of formative assessment. The interviews provided valuable insights into the teachers' thoughts, beliefs, and rationales behind their practices. These interviews provided an opportunity to gather clear and additional information about the challenges faced in implementing formative assessment. Semi-structured questions were prepared and translated into Amharic. The interviewees were asked the questions in Amharic, and their responses were transcribed and translated into English before analysis.

By employing a combination of these methods, the researchers were able to gather both quantitative and qualitative data, providing a comprehensive understanding of the practices and challenges related to formative assessment in physics teaching

To ensure the validity and reliability of the instruments, the questionnaire, observation protocols, and interview guides were reviewed and validated by three teacher educators. Their feedback and comments were considered, resulting in the rejection, addition, and modification of certain items in the instruments to enhance their effectiveness. In addition, the questionnaire was pilot-tested and Cronbach's alpha result of 0.82 was obtained, which is in an acceptable range.

Once the data were collected, they were analyzed and interpreted both quantitatively and qualitatively. The quantitative data were analyzed using statistical measures, while the qualitative data from observations and interviews were subjected to thematic analysis techniques. The transcription and translation of the interviews were made by two trained assistant researchers. This mixed-methods approach allowed for a comprehensive understanding of the research findings, incorporating both numerical descriptions and in-depth qualitative insights.

Results and Discussion

Teachers' Educational Background and Training

All the participants in this study were physics graduates. Nine teachers did not undergo any teacher education program, while the remaining five received training through M.Ed (1), B.Ed. (2), and PGDT. During the interviews, those who took training on assessment expressed that it

was highly beneficial, improving their teaching methods and assessment practices. Furthermore, they reported that they gained confidence in their teaching careers because of the training. Regarding the teachers' experience, all participants had more than seven years of teaching experience, indicating that they acquired ample experience in the field of teaching.

Black and his colleagues (2003) conducted a study to investigate the impact of training and ongoing support on teachers' ability to implement formative assessment effectively. They found that when teachers received training and collaborative support, they were able to make significant changes in their classrooms. Jones and Moreland (2025) also emphasize the importance of teachers' knowledge and skills in assessing students, interpreting data, and using the results to support student learning. Black and William (1998a) further recommend that teachers should receive professional support to assess students effectively and utilize the outcomes appropriately. Therefore, it is evident that teachers' knowledge and ability in assessment play a crucial role. As a result, we can conclude that the teachers who do not undergo teacher education, or professional pieces of training will lack the knowledge and skill to teach and assess students effectively.

Types of Formative Assessment

To identify the most common assessment technique the physics teachers believe they are using, the teachers were provided with a questionnaire. Ten different techniques were listed, and they were asked to rate them from most frequently (5-points) to rarely used (1-point). The responses of the teachers' mean ratings are as presented in the figure 1.

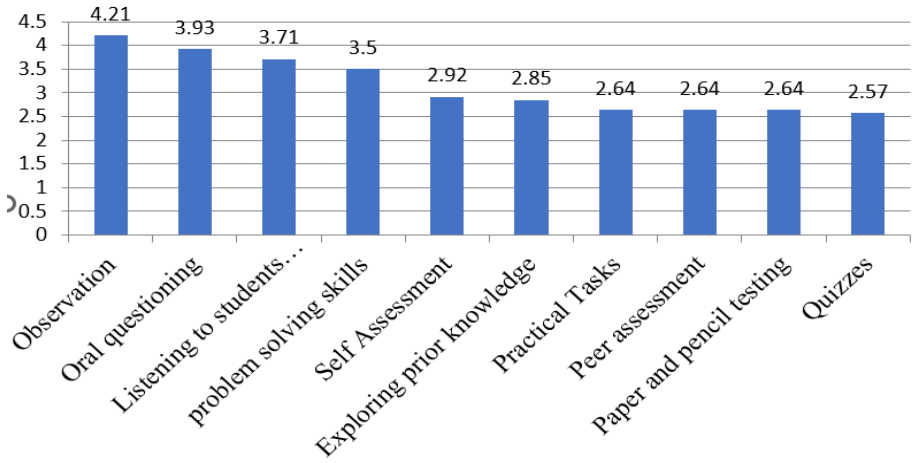

Figure 1: *Teachers' mean ratings of frequently used assessment techniques*

Based on the information provided by the teachers, shown in Figure 1 above, it is evident that the physics teachers claim to use a variety of assessment techniques. The most frequently used techniques, according to their claims, are observation, oral questioning, listening to students, and problem-solving. These techniques have mean ratings of 4.21, 3.93, 3.71, and 3.50, respectively. The standard deviations associated with these mean ratings are 0.891, 0.730, 1.260, and 1.010, respectively.

