

Formative Assessment Practices and its Influence on Students' Learning and Achievement in Biology: Lessons from a Selected Community Secondary School in Moshi, Tanzania

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ABSTRACT

This qualitative study explored current teachers' formative assessment practices in Biology classrooms and how these practices influence performance in the subject. The study employed a case study design in a single selected community ordinary-level secondary school in Moshi municipality. It purposively involved two Biology teachers and twenty students selected from classes that do not have national examinations. Data were collected through semi-structured interviews with teachers, classroom observations, and focus group discussions with the students, as well as a review of students' exercise books. The data were transcribed verbatim, then coded and themes generated through interpretive phenomenological analysis. The findings showed that teacher's oral questioning dominated the assessment practices. Other strategies such as peer assessment, student-student interactions, descriptive feedback, and sharing of learning intentions with students seemed to be unfamiliar to the Biology teachers involved. The study recommends among other things, in-service training for teachers on how to employ alternative formative assessment practices during instruction to promote students' learning and achievement in Biology.

Keywords: Formative assessment, feedback, peer assessment, classroom questioning, student's learning, and performance

INTRODUCTION

In recent years there has been a paradigm shift in assessment, whereby formative assessment has gained popularity in the education arena. The shift is because Formative assessment is an integral part for efficient competence teaching and learning (Gavotto-Nogales et al., 2015). It is also part of a continuous process that involves a series of practices such as; sharing of learning intention and criteria for assessment with the students, peer assessment, feedback and collaborative learning activities and self-assessment. Heritage (2007) refers to Formative assessment or assessment for learning as a circle of assessments that allow both teachers and students to adjust their teaching and learning. In formative assessment, the cycle begins with, the teacher diagnosing the students' prior knowledge of the subjects, followed by sharing learning intentions and criteria for assessment with the students.

Then, administering collaborative learning activities that align with the learning intentions which help the students to attain the intended learning goal (Moss & Brookhart, 2012). Meanwhile, the students take charge of their own learning through peer assessment which involve learners to assess their peers' work with the aid of the criteria for assessment set beforehand, proving detailed feedbacks that inform them on their errors and how to rectify them (Gavotto-Nogales et al., 2015; Landry et al., 2014). Indeed, sharing of learning goals and criteria for assessment assist students to self-assess their learning progress (Moss & Brookhart, 2012). During classroom instruction, teachers use information gathered from classroom questioning and collaborative learning tasks to develop evidence of students' learning (William & Thompson, 2008). The analysis and interpretation of these information assist both teachers and students to identify what and how to improve (Gavotto-Nogales et al., 2015; Panayiotis & James, 2014). Thus, teachers have been practicing formative assessment in their classrooms for

checking conceptual understanding of the learners towards the subject and they have been trying to assist their learners in areas of learning difficulties, while the eventual summative assessment is pivotal in measurement of learning over period of time. (Black & Wiliam, 1998; Guskey, 2003). However, literature has indicated that teachers are still employing traditional teaching and assessment strategies which are primarily teacher-centered and therefore limiting competence learning (Kurebwa & Nyaruwata, 2013; Salema, 2017; Tarmo, 2014b). The present study sought to explore what current formative assessment practices are employed by teachers and how do the teachers use these practices in Biology classrooms to improve learning and performance in Biology.

Methodology

The study used qualitative research approach with a single case study design. A case study was considered appropriate since the study targeted generating a comprehensive and in depth explanation about a social phenomenon (Yin, 1994). A single ordinary level community secondary school was purposively selected for the study. The study involved two Biology teachers and twenty students from purposively selected classes that do not have national examinations (form one and three). Data were collected through semi-structured interviews with teachers, focus group discussion (FGD) with students, classroom observations and the review of students' exercise books. All interviews took forty minutes and were tape recorded. Each FGD lasted for thirty minutes and were not tape recorded, but key points were written down by the researchers. In addition, all FGDs were conducted in Kiswahili language which was familiar to all students. The study applied interpretive phenomenological analysis (IPA), whereby the researchers made sense of data, interpreted them and proved an account of experiences in a narrative form (Smith et al., 2009). The analysis involved multiple stages; firstly, the interviews recordings were

transcribed, then the transcript were read repeatedly in order to preserve the original narration. FGD data were translated into English without losing the meaning. The transcription was done verbatim. Both data from interviews and FGD were coded manually, sorted and themes were generated through the use of *Ms Word*. The themes were interpreted to create one narrative story with extracted pieces from the transcripts in order to affirm the given information (Igor & Smith, 2014). Notably, data from observations and document analysis were used to verify the information provided during the interviews and FGDs (Adu, 2017; Yin, 1994).

