Integrating Assessment with Instruction: Science Teachers' Practice at East Gojjam Preparatory Schools, Amhara Regional State, Ethiopia

Askalemariam Adamu Dessie[1]; Prof PJH Heeralal[2]

[1]Debre Markos University, Department of Psychology, Addis Ababa, Ethiopia

[2] University of South Africa, College of Education, Psychology of Education

Abstract

This study was aimed at investigating science teachers' practice of integrating assessment within their daily instruction to improve students' learning at East Gojjam Preparatory schools, Amhara Regional State, Ethiopia. Both quantitative and qualitative methods were employed to gather the data. The subjects of the study were all of science teachers in the randomly selected schools. From 186 science teachers, 153 of them filled the questionnaire. Moreover, 8 purposively selected teachers were included in the interview and observation sessions. To analyze the data collected through questionnaire, frequency, percentage and mean were used. For the qualitative data content analysis was used. The results of the quantitative and qualitative data showed that the practice of integrating various assessment tools for the sake of learning in the selected schools was very low. Most science teachers administered tests, home works, assignments, and class works at the end of the lesson to consolidate what they taught and to collect marks. Most teachers less likely use different assessment for learning strategies as a part of their instruction to assess higher order thinking and to collect evidence to identify learning gap for future learning. Such activities have negative implication on the quality of science education. Thus, school administrators, teachers, and researchers should do more on the area to effectively implement formative assessment to improve students' learning.

Key Words: Science instruction; Integrating assessment; Assessment for learning; formative assessment

Introduction

Formative assessment is a continuous process which is used to gather evidence about students' learning minute-by- minute to identify the next step in learning (Stiggins and DuFour, 2009; Greenstein, 2010; Fisseha, 2010). It is an integral part of the daily instruction to improve students' learning (Fautley and Savage, 2008; Twing, Boyle and Charles, 2010; Crisp, 2012). Integrating formative assessment with daily instruction allows teachers to use a variety of assessment methods, provide useful and holistic picture of students' progress (Ottevanger, Akker, and Feiter, 2007; Fautley and Savage, 2008), improve the quality of teaching, and provide input for future learning (Martínez, Stecher, and Borko, 2009; Keeley, 2008; Crisp, 2012). "Effective, fit-for-purpose assessment is central to the outcomes and reputation of high quality education" (Walport,Goodfellow, Mcloughlin, Post, Sjovoll, and Waboso, 2010: 43).

Formative assessment is also vital to provide evidence for the learner about their learning (Stiggins, 2008); to capture students' attention and effort throughout the lesson; to give guidance for needy students on a regular basis; to generate appropriate learning activity; to provide constructive feedback (Lauvas, 2008); to assess higher order thinking; to increase students'self-efficacy, intrinsic motivation and responsibility for their own learning; to prepare learners for lifelong learning (Fautley and Savage, 2008, Gardner and Harlen, 2010, Fisseha, 2010); and to deeper students' understanding (Keeley, 2008; Wyatt-Smith and Gunn, 2009). Students who are engaged in continuous formative assessment are able to monitor and scaffold their learning, make corrections, and develop a habit of mind for continually reviewing and challenging what they know (Lauvas, 2008; Moss and Brookhart, 2009).

Correspondingly, students have opportunities to set learning objectives, to develop different learning strategies, to assess themselves and their peers, and to use feedbacks to fill the gaps in their learning, and to engage in activities that have value in future (Crisp, 2012). According to Stiggins (2008: 3), assessment which reveals the next step in learning is "a powerful booster of confidence and motivation' for students as well as for teachers." That is why teachers are recommended to integrate a variety of assessment methods in their science instruction: such as classroom dialogue, questioning, self-assessment, peer assessment, project works, formative feedback, quizzes, practical work and so on to improve students' overall performance.

Thus, assessment and teaching should be compatible and act to support one another (Bloxham and Boyd, 2007) since good teaching is aligned with good assessment (Libman, 2010). Similarly, for Cowie (2012) curriculum, instruction, assessment, learning and students' achievement are strongly linked and both of them are equally powerful to influence one another. Evidences showed the significant effect of integrating assessment with daily instruction to improve learning standards (Boud and Falchikov, 2007; Bloxham and Boyd, 2007; Stobart, 2008; Fautley and Savage, 2008; Boud, 2009; Crisp, 2012; Cowie, 2012; Herman, 2013). Hence, the effectiveness of assessment depends on its alignment with instruction and learning activities (Irons, 2008; Suurtamm, Koch and Arden, 2010; Libman, 2010).