On the other hand, the teachers claim to use practical tasks, peer assessments, paper and pencil tasks, and quizzes less frequently. These techniques have mean ratings of 2.64, 2.64, 2.64, and 2.56, respectively. The standard deviations associated with these mean ratings are 0.633, 0.633, 0.929, and 0.514, respectively. It is important to note that these claims are based on the self-reported data provided by the physics teachers.

Although scholars encourage the use of different techniques of assessment (Douglas & Fisher, 2014; Ciara, 2009; Susan, 2020; Dufresne & Gerace, 2004; Ozan & Kıncal, 2018) and teachers claim that they are using a variety of techniques, there is a discrepancy between the teachers' claims which is the perception about their assessment techniques and their actual practices. The teachers claimed that observation was their prime technique, which is one of the formative assessment techniques that most teachers use to improve students' learning (Gayle & Amy, 2009; Douglas & Fisher, 2014). However, there was no evidence of them using any observational aids or adjusting their instruction based on observational data. This suggests that their perception of their use of observation as an assessment technique may not align with their actual implementation.

On the other hand, oral questioning was observed in a significant percentage of lessons, which supports the teachers' claims. However, it was noted that the teachers often posed questions without giving students sufficient opportunity to respond. This raises concerns about the effectiveness of oral questioning as a formative assessment technique if students are not actively engaged in the process.

Similarly, although peer assessment and self-assessment are recognized as valuable techniques for promoting student engagement and learning as reported in several studies (Matsebelela, 2005; Gayle & Amy , 2009; Wride, 2017; Andrade, 2019), the observation data did not indicate any instances of teachers utilizing these techniques. This indicates a discrepancy between the teachers' stated beliefs and how they implement peer and self-assessment.

Overall, it appears that there is a gap between the teachers' self-perception of their assessment techniques and their actual practices. Teachers need to reflect on their assessment strategies and ensure they align with best practices to effectively support student learning and achievement.

Stages of Teaching Learning process and Formative Assessment

Literature promotes the use of formative assessment throughout the lessons or at each stage; before, during, and after the lessons (Douglas & Fisher, 2014; Gayle & Amy, 2009). The respondent teachers were asked to indicate whether they used the assessment techniques at the beginning (before), middle (during the main lesson), at the end of the lesson (after), or at all stages (throughout) of the lesson. The 12 teachers' responses are shown in Figure 3 below, with a bar graph.

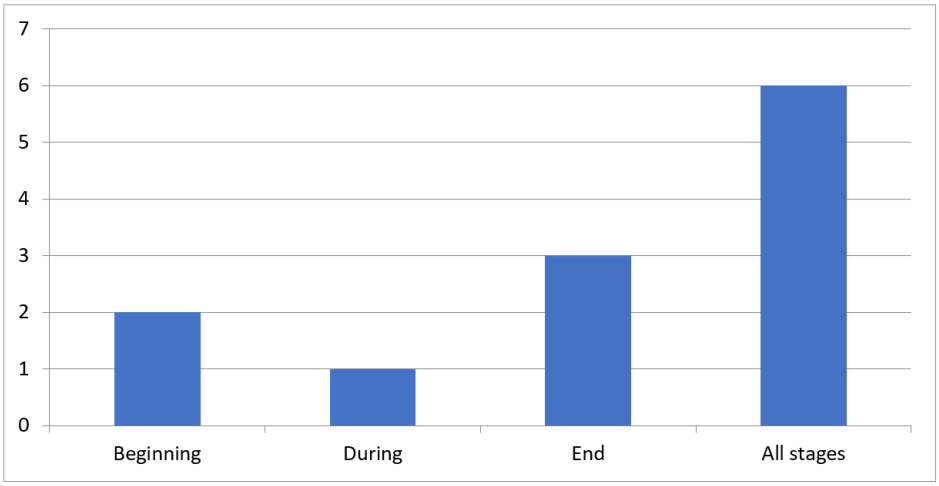

Figure 2: *Stages of lessons during which formative assessment is used by the teachers*