Findings

Current Formative Assessment Practices

Classroom questioning and end-of-topic exercises

Findings of the present study showed that, teachers use exercises, group works and tests upon coverage of a particular topic. Besides, the nature of questions asked focused on lower levels of Bloom's taxonomy, which emphasize on conceptual recalling and most of these exercises were hardly marked. This means that students may have few opportunities to self-evaluate their own learning progress. Thus, the exercises seldom encourage critical thinking and problem solving. The findings also revealed that teachers rely heavily on oral questioning as the means to assess the conceptual understanding of the students and to encourage classroom interactions. One of the interviewed teachers commented: "*Oral questioning is easy and I can make self-evaluation during the lesson...*" (Teacher's voice; P1).

Another teacher claimed that;

I mostly use oral questioning because it is an easy way to assess many students and it encourages them to participate during the lesson. Oral questions motivate students especially when I appreciate students' responses. (Teacher's voice; P2)

In addition, it was observed that teachers dominated oral questioning during instruction while students remained passive. The mostly asked questions were of low levels, teachers answered their own questions when students failed to produce answers and, in some cases, leaved the question unanswered. Some of teachers' questions observed during instruction were: *"Define excretion."* *"...List the five kingdoms of living thing"*

Moreover, the study findings illuminated that students' questioning is minimal during instruction. Students hardly asked questions to either a teacher or their peers. The student's views from FGD highlight on that:

Some time you are afraid to answer a question because you can't pronounce English words properly and if pronounce badly others will laugh. (Student's 1 voice).

Another student stated that:

"Most of us do not go to the teacher for help (if you don't understand), you just disregard it." (Student's 2 voice)

Arguably, inadequate or lack of students' questioning during classroom instruction can be attributed to either by inability of students to understand English language which is used during lessons, or teacher's dominance. Therefore, such situation can hardly foster peer learning through student- questioning and it may also limit gathering of information that may indicate evidence of learning.

Nature of Classroom Interactions

Study findings illustrated that teachers exhaust oral questioning as a strategy for encouraging classroom interactions. These findings suggest that teacher-questioning is the foundation for teacher-student interaction during classroom instruction. Nevertheless, peer to per interaction was also found out to be a supporter of learning and formative assessment. Through FGD, students revealed that they can

share knowledge with their peers and they understand better when taught by their peers. As one of them stated:

Group works help us to learn from one another so if you initially did not understand a concept, then you will understand it during the discussion... (Student's voice retrieved from FGD)

Peer Assessment

Although students were able to interact through group discussions, it was found out that they lacked knowledge on the use of peer assessment in their learning. Some of them opined that peer assessment is un-authentic means of assessment. Moreover, the findings showed that on its occasional use, peer assessment face a number of challenges such as: students' biasness during assessment and under assessment. This was revealed through FGDs whereby students strongly agreed that peer assessment was a challenging practice;

Peer assessment is not a good thing because when my fellow student assesses my work will do it badly maybe due to envy or jealous and when my peer knows my results, he/she will gossip about them and I will feel terrible (student's 1 voice)

Another participant stated that:

Peer assessment is a bad thing and we do not want it at all because when my peer finds out my marks, he/she will speak ill about me especially if I have failed (student's 2 voice)

It is argued here that students' wrong perception that peer assessment is about marking a neighbour's work and not supporting each other is a misconception of peer assessment. Further, lack of knowledge on peer assessment demonstrated by the students suggests that teachers hardly implement peer assessment properly during the lessons. Therefore, it is likely that the use of peer feedback is still uncultivated field during instruction.

Sharing of Learning Intentions with the Students

It was also found out that teachers seldom shared with the students the learning objectives. Instead, they simply inform students about the topic or/and sub-topic to be covered. Regarding that, one of the students said:

The teacher shares with us only the topic to be covered (Student's 1 voice).

Another student noted:

At the beginning of the lesson the teacher tells us the topic to be covered (Student's 2 voice).

Another student commented:

Sometimes the teacher just begins to teach without telling us the topic (Student's 3 voice).

Arguably, students hardly recognized their achievements, errors, and area to improve during classroom instruction.