Despite the research evidence, hence, it becomes challenging and difficult to bring new modes of assessment into practice to promote learning (Dysthe, 2008; Cumming and Wyatt-Smith, 2009; Cowie, 2012). Mostly, teachers tend to use tests that encourage low cognitive level activities such as recall of isolated items of knowledge, which is unreflective and not aligned to the learning objectives; focus exclusively on what is tested to bring high scores (Harlen, 2006), and they "teach to the test" (Harlen and Gardner, 2010:23) rather than "teaching for understanding" (Schauble and Glaser 1996; Stiggins 1999; Wiggins 1998 quoted in King, 2006:33) and "giving less attention to students' wider developmental and educational needs" (Nusche, Radinger, Santiago, and Shewbridge, 2013:14). All the mentioned challenges will occur particularly when high stakes accountability pressures are added (King, 2006; Harlen and Gardner, 2010) and are used to evaluate teachers and schools effectiveness (Harlen, 2006). Specifically, in Ethiopian the secondary school educational system is highly directed by the national examinations given at the end of each year. Hence, what goes on in the classroom is largely dictated by what happens in the public examination halls, because, as stated in the Ethiopian Education and Training

policy, admission to higher institutions is only based on students result on this paper and pencils multiple choice public examinations

Research showed that in most Sub-Saharan Africa countries, "assessment at the school-level is very much summative in nature, and is hardly used for instructional purposes or to provide feedback to the learners to fill the gaps in the future" (Ottevanger, Akker, and Feiter, 2007:20). Practically, continuous assessment squeezes formative assessment out of the instruction by adding more intensive summative assessment tests and quizzes (Lauvas, 2008). Mostly, assessment was used as tool to judge and rank students and schools rather than considered as a source of evidence to improve students' learning (Heritage, 2011). In many cases, teachers and students do not use assessment evidence as an input for future learning (Henriques, Colburn, and Ritz, 2006). Students should be given continuous formative feedback rather than judgmental feedback to see their improvement over time and to understand what comes next in their learning and to develop positive belief about themselves (Stiggins, 2008; Alkharusi, 2008; Hodgson, 2010).

However, using summative tests or paper and pencil tests continuously is not formative assessment. In such repetitive summative assessment students may achieve high marks but their learning is not deepened to apply it into real life situation (Race, 2007). Continuous summative assessment encourages cheating, memorization and regurgitation of facts and rote learning and greatly weakened and lost students' motivation to do more and their legal rights in learning (Lauvas, 2008). Moreover, such assessment system is important only for few students who have good memories of facts, those who work well under pressure and those who like leaving things to the last minute (Wiliam, 2008).

To be formative, continuous assessment must show the current progress of students and what comes next in the learning or it should provide evidence for students and teachers to fill the gaps in learning (Stiggins, 2008). What makes any particular assessment formative is not the specific assessment tool employed continuously but how the information gathered from the tool is used to improve learning and to adjust instructional strategies toward the learning goals.

Thus, assessment must be comprehensive, continuous and integrated into daily instruction to provide evidences for teachers and students to know what comes next in the learning rather than given at the end of the lesson to evaluate learning (Stiggins, 2008; Alkharusi, 2008; Stiggins and DuFour, 2009; Martínez, Stecher, and Borko, 2009; Greenstein, 2010; Heritage, 2011; Crisp, 2012; Cowie, 2012). We all should give high attention to ensure effective practice of formative assessment in science education to prepare self-regulated learners, creative thinkers, lifelong learners and informed citizens, who are pivotal for economic, social and political development of a country. Therefore, this study aimed at investigating science teachers' practice of integrating assessment within daily instruction for the sake of learning at East Gojjam Preparatory Schools, Amhara regional State, Ethiopia.

Methodology

Mixed method research design, particularly concurrent design was employed in this study to assess science teachers' practice of assessment for learning in second cycle secondary schools. The population of the study was all science (Mathematics, Chemistry, Biology and Physics) teachers in East Gojjam preparatory schools, Amhara Regional State, Ethiopia. There are 18 preparatory schools in East Gojjam Zone. To

selected the sample, the schools were clustered into two based on their year of establishment. Those schools 'older' than ten years were grouped in one category and those schools 'younger' than ten years were clustered in the second category. From each group, five schools were selected randomly using lottery methods. Finally, all science teachers in the selected ten schools were subjected to fill the questionnaire. From 186 science teachers, 153 of them filled and returned the questionnaire. Moreover, eight science teachers were selected purposively based on their teaching experience, subject teach and school for interview and observation session.