As shown in Figure 2 above, from the questionnaire data, it is evident that there is a variation in the teachers' practices regarding when they assess their students. Six respondents stated that they assess their students at each stage, three respondents said they assess after the lesson, one respondent assessed during the main lesson, and two respondents assess before the lesson. However, it is important to note that two sample teachers did not respond to this question.

The fact that at least half of the physics teachers believe in using assessment throughout the lesson suggests that they have a good understanding of formative assessment. This aligns with existing research (Douglas & Fisher, 2014; Gayle Amy, 2009). However, it is concerning that the same proportion of teachers still rely on a single assessment at a specific point in time.

On the other hand, the data from the observation indicates that none of the teachers assessed their students during the middle of the lessons. In one observed lesson, the teacher assessed students only at the end, while in four observed lessons, the teacher assessed at the beginning and at the end of the lesson. This further emphasizes the disconnect between the teachers' perception of their assessment practices and their actual implementation of formative assessment.

Teachers must bridge this gap between perception and practice by aligning their assessment strategies with the principles of formative assessment. This includes assessing students throughout the lesson, providing timely feedback, and actively involving students in the assessment process. By doing so, teachers can effectively support student learning and promote continuous improvement.

Feedback

From the results of the questionnaire, it appears that most teachers (12 teachers) believe they are providing appropriate feedback to their students. This belief was also confirmed during interviews, where teachers mentioned providing feedback at the end of lessons and writing feedback on test papers. However, the observations revealed that most teachers tend to give general feedback such as "very good," "you are wrong," or "you are correct" without providing

specific guidance on how to improve. Furthermore, it was observed that teachers provided feedback to the entire class rather than individually. This is not aligned with the recommendations of scholars who underline the importance of timely, positive, clear, and specific feedback adapted to individual students' work (Brookhart, 2011; Epstein, 2007; Hattie & Timperley, 2007; Race et al., 2001; William, 2013). For formative assessment to be more effective, feedback should highlight students' strengths and weaknesses, and guide the next steps (Larson, *et al.*, 2012). This also implies that the teachers' perception about the way they provide feedback has discrepancy with their actual provision of feedback revealed from the observation.

Challenges

Based on the interviews and observations, it is evident that the school's physics teachers face challenges in implementing formative assessment effectively. These challenges include students' misbehavior and lack of interest in responding to assessment questions, as well as the perception that formative assessment consumes too much time and may not allow covering the entire curriculum. The lack of student interest and participation observed during the classroom observations may be credited to various factors. It is possible that students have a lack of interest in the subject matter itself or may be facing other personal or learning-related challenges. Understanding these factors requires further investigation and individualized support to address the underlying issues and enhance student engagement.

Lesson Observations

Based on the observations conducted in the physics lessons, it is evident that there are some areas for improvement regarding the assessment techniques used by the teachers and the way feedback is provided to students.

One commonly observed assessment technique was oral questioning, which was used both at the beginning of the lesson to review prerequisite knowledge and at the end of the lesson as a summary. Here, it was noted that teachers often answered their questions instead of allowing students to respond. Although the teachers during the interview witnessed that they do this not to take much time in waiting for the students' responses, this practice limits student participation and engagement, as it does not allow them to think critically and articulate their understanding.

In addition to oral questioning, some teachers provided students with simple mathematical problems. However, it was observed that teachers did not give students enough time to solve these problems on their own. Instead, teachers would quickly solve the problems themselves. This approach hinders students' problem-solving skills and does not allow them to fully engage with the material.

