

Student Perceptions of Blended Assessment Approach in The Bachelor of Education Degrees in Mathematics And Science Through Open Distance And E-Learning (Odel)

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ABSTRACT

Blended assessment approach (BAA) comprising closed book test (CBT) and open book test (OBT) assessment strategies is being used in the Bachelor of Education Degrees in Mathematics and Science ODeL programme offered by a University M in Zimbabwe. Adherents to BAA identify compensating for weaknesses of one strategy by another, as its major strength. Research studies reveal that if assessment strategies are aligned to assessment objectives the gap between the intended and achieved curricula is reduced. This study was conducted to explore how BAA enhanced congruency between the BED Mathematics and Science ODeL intended and achieved curricula based on the perceptions of in-service teachers in the programme. Interviews, focus group discussions (FDGs) and document analysis were used to gather data. Qualitative data analysis techniques were used, since they were consistent with the objectives of the study. Findings reveal that giving a compulsory OPT after the CBT ensured that learners concentrated both on areas they had challenges, as well as consolidating what they got correct in the CBT. This tended to broaden and deepen frontiers of knowledge of the in-service teachers in their respective subject areas (Mathematics, Physics, Biology and Chemistry). All the in-service teachers in the study concurred that the learner-centred nature of the BAA approach was effective in achieving curriculum objectives. They (in-service teachers) could not hide their support for the BAA by showing their preparedness to immediately implement it in teaching and learning at their schools. Further studies on the use of formative (continuous) assessment strategies like presentations, question setting, group projects and exhibitions by learners are recommended, to improve the blend of assessment strategies in the BAA.

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1. INTRODUCTION

In this knowledge driven society in the context of sustainable development goals (SDGs), various skills are expected of secondary school graduates, so that they fit in the diverse science, technology, engineering and mathematics (STEM) skills demanding global society of the 21st century. Among others, skills needed in the 21st century global society are critical thinking, reflection on one's practices with the view to align with both individual and societal needs, and identifying the place one can contribute for sustainable development. School leavers can have these skills if the education system develops them (skills) in learners during the teaching and learning process. In order to do this, assessment based on grades which is usually summative, should be blended with formative assessment to enable continuous development and refinement of skills which constitute exit competences of school leavers. This implies that mathematics and science teachers should align assessment to the objectives of STEM skills demanding global society of the 21st century, in the context of SDGs.

2. LITERATURE REVIEW

2.1 Concept of Assessment

Mathematics education is a field of study concerned with the tools, methods, and approaches that facilitate the practice of teaching and learning mathematics (Abah 2017; Winarso, 2018). Mathematics educators take a comprehensive view of how mathematics as a subject of study is learned, understood and used. Mathematics education looks beyond mere applications to ways in which people think about mathematics, how they use it in their daily lives, and how learners can be brought to connect the mathematics they see in school with the mathematics in the world around them (Abah & Anyor, 2018). As a field of practice, mathematics education is an ecosystem comprising the learners, mathematics teachers across all levels, mathematics educators in teacher-training institutions, school administrators, mathematics education policymakers and regulating agencies of government, all interacting together for the efficient transmission of mathematical knowledge. The target of these stakeholders, most of the time is the attainment improved

achievement of pupils and students at the basic and secondary education level.

Assessment is viewed by Kizlik (2012) as a process by which information is obtained relative to some known objective or goal. In education it seeks to determine whether or not the objective of learning has been obtained. However, determining understanding through assessment is complex, since it (understanding) cannot be practised. This makes blending of assessment techniques justified (MoPSE, 2015).

According to McCulloch (2007), assessment is primarily concerned with providing guidance and feedback to the learner. It is any procedure used to estimate student learning for whatever purpose. Teacher observation, classroom discussion, and analysis of student work, including homework and tests are involved in the process of assessment. CCSSO (2011) views assessment as a process of monitoring, measuring, evaluating, documenting, reflecting on, and adjusting teaching and learning to improve performance of students. From these definitions, it is clear that whatever view of assessment is posited, the common feature is measurement of learner performance against set standards or benchmarks, as defined by the curriculum (Ministry of Primary and Secondary Education (MoPSE), 2015).

2.2 Importance of Assessment

Students' attitudes towards their studies are strongly affected by the nature and timing of assessment, because apart from measuring achievement of learning outcomes, assessment classifies or grades student achievement (Asale, 2017). The grades determine future progression with education and employment prospects (Murphy, 2007). Early assessment, particularly when it provides students with timely feedback, is crucial in helping students learn by pinpointing where they may be going wrong, and what they need to do to improve. Importantly, it also gives teachers an indication of how effective their teaching approaches are in terms of student progress (Murphy, 2007).