The questionnaire has 63 closed-ended items related to teachers' practice of assessment for learning. It was rated using a five point Likert scale ranging from 1 (Never) to 5 (always). Pilot study and peer review were conducted to increase the validity and reliability of the items. Finally, based on participants' responses factor analysis was done to reduce the number of items into manageable factors. The factor structure, reliability and percent of variance explained respectively were: Application of assessment evidences (α =0.720, 10.7%), Collection of learning evidence (α =0.878, 10.4%), Support provided to engage students' actively (α =0.820, 9.4%), Interpretation and communication of evidences (α =0.905, 7.6%), Learning contents assessed (α =0.808, 6%), and Planning of formative assessment (α =0.782, 5.8%). Totally the six factors accounted 49.90% of the variance in the practice scale.

To analyze the quantitative data frequency, percentage and mean were used. The data gathered through interview and observations were analyzed using content analysis. Finally, both results were integrated to understand the problem under investigation in the better way.

Results

Teachers' practice of assessment for learning in science subjects

The quantitative data in this study indicated that 93.43% of science teachers in the selected school regularly provide supports for students to engage them actively in the lesson. Moreover, 66% and 65.35% of teachers responded that they mostly used assessment evidences appropriately to improve students' learning and their instruction, and plan formative assessment strategies as an integral part of their lesson respectively, whereas, the qualitative data goes up against it. During the interview and observation sessions, there were not evidences that pointed to the teachers' use of formative assessment strategies regularly with their students.

On the other hand, 67.32%, 56.21 and 48.37% of the teachers find themselves limited by different factors to implement different assessment for learning methods to collect learning evidences, interpret or identify learning gaps and communicate evidences in a way to improve students' learning, and assess higher order learning outcomes to equip their students with essential scientific skills and competencies respectively. It is similar with the qualitative result. Next the results of the quantitative and qualitative data for each factor loadings were presented in detail accordingly.

Support provided to engage students actively

From the six factors "Support provided to engage students actively" was practiced frequently by most science teachers (a mean of 3.73) in the selected school. Most science teachers (79% with a mean of 4.05

and 77.8% with a mean of 4.06) revealed that they regularly encourage every student in their class to ask questions and to actively participate in the lesson. Respondents also encourage students to share ideas (72.5% with a mean of 3.88), inspire every student's to answer questions (72.6% with a mean of 3.93), give home works (69.9% with a mean of 3.88), ask oral questions (65.4% with a mean of 3.84), persuade their students to take risks and listen to others ideas carefully (66.6% with a mean of 3.76), and create opportunity for their students to act on the feedback provided (65.4% with a mean of 3.75). Large number of teachers (81.1%) on the other hand, encourages their students to answer questions quickly. Lesson observations also confirm it. Most teachers immediately answer the question and proceed to the next explanation, if the expected answers were not forwarded within the expected time.

In most of the observed classes, except in one mathematics lesson (to some extent), most of the students listen, read text books and take notes. Teachers also stated that they regularly used lecture methods and simple oral questions. For example, Teacher B stated that:

> *Mostly, I used teacher centered methods to explain important point in the lesson, because students expect themselves as a student who passively receive information and the role of the teacher as a good reservoir and impart of knowledge. If I used student-centered methods, they consider me as lazy teacher, who is careless and who does not worry about their learning* (Teacher B, Nov 19, 2014).

Besides, one mathematics teacher reported that he encourages his students to share ideas in group and to ask and answer questions during the lesson. But, he used such techniques to allow students to remember or better understand what they learn to score high marks on tests, rather than to reflect new ideas and thinking for future learning.

Application of assessment evidences

Regarding the "Application of assessment evidences" factor, most teachers showed inconsistency in their responses. It is the second loaded factor according to the results of the descriptive statistics (a mean score of 3.70). Even if, 66 % of teachers in the selected schools scored greater than the expected mean score in the factor, they also used assessment results for judgmental purpose mostly. 80.4 % and 69.9% of science teachers agreed that they regularly used the collected assessment evidences to modify their teaching strategies and to plan what to teach next respectively. Furthermore, most teachers (70.6% with a mean of 3.92) frequently used assessment results to identify the gap of students understanding and 74.5% of them used it to advise their students on how to fill such gaps in their learning. Similarly, half of the science teachers (51.7 and 51.6%) suggest means for their students to plan their future learning and allow them to resubmit their work once they improved it respectively.

In contrast to the above, 79.1% of respondents' regularly used assessment results for the purpose of recording for final marks. Moreover, 62.6%, 60.2% and 67.4% of respondents' described that they mostly used assessment evidences to categorize students into different groups based on their results, to make the students aware about their achievement against other students' result and to approve students who score high in the assessment task respectively. The interview results also confirm that almost all of the interviewed teachers were guided by the traditional use of assessment results, which have no value for

future learning. Teachers were asked to describe*: For what purpose do you use assessment evidence?* For instance, Teacher E stated that:

> *I used assessment results to classify students into different groups (high achiever, medium achiever and low achiever) and as a result to give tutorial accordingly. Moreover, I used it to create awareness among students about their level of understanding or rank against other students, because I believed that creating competitive environment between students is good to improve students' learning. Finally, I record the result on the mark sheet for final result to decide whether a student passes or fails in the subject* (Teacher E, Nov 14, 2014).