Furthermore, it was noted that some teachers only observed the work of a few students repeatedly while ignoring the rest of the class. This selective observation and feedback can create a sense of inequality among students and may lead to a lack of motivation for those who are not receiving attention. Teachers need to provide feedback to all students, recognizing their efforts and providing guidance for improvement.

Observation 1

Grade 10

Topic: Mechanical Energy (from grade 9)

The teacher started the lesson by revising the main points from what students had learned in the last lesson, about energy, kinetic energy, and potential energy. Then I introduced the lesson (Conservation of Mechanical Energy). This time the teacher defined mechanical energy and told the students that mechanical energy is the sum of kinetic energy and potential energy and about the transformation of these two forms of energy by taking a falling ball as an example. This process took 35 minutes (from a total of 45 minutes) and there was no assessment made until this time. In the remaining 10 minutes, the teacher wrote four numerical problems at a time and ordered the students to solve the problems. The questions were:

> "1. Calculate the Kinetic Energy (KE) of a 60kg man running at 8m/s;
>
> 2. Calculate the Gravitational Potential Energy (GPE) of 15kg wooden block placed 6m above the ground.
>
> 3. Calculate the energy stored by a spring when compressed by 5cm with a force of 60N;
> 4. Determine the Mechanical Energy (ME) of a bird of mass 200g flying at 12m/s at a height of 50m above the ground."

The students are given some time (less than two minutes) to solve the problems, and the teacher observed some students' work when the students ask for support from the teacher and most are left with no support. Most of the time the feedbacks given were not clearly stated, the teacher only said correct/not correct but no indication on where and how to correct their mistakes, which is in contradiction to scholars' recommendations about feedback provision which has to be specific, clear, timely and targeted to the individual student (Brookhart, 2011; Race et al., 2001; William, 2013)

After a while, the teacher asks a volunteer student to solve the first problem in front of the students (on the chalkboard). A volunteer student solved the problem on the chalkboard without explaining. By simply confirming the correctness of the solution, the teacher solved the second problem and left the others saying nothing. While solving the second problem, the teacher asked some questions orally but did not wait for the student's response. This is a clear implication that the teacher has no plan on what and how to assess his students.

After the lesson ended, the researcher asked the teacher why the teacher didn't wait for the students' responses to the questions and why he didn't see (observe) each student while solving the given problems. The teacher's answer was *"just to save time".* According to the teacher, to finish the portion in the given time getting fast is the most important thing. The teaching and learning time is reduced from five days learning time to three days and so, Physics periods are reduced from 3 periods to 2 periods per week due to the Covid-19

pandemic, to minimize exposure to getting infected. Students were learning five days a week before the pandemic, but now only three days a week, because of shifting and lack of classrooms since the classroom size has been reduced by half and the number of sections has nearly doubled. This made the teacher teach fast without properly assessing their students to cover the bulky content of the textbook which was even difficult before the pandemic.

The teacher's approach of revising the main points from the previous lesson and introducing the new topic of Conservation of Mechanical Energy is good practice to build upon prior knowledge and provide context for the new lesson. This helps students connect concepts and facilitates better understanding.

However, it is concerning that there was no assessment conducted until 35 minutes into the lesson. Regular formative assessments throughout the lesson can provide valuable feedback to both the teacher and the students, allowing for adjustments in instruction and identifying areas of improvement. It is recommended that the teacher incorporates more frequent and varied formative assessments to gauge student understanding and progress.

The inclusion of numerical problems toward the end of the lesson is a good way to assess students' application of the learned concepts. However, the limited time given (less than two minutes) for students to solve four problems may not be sufficient for all students to demonstrate their understanding adequately. It is important to provide ample time for students to work on problem-solving tasks, allowing them to think critically and apply the concepts effectively.

Observing students' work and providing support when requested is positive practice. However, it is concerning that most students were left without support, which can hinder their learning and discourage active participation. The teacher should strive to provide support to all students, ensuring that everyone has an equal opportunity to seek assistance and clarify their doubts.

Regarding feedback, it is crucial to provide specific and constructive feedback to guide students' learning and help them improve. Simply stating "correct" or "not correct" without indicating where and how to correct their mistakes may not be sufficient for students to understand their errors and make necessary adjustments. Providing targeted feedback that highlights both strengths and areas for improvement can be more effective in supporting student learning.