When teachers are furnished with information on how students are progressing, they become better positioned to make remediation. For instance the teacher may use assessment feedback to make necessary instructional adjustments, like trying alternative instructional approaches. Such intervention strategies can lead to improved student success (MoPSE, 2015). Incorporating formative assessment raises levels of student achievement ((Ndalichako, 2015), through improved ability of teachers to meet needs of diverse student populations. Frequent interactive assessments of students' progress and understanding help to identify learning needs, hence allowing appropriate teaching adjustments to be made (OECD, 2008).

2.3 Rationale for Understanding of Assessment by Teachers

Although teachers are expected to use evidence to improve instruction and support for learner success, the current education system treats assessment as a function largely separated from teaching. Teachers need to have knowledge and skills on how to use a range of assessments, and balancing formative and summative assessment (McCulloch, 2007; Saeed, Tahir & Latif, 2018). Assessment data should be used to understand each learner's progress, adjust instruction as needed, provide feedback to learners, as well as document learner progress against standards (Struyen, Dochy & Janssens, 2005; CCSSO, 2011).

2.4 Determinants of Assessment

Assessment and Reporting Unit (ART) (2005) posit that current assessment practices need to reflect changes based on new understandings of learning theories, new curricula being developed, new knowledge and skills that are necessary for the 21st century and the accountability requirements of systems and governments. Therefore, assessment of student achievement change with world demands for new knowledge, skills and behaviours. In addition to understanding of disciplines in this fast and ever changing technological and knowledge driven global economy (Makhurane, 2000 ; Gift, 1991 in Akpan, 2010), students need to develop the ability to analyse, synthesise and make inferences as well as think critically. In order to assist students to develop these attributes and become life – long learners, teachers need to change assessment process at classroom level (ART, 2005). As a way of preparing teachers consistent with assessment expectations, the AFT (2012) recommends that stakeholders should seek better alignment of standards, programmes and assessments around a vision of teacher preparation well – grounded in research on best practices.

2.5 Implications of current learning theories for assessment

Learning is guided generally by learning theories at any particular time. Traditionally learning was guided by transfer theories which viewed learning as the transfer of knowledge from the teacher (source), to the learner (receiver) (Gosling, 2009; Myrã 2015). Currently constructivist theory emphasises construction of knowledge and understanding its meaning by the learner (Shepard, 2000; Wilson and Peterson, 2006). This suggests that assessment should focus on understanding and development of skills to apply knowledge rather than memorisation.

2.6 Directions in assessment

The constructivist approach to learning has brought new understandings of learning leading to rethinking about the nature of assessment (Norton, 2009). In the constructivist and socio - cultural view of learning, assessment is reflected in a contextual – qualitative paradigm. In this paradigm assessment is embedded in the teaching and learning process, focusing on both the process of learning, and its products (ART, 2005). Assessment is intrinsically linked to student learning and performance in educational programmes (Coll, Exames and Hodges, 2014). Therefore as MoPSE (2015) notes, teachers should make assessment congruent to learning, and apply a range of measures within the context of current learning theory. Kneale (2009) posits that it is worth to remember that many students are motivated more by assessments than by an intrinsic love of learning. The time students spend in the library is not by choice, but it is because the curriculum is cleverly designed to involve reading. Therefore assessment employed in teaching and learning should promote student – centred learning.

Focus on assessment is shifting from decontextualised use of single assessment technique, to authentic, contextualised assessment practices, using multiple techniques with increased student responsibility in the assessment process (Chiwiyee, 2012). Alignment of formative and summative assessments is important, so that formative work can feed into summative work and summative work can be used formatively This new assessment culture ought to enhance classroom and school discourse on assessment, and raise

overall standards of student achievement (ART, 2005).

2.7 Types of Assessment

Coll, Exames and Hodges (2014) identify two broad types of assessment namely, formative and summative assessment.

2.8 Formative Assessment

Coll, Exames and Hodges (2014) observe that teachers can use formative assessment to improve students' work by linking it to classroom based assessment. Using a range of assessment procedures during teaching, the teacher identifies the needs of learners, and guides them towards the desired goals (Chiywe, 2012). According to MoPSE (2015), formative assessment involves tracking learner performance on an ongoing basis, measuring skills and values such as leadership, innovation, problem – solving, collaboration and teamwork.