Nature of Feedback

Study findings revealed that Biology teachers preferred grading, and scoring for the purpose of creating competition among students, error flagging such as; writing question marks, putting circles, and drawing lines on students' work, were observed in students' works. The findings also illuminated that, teachers corrected all the questions on the blackboard from the tests and exercise. This implies that, Teacher's corrections prevail among other kinds of written feedbacks, and that teachers believe collective corrections amounts to effective feedback. The findings further disclosed that teachers also used punishment as a form of feedback. The students who failed tests and scored grade F were punished. Both teachers and students expressed their views concerning such punishment-feedback. One teacher commented:

If they fail so much, I may go and give them punishment because I think they are not studying hard (Teacher's voice P1).

One of the students stated: *"If you fail and scored F, then you are caned"* (Student's 1 voice from FGD).

Generally, teachers appear to use a diversity of feedbacks both positive and negative basing on the situation at hand. But they hardly employ descriptive feedback which inform students on their strength, weakness and how to improve in future works.

Teachers' Knowledge on Formative Assessment Practices

The study findings showed that teachers had inadequate knowledge about formative assessment. This is also reflected in their practice because they hardly implement some aspect of formative assessment such as peer assessment and descriptive feedback. Therefore, teachers were asked through interviews to share their understanding on the concept of formative assessment and one of them commented: *"I don't remember; Formative Assessment is guidance and counseling..."* (Teacher's voice p1)

Another teacher said:

Formative assessment is an assessment that is conducted to evaluate the achievement of the lesson taught based on the lesson objectives through classroom tasks and questioning.
(Teacher's voice P2)

Among other factors teachers' knowledge and experience determine their practice, thus such inadequate knowledge in formative assessment influences their current practices which hardly nurture learning of Biology.

Discussion

The purpose of this study was to explore current formative assessment practices by Biology teachers and how these practices influence

students' learning and performance in Biology. Assessment is one of the imperative aspects in education without which, it is hard to establish whether learning has taken place and that students are following the learning process or not. Studies show that formative assessment plays important role in enhancing learning and performance especially of lower achievers (Andersson & Palm, 2017; Black & Wiliam, 2010). Yet, teachers have been observed to adopt limited strategies for executing formative assessment to the extent that students' learning gets curtailed. A few of the strategies that the present study observed to be preferred by the teachers include teachers' oral questioning and few classroom tests. The finding in the current study, that teachers are using oral questions as part of formative assessment, is in line with findings by Arslan (2006), who claimed that teachers' questioning has higher rate of recurrence as compared to students' questioning during the lesson.

However, as highlighted by Almeida (2010), and as found out in the current study, teachers' questions emphasize rote learning and memorization. Likewise, Salema, (2017) and Mkumbo (2012) studies showed that even in national examinations in Tanzania, which are administered by the National Examination Council (NECTA) Biology questions highly comprise of remembering and understanding levels. Arguably, such questions limit critical thinking and application of Biology concepts. In line with the findings of the current study, studies by Ndalichako (2015) and Tarmo (2014) observed that teachers utilize traditional assessment strategies that limit inquiry learning. Moreover, the finding that teachers answer questions when students cannot, correspond with a previous study by (Tarmo, 2014), which disclosed that teachers' answer their own questions, before proceeding with a new concept or changed the nature of their questions when students fail to respond. These observations clearly show that teachers hardly invest time in scaffolding students' learning through formative

assessment or they seem to be in a rush to cover the lesson's content. Likewise, Komba and Mwandaji (2015) findings show that teachers stress highly on syllabi coverage and due to that they hardly wait to find out the students' learning progression through time-to-time assessment. The importance of formative assessment is also expressed in Stiggins (2002) claim that, classroom questioning foster students' confidence, motivation and improve a sense of ownership of their learning. The findings of the present study have also shown that teachers extensively employ lecture method which is in essence not compatible with competence-based learning. Such lecturing denies what Costa et al., (2015) observed that student-student interactions promote learning among themselves through collaborative learning tasks and feedback from the peers.

Furthermore, they argue that classroom interactions indirectly influence learning performance and academic achievements. This is also observed by Wang (2017) who acknowledges that when students interact with their peers through asking questions and discussions, they engage better. According to Gavotto-Nogales et al., (2015) students understand better when the information is conveyed to them using peer's language. As a results, it improves conceptual understanding and retention of materials (Siddig & AlKhoudayr, 2018). The present study found that students were passive mostly during instruction and they hardly asked questions either to the teacher or their peers. Besides, teachers hardly used collaborative learning strategies to encourage student-student interactions. It was observed that in a classroom there were more than fifty students which seemed to hinder effective interactions at a large extend. Study findings by De Paola et al., (2013) and Yelkpiri et al., (2012) concur with the present study regarding the difficulties on interacting an a congested class. However, Adimonyemma et al., (2018) disagree with findings of the present study because in their case, student-to-student interactions