Understandably, the teacher is facing challenges due to the reduced teaching and learning time caused by the Covid-19 pandemic. However, it is important to note that rushing through lessons and sacrificing proper assessment and feedback practices may hinder students' understanding and progress.

While the teacher attempted to incorporate some formative assessment techniques such as oral questioning and numerical problems, it is concerning that these techniques were not utilized effectively to check students' understanding. By not waiting for students' responses and simply confirming the correctness of solutions, the teacher missed valuable opportunities to gauge student comprehension and address misconceptions.

Additionally, the lack of observation of each student while solving problems can further impede the teacher's ability to understand individual student needs and provide targeted support. Proper observation allows the teacher to identify areas where students may be struggling and intervene accordingly.

The teacher's explanation that the need to save time is the most important factor is understandable given the constraints imposed by the pandemic. However, it is crucial to find a balance between covering the content and ensuring that students have a solid understanding of the material. Without proper assessment and feedback, students may not have the opportunity to address their misconceptions and fully grasp the concepts being taught.

In this situation, it may be beneficial for the teacher to explore alternative assessment methods that can be implemented within the limited time available. For example, using online quizzes or assigning homework that requires written explanations can provide insights into students' understanding without compromising instructional time. Additionally, providing constructive feedback that guides students' progress can be more effective in supporting their learning.

In conclusion, while the observed lesson had some positive aspects, there are areas for improvement in terms of assessment techniques and feedback practices. Incorporating regular formative assessments, allowing sufficient time for problem-solving tasks, providing support to all students, and offering specific and constructive feedback can enhance student engagement and promote a deeper understanding of the subject matter. It is also important for the teacher to prioritize both content coverage and effective assessment practices, even in challenging circumstances. Finding creative solutions and adapting instructional strategies can help ensure that students are able to learn and progress despite the limitations imposed by the COVID-19 pandemic.

Observation 2

Grade 11

Topic: Introduction to electronics (from grade 10)

The teacher started the lesson by asking some questions orally. By saying;

> *"1. What are semiconductors?*
> *2. What are the examples of semiconductors?*

3. How many free electrons does a semiconductor have?"

But, no one responded to the questions, and then the teacher directly started teaching and taught too many concepts in the given 45 minutes. The Unit topic was Introduction to Electronics; the sub-topics were Semiconductors (intrinsic and extrinsic semiconductors), PN- Junction (forward vs reverse bias), Rectification (full wave vs Half wave rectification), semiconductor devices (diodes, LDR, transistors…) and finally logic gates.

However, there was a chance for the teacher to make it interactive but, the lesson was totally lecture, and no student participated in any part of the teaching-learning process. The questions asked by the teacher were not managed. Unfortunately, no students responded to the teacher's questions at the beginning of the lesson. This lack of student engagement can hinder the effectiveness of the teaching and learning process (Suaalii & Tufuga, 2024). It is, therefore, important for teachers to create a supportive and interactive learning environment where students feel comfortable participating and sharing their knowledge.

By directly starting the lecture without addressing the lack of student response, the teacher missed an opportunity to encourage student engagement and participation. Utilizing strategies such as wait-time, providing prompts or hints, or encouraging peer discussion can help stimulate student involvement and promote a deeper understanding of the concepts being taught.

Furthermore, it is concerning that the teacher covered a significant amount of content within a limited 45-minute time frame. While it is important to cover the necessary material, it is equally important to ensure that students have a solid understanding of the concepts being taught. Overloading students with too much information can lead to confusion and hinder their ability to grasp the fundamental concepts.

To make the lesson more interactive, the teacher could have incorporated activities, demonstrations, or group discussions to actively involve students in the learning process. For example, students could have been allowed to explore real-life examples of semiconductors or work in pairs to solve problems related to rectification or logic gates. This would have allowed students to apply their knowledge and engage in meaningful discussions.

Managing the questions asked by the teacher is crucial for promoting student participation. The teacher could have used various strategies such as providing wait-time, breaking down complex questions into smaller parts, or encouraging students to discuss their answers with their peers before responding. This would have created a more inclusive and interactive learning environment.