As part of the instructional process, formative assessment assists in providing feedback needed to adjust the teaching and learning process. It informs both the teacher and student about student understanding, and timely adjustments to be made (Abulnour, 2016). The ultimate purpose of adjustments is meeting student needs to achieve desired learning outcomes, based on set standards (MoPSE, 2015). Formative assessment helps teachers to determine next steps during the learning process, as the instruction approaches the summative assessment of learning. Information available about students should provide a clear picture about student achievement. In order to implement formative assessment to its full effectiveness, students should be involved in the assessment process (Abulnour, 2016).

2.9 Summative Assessment

Summative assessment makes evaluative judgments for a set duration, about the level of achievement of instructional objectives (Coll, Exames and Hodges, 2014). In other words, it measures learner performance at the end of a learning programme, focusing on grading, placement and informing system performance (MoPSE, 2015). Through subject grades assigned to students (Chiywe, 2012), information on the effectiveness of the curriculum or educational programme is provided (ZIMSEC, 2010). Examples of summative assessment include end – of – unit tests, final examinations, semester examinations and portfolios (CCSSO, 2011).

2.10 Examinations

They include:

1. *Unseen Paper (standard examination);*
2. *Open Book (students can take books in to refer to);*
3. *Seen Paper (students are given the paper before the examination);*
4. *Take – away paper (students are given days in which to do examination);*
5. *oral examination;*
6. *Essay questions;*
7. *short answer questions;*
8. *practical; and*
9. *objective questions e.g. multiple choice (McCulloch, 2007).*

2.11 Coursework

McCulloch, 2007 identifies various continuous techniques which are used for continuous assessment. These are listed below:

1. Project reports;

2. Practicals / laboratory reports;
3. Portfolios;
4. Reflective logs;
5. Group work / group projects;
6. Presentations / Essays / reports / critical reviews / articles;
7. Question setting (student task is to set questions or design task most appropriate to assessing the subject);
8. Objective questions / short answer questions / Dissertations;
9. Production of a video; and
10. Production of a magazine / newsletter / exhibition / play (McCulloch, 2007; Mussawy, 2009).

2.12 Overview of University M BED Mathematics and Science ODeL Programme

University M in Zimbabwe is implementing a BED Mathematics and Science ODeL Programme in partnership with three secondary school teachers' colleges. The programme offers Bachelor of Education Degrees (BEDs) in Mathematics, Physics, Chemistry, and Biology through ODeL. The purpose of offering these degrees is to reduce the shortage of Mathematics and Science teachers by increasing opportunities for high quality science teacher preparation, at low cost.

A mixed mode of delivery being used entails online and face to face interaction through Open Distance and e – Learning centres in participating secondary teachers' colleges (PSTCs). The role of each PSTCs is to coordinate programme implementation for students enrolled at the PSTCs on behalf of University M. The multimedia approach being used, involve e – learning, whatsapp, CD – ROMS, flash discs, cell phones, email and print, to help more learners to access and benefit from the programme as the combination (multimedia approach) over – rides the technological gap between institutions.

2.13 Assessment Techniques in the University M BED Mathematics and Science ODeL Programme

The programme uses blended assessment approach (BAA) comprising formative (continuous) assessment and summative assessment. Formative assessment comprise presentations by students, assignments, practicals, closed book test (CBT) and open book test (OBT). Summative assessment is in form of unseen examinations. Adherents to BAA (CCSSO, 2011; Chiywe, 2012), identify compensating for weaknesses of one assessment technique by another, as its major strength. Research studies (AFT, 2012), reveal that if assessment strategies are aligned to assessment objectives the gap between the intended and achieved curricula is reduced. Focus of this study is on the CBT and OBT assessment techniques, whose structures are discussed below.

2.14 Nature CBT and OBT of Tests

1. CBT is set to required standards;
2. OBT is a duplicate of the CBT. Everything from structure to instructions will be the same except that the CBT will have normal test time, whereas the OBT will have some days given to complete before submission;
3. On one hand the CBT is administered so that students write individually, under invigilation without referring to sources or discussing.; and
4. On the other, the OBT is written without invigilation and students will be free to consult sources or classmates.

2.15 Purpose of the Study

This study was conducted to explore how BAA enhanced congruency between the BED Mathematics and Science ODeL programme intended and achieved curricula based on the perceptions of in – service teachers in the programme. The study was guided by the following research questions:

1. What are the views of in – service BED Mathematics and Science ODeL teachers' perceptions of the congruency of BAA to Mathematics and Science curriculum implementation?
2. How prepared are in – service BED Mathematics and Science ODeL teachers to apply BAA skills learnt during training to actual teaching in schools?
3. What could be done to enhance effective use of BAA in Mathematics and Science teacher training?