Interpretation and communication of evidences

The third highest rated and diversely responded factor is the "Interpretation and communication of assessment evidences" (a mean of 3.39). In order of level of practice science teachers stated that the collected assessment evidences were interpreted regularly: against learning objectives (59.5%, with a mean of 3.61), against assessment criteria or standards (58.1% with a mean of 3.58), compared to other class of students with the same grade level (52.3% with a mean of 3.5) and compared to other students result within the same class (51% with a mean of 3.44). During the interview session, most teachers also expressed that they identify students' learning gap in the lesson by comparing their result with other students result in each assessment task.

One example:

> *I usually compared students' score in the assessment task within the class and with other class of students to know students' level of understanding in that lesson. Moreover, such relative analysis helps me to assess how much my lesson was successful compared to other lessons and teachers who teach the same grade level. Knowing students level of understanding in my subject (i.e. high achiever, medium achiever and low achiever) also helps me to form groups for further learning* (Teacher F, Nov 18, 2014).

Moreover, descriptive feedback was not given by most teachers in the selected schools. 40.6% and 37.9% of teachers agreed that they regularly or often provide only marks and detailed answers for each assessment task along with marks respectively. Evidences from the interview also indicated that teachers regularly provide feedback to the students in the form of numerical scores and correct answers rather than giving constructive messages on how to improve their work in the future to facilitate their learning. However, this kind of feedback did not give direction for students to know where they are in relation to the learning objectives and success criteria to identify the gaps in their learning. In general, to improve students' learning through formative assessment, students result in any activity or task should be interpreted in line with the intended outcomes of the activities or success criteria and to some extent with their previous achievement.

Planning of formative assessment

From the six items which are loaded for the "Planning of formative assessment" factor, 56.2% and 53.6% of science teachers reported that they regularly identify learning objectives and assessment criteria and

design better questions and questioning strategies in the planning of their lessons respectively. Similarly, 45.8%, 47.8%, 41.8% and 30.8%, of the respondents frequently plan: how to share learning objectives and assessment criteria, to examine students' prior knowledge in the subject, student-centered assessment methods and how and when to provide feedback respectively. Thus, the quantitative data indicates that the planning of formative assessment strategies as an integral part of the lesson preparation prior to collecting learning evidences was practiced by few science teachers in the selected schools.

Correspondingly, as to the expression of two interviewed teachers:

> *…Still I did not plan formative assessment strategies such as self-assessment, peer assessment, self-reflection, peer questioning, student to student dialogue, sharing of learning objectives and assessment criteria, and when and how to provide descriptive feedback.* (Teacher B, Nov 19, 2014).

> *Mostly, I include simple oral questions as one part of the lesson planning to evaluate students' level of understanding in each phase of the lesson. Many of them are simple oral questions, because, most of my students are low achievers who passed the national examination through cheating* (Teacher A, Nov 20, 2014).

Including formative assessment strategies as one part of their lesson preparation helps teachers and students to collect learning evidences related to students' knowledge, skills and attitude in the lesson and, as a result, to use such evidences as an input to improve students' learning and to adjust instruction. Moreover, it encourages higher order learning and active engagement of students during the lesson.

Learning contents assessed

From the five items which loaded the "Learning contents assessed" factor, 62.7%, 49.6% and 49% of teachers often focus on assessing difficulties during the teaching learning process, knowledge of scientific facts and higher order thinking respectively. However, the application of problem solving skills and scientific reasoning ability were assessed occasionally (37.3% and 35.9% of respondents respectively). And 28.1% and 26.8% of science teachers hardly ever assessed such higher order thinking in the selected schools.

The interview results also support it. Most interviewed teachers expressed their lack of focus on higher order thinking in the learning as well as in the assessment process due to students' different background. For instance: "*Mostly, I asked factual questions that are short and precise. My question does not need much effort and calculation, if they understand the concept they can easily answer it."* (Teacher G, Nov 18, 2014)

Collection of learning evidences

This factor addresses how different formative assessment strategies are integrated in the teaching learning process to collect information about students' knowledge, skills and attitude in that lesson to decide next steps in learning. However, it is the least practiced formative assessment phase in the selected schools (a mean score of 2.87).