To sum up, teachers need to create an interactive learning environment where students actively participate and engage with the material. By incorporating strategies to encourage student involvement, managing questions effectively, and balancing the amount of content

covered, teachers can enhance the learning experience and promote a deep understanding of the subject matter.

Observation 3

Grade 12

Topic: Energy (from grade 11)

Here the teacher started the lesson by revising the last lesson about work done. Then the teacher taught too many concepts within 45 minutes period. He defined energy, stated and explained the different forms of energy, explained how energy is transformed from one form to another using a swinging simple pendulum pictorial diagram as an example, explained the work-energy theorem mathematically, and finally about power. Here the teacher asked: "What is the most used unit of electrical energy?" Most students became active in answering the question and some replied: *"joule", "volt", or "watt"*… finally the teacher told them that it is 'KWh'. Next to this, the teacher asked if they knew two vector physical quantities in which their dot product gives power, but no replies. By telling them that the dot product of force and velocity gives power, the teacher gave them homework. Finally, the teacher told the students to take a worksheet from his office which consists of problems covering all the topics they learned today.

The teacher taught broad content and assessed the students rarely. Two questions were asked orally and homework was given all from the same topic (power). The teacher told me that:

> "I am hurrying to finish the unfinished contents from grade eleven (from last academic year, which was skipped because of the COVID-19 Pandemic) and then start contents of grade twelve."

It seems that the teacher is facing challenges in effectively covering the curriculum due to time constraints and the need to catch up on missed content from the previous academic year. While it is understandable that the teacher may feel pressured to cover a lot of material, it is important to prioritize quality over quantity when it comes to teaching and learning.

Teaching to cover content quickly can hinder the student's ability to fully grasp and understand the concepts being taught. Teachers must create a balanced approach for meaningful learning experiences, rather than rushing through the material. This can be achieved by incorporating interactive activities, discussions, and opportunities for students to apply their knowledge.

Assessing student understanding is also essential to ensure that the learning objectives are being met. By only asking a couple of questions orally and giving homework, the teacher may not have enough information to gauge the student's comprehension of the topics covered. It would be beneficial for the teacher to incorporate more formative assessments throughout the lesson to monitor student progress and adjust instruction accordingly.

Furthermore, the teacher needs to provide feedback and clarification to address any misconceptions or gaps in understanding. This can be done through class discussions, individual or group feedback, or providing additional resources for self-study. By actively engaging with the students and addressing their questions and concerns, the teacher can create a more supportive and effective learning environment.

In conclusion, while it is understandable that the teacher is trying to catch up on missed content and cover a lot of material, it is important to prioritize quality teaching and meaningful learning experiences. By incorporating interactive activities, assessing student understanding, providing feedback, and allowing sufficient time to process and comprehend the concepts, the teacher can create a more effective learning environment for the students.

Observation 4

Grade 10

Topic: Conservation of Mechanical Energy (from grade 9)

The teacher started the lesson by revising the previous lesson about the forms of energy (KE, GPE, and EPE) with their mathematical expressions. This can be taken as the pre-requisite knowledge but no assessment was made here. Then the teacher started to deal with 'Mechanical Energy' and 'The Law of Conservation of Energy. Finally, the teacher wrote three problems on the chalkboard for the students to copy and solve them in their home. The questions were:

"1. A ball of mass 500g was released from point A (the top) of 10m length and 5m high inclined plane as shown in the figure below (figure 3). Calculate the KE of the ball as it reaches point B (bottom) of the inclined plane.

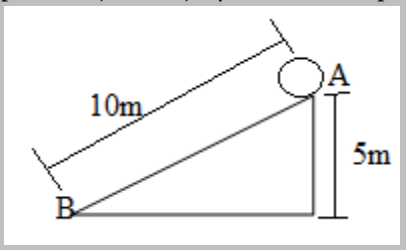

Figure 3

2. *A 60kg man jumps from a 0.8m table. What is his speed when he hits the ground? (take $g = 10m/s^2$)*
3. *What is the total ME of a 15,000kg aircraft flying at a speed of 100m/s at an altitude of 400m relative to the ground?"*

It appears that the teacher is introducing and discussing various concepts related to energy, including forms of energy, mechanical energy, and the law of conservation of energy. The teacher has also provided three problem-solving tasks for the students to complete at home.