were very efficient in large classes. Thus, this is to say that even with large classes, ways can be found through which student-student interactions for a better learning. The present study also found that teachers hardly employ peer assessment during the lesson and students lack an understanding of the significance of peer assessment in learning. In correspondence to that, Komba and Mwandaji, (2015) and Salema, (2017) observed that teachers do not employ peer assessment in their classrooms. Moreover, Alzaid, (2017) findings expose that teachers seldom train students on how and why they should practice peer assessment. As a result Pocock et al., (2010) disclose that students over evaluate or under evaluate their peers' work. However, Double et al., (2020) explain that peer assessment is a strategy which promotes both classroom interaction and student-content interaction. Additionally, Gavotto-Nogales et al., 2015 emphasize that during peer assessment students self-asses their work with reference with their peers' work and then assess their peers' works.

Despite that, Moss and Brookhart (2012) express that sharing of learning objectives play a significant role in improving students' learning and performance. Findings of the present study reveal that teachers seldom share with the students the learning objectives. It was found that teachers do not communicate the lesson objectives to be covered in a lesson. This implies that students end up lacking an insight to where they are going. Correspondingly, Ndalichako (2013) study findings illuminate that teachers do not inform students on criteria for success which blocks students from understanding what is expected of them and be able to evaluate the extent to which they can attain the expected goals. But, Stiggins (2002) argues that when teachers share the learning objectives through verbal communication and using learning activities that reflect learning objectives, then students can self-evaluate and be informed about their own learning

progress. Leahy et al., (2005) explain that teachers should comprehend the learning objective prior to the lesson so that they may effectively rely learning objectives to the students in a simplified language. Arguably, the practice of sharing learning objectives with students is less exhibited in Biology classrooms. The study findings have further shown that teachers use verifying, corrective and elaborative comments on students' response and it was also observed that teachers used written comments to signal students 'errors'. Moreover, the findings of this study show that teachers use scoring feedback to foster competition among students and identifying students' academic position. The tendency of fostering competitions among students increases the gap between the higher achievers and the lower achievers (Rahman, 2018).

In such cases, the lower achievers are highly neglected while teachers focus more to the higher achievers. And yet, Black and Wiliam (1998) explain that descriptive and individualized feedback promote learning improvement to the lower achievers. Notably, when feedback evaluate students according to their pace, it then encourages lower achievers to engage more during the lesson Ozan and Kincal (2018). Furthermore, the study findings revel that, teachers hardly provide students with detail feedback that inform on their errors and how to modify them. This suggests that students miss out essential information that can improve learning and performance. This is because descriptive feedback assists students in realizing and filling their learning gap with the intended learning target (Hattie & Timperley, 2007; Heritage, 2007). Again, constructive and timely feedback gives a clear and detail information to students' work and aids guidance for future work with a regard of learning targets (Gavotto-Nogales et al., 2015; Moss & Brookhart, 2012). Hence, teachers should discourage feedback that instills competition among students. The study has exposed that, teachers punish students who score F. In the same way, Abejehu,

(2016); Ndalichako, (2013) and Rahman (2018) findings show that students who fail to meet the benchmark are punished by their teachers. The use of punishment as a form of feedback is a negative practice since it discourages students and foster low self-esteem (Al-Bashir et al., 2016; Ndalichako, 2013). With that reference, Brinko (1993) and Heritage (2007) argue that feedback should be motivational so that it can create a positive learning environment for students. Therefore, teachers should less employ negative feedback during instruction. As observed in the current study, a good number of studies demonstrate that teachers have inadequate knowledge and skills for practicing formative assessment effectively (Andersson & Palm, 2017; Kitta & Afeli, 2017; Kurebwa & Nyaruwata, 2013). Likely, inadequate teachers' knowledge on formative assessment practices may be one of many hindrances for effective learning and performance in Biology.

Conclusion and Recommendation

This study advocates for alternative forms of assessments that gather the evidence of learning. The former would occur when teachers careful analyze and use the information from assessment tasks to modify teaching and learning techniques during classroom instructions. Therefore, in-service teachers training on formative assessment practices is crucial especially in areas of; peer assessment, descriptive feedbacks, self-assessment and collaborative assessment tasks. This is because teachers' formative assessment practices in classroom are key catalyst in facilitating learning and can improve performances of students.

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