Here, 67.32% of science teachers did not put into practice different assessment for learning strategies throughout their daily instruction to collect learning evidences for further learning in the selected schools. Particularly, large number of teachers hardly put into action: criteria and objective setting with students (2.23), self-reflection through drawing and concept mapping (2.48), quizzes (2.5), self-assessment (2.57), written feedback (2.57), peer feedback (2.65), peer-assessment (2.69), practical work (2.86), peer to peer questions (2.79) and students' reflection of ideas on the lesson learnt (2.99), which are the main components of assessment for learning to collect evidences. Similarly, other assessment for learning methods which loaded this factor such as student-to-student dialogue (3.30), observation (3.19), oral feedback (3.17), presentation (3.13), teacher-to-student dialogue (3.05) and provision of written comments on how to improve their work (3.05) were practiced occasionally. While, 54.9 % of science teachers regularly ask self-evaluation questions at the end of their lesson (with a mean of 3.52), which is important to see the achievement of learning objectives, but it has little value to provide information for further learning.

The qualitative results also confirm it. Teachers were also asked about formative assessment tools they used in their lessons to collect learning evidences. All teachers appeared to share similar practices. The common assessment methods they employed were tests, assignments, mid exams, home work, and oral questions and for some class works. The lesson observations evidence it. Moreover, these assessments are given at the end of the lesson or chapter to check students' understanding. Thus, evidences collected through such assessment methods cannot reflect the full range of learning goals to identify learning gaps; rather, it will be applicable for recording and reporting results. Most of teachers felt that large number of students in one class and limited instructional time were factors for them to effectively integrate different formative assessment strategies into their lesson. For these reason, one mathematics teacher used self-and peer assessment as a "time saver" for marking students' work. Thus, sharing of learning objectives and success criteria, self-and peer assessment, descriptive feedback, student to student and teacher to student dialogues were not strong points for most of the teachers in the selected schools. Even, most of the participants realized that such words are new for them.

Discussion of Results

Research evidences approved that formative assessment has a decisive power, particularly in science education, to improve students' understanding of scientific ideas, reasoning ability, scientific competencies of gathering and using evidences, scientific attitudes, ability to communicate using appropriate scientific languages, and application of scientific problem solving skills in new situations (Lauvas, 2008; Keeley, 2008; Irons, 2008; Moss and Brookhart, 2009; Harlen, 2010; Hasan and Ehsan, 2013). Despite of this truth, the practice of integrating formative assessment with daily instruction to improve students' science learning standards in the selected school is very low. Mostly, science teachers implement formative assessment in its' traditional way. They use formative assessment to review learning over a period of time and to collect pieces of marks continuously rather than bearing in mind its' learning value. The results of this study related to the six factors of the practice of assessment for learning scale were discussed below.

Planning of formative assessment

Planning different formative assessment strategies as an integral part of our lesson preparation is a prerequisite for any activity in the teaching-learning process to improve learning through active engagement of students in the learning to learn environment. It is the first step in formative assessment cycle to integrate it with daily instruction to improve students' learning. However, it was not the trepidation of most science teachers in the selected schools.

As mentioned above, half of the teachers reported that they frequently planned better questions and learning objectives in their lesson. While, considerable number of teachers reported that they rarely plan to share learning objectives and assessment criteria, student-centered assessment methods, to provide feedback that will identifies next steps in learning, and to assess students' prerequisite knowledge.

Similarly, the qualitative data revealed that planning of different assessment for learning strategies as an integral part of the lesson preparation was practiced hardly in the selected schools. Most interviewees articulated that they incorporate assessment methods such as classwork, assignments, home work, and oral questions in their lesson plan to evaluate students' level of understanding at the end of the instruction. Lesson observations also support it. Evidences showed that the endeavor of teaching, learning, and assessment closely entwined when lesson preparation includes various assessment for learning strategies.

Thus, it seemed that the planning of different assessment for learning strategies as an integral part of daily instruction was very low in the selected schools. Consequently, failure in planning of different assessment for learning strategies as a part of lesson preparation would lead to failure in putting such assessment for learning strategies into practice to achieve higher order learning out comes.

Collection of learning evidences

One of the main phases in the integration of formative assessment into daily instruction was collecting evidences of students existing ideas, skills, knowledge, and ways of thinking in the context of an activity during the lesson. Implementing different assessment for learning strategies was vital to partner teachers and students in the teaching-learning process to continuously and systematically gather evidences of learning for next steps in learning (Moss and Brookhart, 2009). Dysthe (2008) also illustrated the importance of integrating different alternative assessment methods as a part of daily instruction to assess and gather evidences of higher-order science thinking, problem solving skills, and the application of knowledge into real-life contexts.

However, the result of this study indicates that most science teachers hardly integrated different assessment for learning strategies in their daily instruction to collect learning evidences for further learning in the selected schools. As illustrated above, large number of teachers rarely shared learning objectives and assessment criteria, and used self-assessment, peer assessment, self-reflection, quizzes, written feedback, peer feedback, practical work, and peer to peer questions.