While it is commendable that the teacher is covering important topics and providing opportunities for students to apply their knowledge through problem-solving, it is crucial to incorporate formative assessments within the classroom to gauge student understanding and progress.

Formative assessments play a significant role in the teaching and learning process as they provide valuable feedback to both the teacher and the students. They allow the teacher to identify any misconceptions or gaps in understanding, which can then be addressed promptly. Additionally, formative assessments enable students to reflect on their learning and identify areas that require further attention.

Implementing formative assessments does not have to be time-consuming or tedious. Various strategies can be used, such as short quizzes, class discussions, group activities, or even verbal questioning during the lesson. These assessments can be embedded seamlessly within the teaching process and can be used to guide instruction and tailor it to the students' needs.

By incorporating formative assessments, the teacher can ensure that the students are grasping the concepts effectively and can adjust their teaching strategies if necessary. It also fosters an environment where students feel more engaged and involved in their learning.

In conclusion, while it may seem time-consuming to implement formative assessments, they are essential for effective teaching and learning. They provide valuable feedback, identify misconceptions, and allow for timely interventions. By incorporating various formative assessment strategies, the teacher can create a more dynamic and engaging classroom environment that promotes student learning and success.

Observation 5

Grade: 11

Topic: Semiconductors (from grade 10)

In the other observed lesson of the same Unit Topic (Introduction to electronics) with 'observation 3' but a different teacher, it was seen that the teacher taught about semiconductors and did not assess the students while teaching. But during the start of the lesson, he asked the students if they knew the difference between conductors, semiconductors, and insulators. The teacher started to teach without waiting for the students' response and continued to teach for about 40 minutes. In the remaining 5 minutes time, the teacher posed some questions. The questions were:

"1. What are semiconductors?
2. What are insulators?
3. What are the two types of semiconductors?
4. What are the differences between intrinsic and extrinsic semiconductors?
5. Can give me some examples of intrinsic and extrinsic semiconductors?
6. What are the two types of extrinsic semiconductors?

7. Can you give me examples of p type semiconductors and n type semiconductors?"

All the questions are asked one after the other and the teacher harries and doesn't give enough time for the students to respond. One student answered the third question by saying intrinsic and extrinsic semiconductors, all the rest are answered by the teacher himself. All the questions cover the whole lesson but are not properly managed to check the students' understanding.

After the lesson observation, the observer/researcher informally asked the teacher that 'The eight questions cover all the contents you taught but you didn't manage them properly to know your students understanding, why?' The teacher replied:

"It is difficult to cover the contents of the textbook by giving additional time for students to answer. So, I cannot wait too much, that is ideal for me with this big sized textbook. In addition to this, I am teaching contents of grade ten which was supposed to be taught in the last academic year but because of covid-19 there was no schooling last year".

The teacher replied that he acknowledges the importance of assessing students' understanding and agrees that the questions could have been better managed during the lesson. However, he mentioned that due to time constraints and the amount of content to be covered, he felt the need to prioritize delivering the material rather than spending too much time on assessments.

The teacher further explained that he intended to cover all the key concepts and information about semiconductors within the given time frame. He believed that by providing the students with a comprehensive overview of the topic, they would be able to grasp the main ideas and principles.

Additionally, the teacher mentioned that he planned to conduct a formal assessment later, such as through a quiz or a homework assignment, to gauge the student's understanding and assess their learning. He acknowledged that it would have been ideal to have more interactive discussions and opportunities for students to respond during the lesson itself.

The teacher expressed a willingness to reflect on his teaching approach and consider incorporating more formative assessments in future lessons. He recognized the importance of regularly checking for understanding and ensuring that students are actively engaged in the learning process.

In conclusion, while the teacher acknowledges the missed opportunity for more effective assessment during the lesson, he plans to address this by implementing formal assessments and considering alternative teaching strategies in the future.