The interview and observation data also revealed that:

- Learning objectives and assessment criteria's were not shared, even some teachers expressed that they were not mindful for such activities;

- Self-and peer assessment, peer to peer questions, teacher to student dialogues, peer feedback, self-reflections were not implemented; one teacher used self-and peer assessment as a time saver for marking class works, home works…;
- Most students simply listened and took notes during lecturing; and
- Written feedbacks that suggest future works were not provided on students' work.

Research evidences revealed that integrating such assessment strategies are crucial to make self-regulated learners (Moss and Brookhart, 2009), to help them to identify their learning gap and next steps in their learning (Hodgson, 2010), and as a result to increases the rate of their learning dramatically (Irons, 2008). Even if, teachers gave class works, home works, and individual exercise toward the end of the lesson, the tasks were given to the students to practice and consolidate what the teacher had just explained, not to collect evidences for further learning or to adjust next steps in learning. Yet, such assessment methods did not give students evidences about their own thinking and growth during the lesson. As a result it did not give evidences to gain new perspectives on their potential to take actions in the future to learn science.

Evidences also showed that collection of learning evidences related to students' skills, knowledge, and attitude relevant to the learning objectives is not the sole practice of teachers, but rather both teachers and students collect evidences together to advance students' learning and achievement (Greenstein, 2010; Heritage, 2011) because, higher order learning is occurred through interaction between the student, the teacher, and the tasks in the social environment. Therefore, teachers had to put into practice different assessment for learning strategies or tasks that engaged students actively and brought out the application of higher order skills, knowledge, and thinking in a new situation to acquired continuous evidences for next steps in learning.

Interpretation and communication of assessment evidences

Identifying learning gap and communicating this gap against learning objectives and assessment criteria is one of the main feature in formative assessment to improve students' learning, because it provides information about what a student can do or not do in relation to the intended learning objectives.

More than half of teachers in the selected schools interpreted assessment evidences or identify learning gaps against learning objectives and assessment criteria. On the other hand, teachers reported that they regularly judged the results of students in the task in relation to the performance of other students within the class and with other classes. The results of the interview session also confirmed it. Most interviewed teachers identified students' level of understanding in the subject against the result of other students' and communicated the result with them and schools in such way. However, assessment which focuses on competition among students rather than on personal improvement de-moralized low performing students to further next steps in their learning. Moreover, such type of norm-referenced interpretation of results does not clearly show students' progress and gap in learning against the intended learning objectives and it does not give clear direction for students what to do next. Rather, it creates competitive classroom environment which undermine the self-esteem, confidence, and motivation of low achieving students to improve their learning in future (Stobart, 2008; Fautley and Savage, 2008; Heritage, 2011).

Provision of support to engage students actively in the lesson

It is one of the interventions in the assessment process to close the gaps in students' understanding. Currently, assessment for learning is seen as an active social process, particularly accomplished by the quality of teacher-student and student-student interaction in the learning context (Dysthe, 2008; Heritage, 2011; Willis, 2011). This two-way exchange of information between teachers and students is the heart of formative assessment to improve students' learning.

The result of this study indicates that most science teachers regularly supported their students to engage them actively in their learning through the key elements of formative assessment. As to the response of most teachers, they allowed students to actively share ideas in group, to ask questions, to answer, to take risks, and to listen other ideas. However, in most of the observed classes, teachers did not engage their students actively in the teaching-learning process, particularly in formative assessment. Except one mathematics lesson, most teachers dominantly used lecture method and students were not allowed to share ideas in group. Teachers invested very little effort to support their students to actively engage them in the lesson. It seemed that most teachers were very much concerned in covering the contents of the lesson on time, rather than engaging every student actively in the lesson to improve their understanding.

In all of the observed schools, none of the teachers gave chance for students to discuss the questions raised in groups to allow every student to share ideas and to actively engage all of them in the lesson. However, questioning is one of the key strategies in formative assessment to engage every student actively in the lesson through thinking, to assess students' prior knowledge, to communicate learning objectives (Moss and Brookhart, 2009), and to develop a learning culture of open discussion or dialogue between students and students to teachers (Irons, 2008).

Despite of this fact, most teachers in the observed class did not ask divergent questions and provide enough thinking time during questioning to engage every student through thinking and to get more explanation about the question. Large number of teachers reported that they regularly "encouraged students to answer questions quickly" which support fast learners and memorization of facts. These low levels of questions and the involvement of few students in answering such questions could keep the lesson going, but it was actually out of touch with the understanding of most of the class students.

Generally, even if 93.43% of teachers reported that they regularly or often provided support to engage students actively in the lesson, evidences from the qualitative data revealed that teachers had not developed the group work sprit with their students. The lesson was still all teachers driven. Students in the selected schools were not engaged actively to collect, interpret and use assessment evidences for their learning. Thus, the actual practice in the classroom showed that the provision of supports to engage students actively in the lesson was very low in the selected schools. Teachers became the only actors in the classroom, particularly in the assessment process, which had less value to achieve the desired learning objectives. Hence, there was a mismatch between what the teachers reported and what they actually practiced in the classroom. This indicated that teachers had the theoretical knowledge on the role of students that they had in learning, but they failed to put the theory into practice.

Learning contents assessed

It is widely acknowledged that science education should equip students' with problem solving skills, critical thinking, and scientific reasoning abilities, which enable them to be competent citizens of the country because the knowledge based economy in the 21st century needs critical thinkers and lifelong learners. On the contrary, the accumulation of factual knowledge, formulas and principles in science education is not vital to acquire the precondition for successful learning in the future. Consequently, assessment tasks need to be authentic (i.e. realistic, practical and challenging) to achieve these higher order learning outcomes in today's education system because authentic assessment tasks focus on students' problem solving and analytical skills, scientific reasoning abilities, ability to integrate and coordinate what they learn, creativity ability, and ability to work collaboratively.

Despite this intention, the results of this study indicates that science teachers mostly assessed lower levels of learning contents such as knowledge of facts, principles and formulas in the selected schools. Near to half of science teachers reported that they assessed learning difficulties, knowledge of scientific facts and higher order thinking (i.e. analysis, synthesis and evaluation). Relatively, large number of teachers on the other hand assessed problem solving skills and scientific reasoning ability of students in new situations occasionally and hardly ever.

However, assessment, which emphasis on the recall of isolated facts encourages shallow learning and memorization of scientific facts (Liu, Lee and Linn, 2011). It does not deepen students' understanding of scientific knowledge, attitudes, and skills which are crucial in today's' education, because such factual scientific question do not allow students to fully understand the principle, the cause and effect relationship between variables and the application of scientific concepts in the real situations (Odom, Marszalek, Stoddard, and Wrobel, 2011).

The qualitative result also showed teachers' predominant focus on assessing memorization of simple learning outcomes. As said by most interviewed teachers, they did not design assessment tasks in line with the learning objectives and real world tasks. Rather, they simply put straightforward oral or written questions to accommodate students who had different understanding levels (high, medium and low achievers) in science subjects and as a result to decrease attrition rate in the school. The results of the lesson observations also validated it. During lesson observation, most teachers asked factual questions such as simple facts, formulas, principles, which discourage divergent thinking's in the teaching learning process. Due to this fact, the assessment tasks used in the selected schools lacked alignment with the learning objective and real world tasks to be authentic assessment to assess higher order thinking in science subjects. It is true that failure in planning a variety of assessment for learning strategies as a part of their lesson would lead to failure in assessing higher order learning out comes in the selected school.

Application of assessment evidences

This factor concentrated on how the collected evidences from different assessment tasks were used to address students' needs or next steps in learning. The use of the collected assessment evidences to advance learning is the hallmark of formative assessment that makes it different from other modes assessment. However, the results of this study indicated that the application of the collected assessment evidences to

improve students' learning was very low in all of the selected schools. There was clear misconception on the use of assessment evidences in the learning process. On one hand, large number of science teachers regularly used the collected assessment evidences to modify their teaching strategies, to identify gaps in students' understanding, to advise students how to fill the gaps in their learning, and to plan what to teach next.

Though, it seemed that most teachers in the selected schools were appropriately using assessment evidences to improve students' science learning. In contrast, they also frequently used the collected assessment evidence to record marks for final result; to approve students who scores high in the test, quiz, mid exam; to categorize students into different groups (high achiever, medium achiever and low achiever); and to tell their achievement on a task against other students result. The fact was that, formative assessment was aimed for internal modification, but not to select, rank and group students accordingly.

This might be happened because of teachers' lack of appropriate knowledge and skills about formative assessment strategies and its purpose in learning. In the interview session, most teachers also expressed that they used assessment evidences to classify students into different groups, to record marks for final result and to make aware students about their results against other students. The observation also confirmed it. However, such activities undermine the self-esteem, motivation and confidence of low achieving students (Fautley and Savage, 2008; Fisseha, 2010). It empowers low achieving students to attribute their failure towards lack of ability rather than effort to do more in the future.

In general, what was evident in this study was that the majority of science teachers did not effectively integrate formative assessment strategies into their daily instruction to improve students' learning. Particularly, the results of the qualitative data clearly indicated that science teachers relied predominantly on the traditional form of formative assessment. This was unfortunate because it narrowed the instruction and limited students' engagement in the teaching learning process to achieve high science education standards.