Conclusion

Based on the study's findings, it was observed that some physics teachers in the school only ask questions or provide mathematical problems at the end of their lessons, while others assess their

students at the beginning and end. The teachers generally do not check students' understanding of the concepts throughout all stages of teaching (before, during, and after the lessons). It is also confirmed that none of them provide feedback to students in a clear, encouraging, timely, and specific manner that would facilitate students' progress.

The teachers perceive that they practice a variety of assessment methods including self-assessment and peer assessment methods. But the findings revealed that they only used limited types of assessment such as oral questioning and numerical problem-solving using formulas. Furthermore, the teachers perceive that they assess students in all the stages of teaching (before, during, and after the lesson) but this was not seen during the lesson observation. They only rarely assess students' understanding either at the beginning, at the middle, or at the end of the lesson. In addition to this, teachers perceive that they provide feedback to students in the way that scholars recommend, but it is confirmed that none of them provide feedback to students in a clear, encouraging, timely, and specific manner that would facilitate students' progress. This implies that there exists a mismatch between the teachers' self-perception about their practice of formative assessment and their practice.

Previous studies on the implementation of formative assessment in Ethiopian schools have highlighted various challenges. These challenges include teachers' limited knowledge and skills in assessment, students' learning difficulties, negative perceptions of learning and assessment among instructors, large class sizes, labor division within schools, school culture, school authority, lack of instructional materials, and an examination-oriented culture (Do Quyen, & Khairani, 2017; Moges, 2018; Bayissa & Jote, 2019). In the current study, teachers in school listed several factors that either facilitate or hinder the practice of formative assessment. Among the facilitating factors, administrators' support in providing necessary materials and allowing the use of stationary materials and copier machines for educational purposes, including assessment, were mentioned. However, although not currently a problem, the size of the student population was identified as a hindering factor, as it becomes challenging and time-consuming to assess each student in a large class. Teachers also noted that students' lack of interest in learning physics and being assessed negatively impacted the assessment practice.

Other hindering factors mentioned by the teachers include the extensive content in the textbook, which makes it difficult to cover using student-centered methods and assess each student frequently due to time constraints. Students' attitudes towards physics, shortage of time resulting in teacher overload, and the lack of in-service training or discussions among teachers within the school to share experiences regarding formative assessment were also identified as challenges to implementing formative assessment.

Recommendations

For effective practice of formative assessment, it is important to mitigate the challenges. The challenges related to content size, students' lack of interest to be assessed and negative attitude towards assessment needs to be resolved and the facilitating factors needs to be encouraged for effective practice of formative assessment. To address the challenges, the teachers provided

valuable suggestions. Firstly, reducing the content of the textbook can help alleviate the burden on both teachers and students, allowing more time for formative assessment activities. Secondly, providing training for teachers on how to use formative assessment effectively can enhance their understanding and confidence in implementing it in the classroom. This training can also help teachers become aware of various strategies to motivate students and create a positive learning environment. Lastly, fostering cooperation between teachers and parents can contribute to student engagement and support their learning process.

In addition to these, to address issues related to lack of motivation, it is recommended that teachers incorporate more interactive assessment techniques that encourage student participation and critical thinking. This could include allowing sufficient wait-time for students to respond to questions, promoting peer-to-peer discussions, and providing opportunities for students to solve problems independently before sharing solutions as a class. Additionally, teachers should strive to observe and provide feedback to all students, ensuring equal attention and support for their learning progress. By implementing these strategies, teachers can create a more inclusive and engaging learning environment, where students actively participate in the assessment process and receive meaningful feedback to enhance their understanding and growth in physics.

To enhance the effectiveness of feedback, it is essential for teachers to align their practices with the recommendations of scholars. This includes providing timely feedback that is encouraging, descriptive, and specific to individual student work. By doing so, teachers can create a more supportive and targeted learning environment that helps students understand their strengths, and weaknesses, and progress toward their learning goals.

Furthermore, the actual frequency and effectiveness of formative assessment techniques may vary and could be further explored through additional research or observations to examine how assessment course is included in the physics teacher education curriculum and how much formative assessment is incorporated in it to implement formative assessment.

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