As a result, it was a dream to say assessment for learning was put into practice effectively in science subjects in the selected schools to assess higher order thinking; to increase students motivation for learning, to develop self-regulated learners, to engage every students actively in the assessment process, to collect learning evidences (i.e. evidence of students' knowledge, skill and attitude), to identify learning gaps and to fill such gaps using appropriate intervention mechanisms and as a result to improve their science learning.

Conclusion

Teachers in the selected schools predominantly focused on increasing students' academic achievement or on the collection of marks to decrease attrition rate rather than on improving students' learning to learn skills. As a result of this intention, teachers mostly involved with continuously administering and scoring more simple assessment tasks such as assignment, quiz, test, homework, and mid exam throughout the school year as a means of evaluating students' learning and collecting marks. Both the quantitative and qualitative results used below to conclude for each factor loading of the overall practice of assessment for learning in the selected schools.

Planning of formative assessment

In the selected schools science teachers' give low attention to incorporate different assessment for learning strategies in their lesson preparation for the purpose of students' further learning. Thus, planning of different formative assessment strategies as an integral part of the lesson preparation to improve students' learning is not a matter of most science teachers and even for school officials in the selected schools, they all follow the traditional culture of lesson planning. As a result, the teaching-learning process becomes superficial which focuses on content coverage, rather than deepening students' understanding about the subject.

Collection of learning evidences in the selected schools

Both the quantitative and qualitative data revealed that teachers did not effectively implement different assessment for learning strategies to collect learning evidences for further learning. Rather they regularly used tests, class works, home works, and assignments towards the end of the lesson to collect marks for the purpose of summative assessment. Thus, students' active involvement became suffered in the teaching-learning process to collect evidence for their learning to improve their understanding in future. Moreover, it has negative implication to assess the more holistic picture of students' performance in the lesson.

Interpretation and communication of assessment evidences

The identification and filling of students' learning gaps against the learning objectives in the selected schools and communication of assessment evidences too were very low. Teachers rarely identify learning gaps against the learning objectives, students' pervious performance and assessment standards to decide next steps in learning. Moreover, most teachers in the selected school communicate the evidences with students using marks, correct and wrong answers which have no value to improve students' learning. Thus, it has negative implication on the self-esteem, confidence, effort and working ability of low achieving students in the selected schools.

Supports provided to engage students actively

Active engagement of students in formative assessment is the key element to improve their learning. In the new learning paradigm, students are at the center for any activity in the lesson to achieve the competencies required in the 21th century. The result of the current study, particularly the quantitative data divulged that most science teachers provide support to engage their students actively in the lesson. Whereas, the qualitative data suggested that most teachers in the selected schools did not engage every student actively in the lesson to improve their learning. Thus, we can conclude that most teachers have a theoretical knowledge on the provision of support to engage students actively in their lesson, but fail to put it into practice. Such activities, in turn troubled the development of independent, confident, self-regulated, and creative science learners who are vital for today's knowledge based society.

Learning contents assessed

The findings indicated that most science teachers predominantly focused on assessing scientific facts, formulas, and principles and students' learning difficulties in the lesson. Moreover, the assessment tasks lacked alignment with learning objectives, students' need, and real world tasks to achieve the intention of the current education system. Thus, we can conclude that the implementation of authentic assessment methods to assess students' problem solving skills, creativity, scientific reasoning ability, and application of new ideas in the real works in the selected schools was very low. As a result, it inhibits students to apply or demonstrate their scientific knowledge and skills in real-life context or problems.

Application of assessment evidences

The application of the collected assessment evidences to plan next actions in learning is one of the basic elements in the cycle of formative assessment to improve students' learning. And it is the vital manifestation of formative assessment that makes it different from other modes of assessment and it is called assessment for learning. However, the outcomes of this study related to the application of assessment evidences for further learning seems very low. In general, the use of formative assessment as a tool for learning was very limited in the selected schools. Priorities were given to rank and classify students and to record results for final mark to decide whether the students pass or fail the required subjects. Thus, students were disappointed from using assessment evidences to identify their learning gaps and to take actions for their future learning.

Generally, what was evident from this study was that science teachers in the selected schools did not effectively integrate formative assessment into their daily instructions to improve students' science learning, but rather to collect marks for final decisions. Briefly, based on the results of this study, we can say that the role of the student in the selected schools became working hard to listened, took notes, and read text books correctly to memorize and repeat scientific facts, concepts, principles, and formulas to score high marks in science subjects to pass to the next grade and the national examination. This reality was also manifested in higher education's and became challenging. As a result, such assessment activities negatively affect the quality of science education in the selected schools to achieve the long-term vision of the country.

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