3. RESEARCH METHODS

Interviews, focus group discussion (FDG) and document analysis were used to generate, and gather data. An interview guide with questions loosely structured was used. This allowed participants to articulate their experiences in a less constrained manner, than if a structured interview guide was used (Rowan & Wulff, 2007; Turner II, 2010). For this study the FDG guide comprised open – ended questions which allowed participants to project their own feelings through engaging with the questions. The FDG elicited multiple perspectives from respondents. As a wrap – up, the FDG was done when interviews were no longer adding new information to the data gathered. ie saturation (Rowan & Wuiff, 2007).

The document analysis guide used provided direction in the comparison of the Curriculum Framework for Primary and Secondary Education 2015 – 2022, and the Teacher Professional Standards (TPS) (MoPSE, 2015), with interview responses of in – service mathematics and science teachers (Creswell, 2012). This was done to establish how congruent the blended (formative) assessment approach through CTB and OBT was, with intended curriculum implementation.

3.1 Data Analysis

Qualitative data analysis techniques were used, since they were consistent with the objectives of the study. Interview data was coded to develop themes, which were subsequently used for comparison with focus group discussion and document analysis data.

4. RESULT AND DISCUSSION

Themes which emerged from the study are:

1. Self – regulated learning;
2. Rationale for blended formative assessment;
3. Student – centred assessment approaches;
4. Use of multiple formative assessment techniques;
5. Learner and teacher motivation;
6. BED Mathematics and Science ODeL Assessment Model versus the New Curriculum;
7. Emerging issues; and
8. Strengths of formative assessment in the programme.

These themes are discussed in subsequent sections of this report.

4.1 Self – regulated learning

The BAA comprising the CBT and OBT encourage self – regulated learning (SRL) (IBO 2012), in trainee teachers which they may apply in their classes during teaching and learning.

This is illustrated by in – service science teacher Biology J who said:

By comparing what I will have done in the CBT and what I will be doing in the OBT, I get personal feedback which I use to guide myself to achieve objectives of learning among them managing my learning. I learn skills to use assessment in improving performance of students.

This is consistent with SRL which among other things according to Boekaerts (1999) in IBO (2012) include the ability to: effectively choose and coordinate various cognitive strategies, set learning goals and direct one's own learning, and engage in achieving self – set goals. If trainee teachers develop these skills they will be better placed to assist students to develop such skills, hence promoting meaningful learning.

Commenting on the benefits of blended assessment approach though CBTs and OBTs in preparing teachers, in – service mathematics teacher N said:

Through blended assessment I have developed skills to interrogate the way I learn. My ability to learn independently has tremendously increased as shown by my interest to find solutions through my individual effort, rather than depending on others all the time.

Asked whether learning alone was the best, in – service mathematics teacher N was quick to answer:

Oho no, no. In the process of learning they are times when I collaborate with other learners to share knowledge and views. Learning totally alone is not good, because I will lack the important feedback from fellow learners which may compromise the quality of my learning. Therefore, I work with other classmates in addition to learning alone.

In – service mathematics teacher N clearly shows the need to balance learning styles which is good. However, it needs to be specifically pointed out that it may not be so obvious that all in – service teachers will be aware of the need for any learner to mix individual learning and collaboration. Therefore, tutors should help in – service science and mathematics teachers to be aware of balancing (Crosman, 2007), the use of learning styles. Gurney (2007) observes that if students are able to see the value of the learning process, and assessment as part of learning and not an end in itself, then they can buy into the learning process. Consequently, students will use assessment to gain better results through self – monitoring and peer – assessment activities (Gurney, 2007; Gómez, 2017).

4.2 Rationale of Formative Assessment in BAA

The primary focus of formative assessment in the BAA is to identify areas that need improvement. This was reiterated by in – service Physics teacher Z who said:

In blended assessment approach formative assessment gives the learner the opportunity to reflect on personal performance and compare reflections with the tutor's guidance, when OBTs and CBTs revised. During this interaction, areas which need improvement are identified by the teacher and appropriate remedial action is taken. Also the learner develops critical thinking skills and understands concepts better.

Also, in – service Chemistry teacher G justified the use of BAA

saying:

When I reflect on my performance comparing CBT with OBT performance, it builds my confidence, and focuses my learning. The overall effect is improvement in my understanding of concepts and development of skills I will use to assess learners when I go back to my school.

These quotations show understanding and appreciation of the use of blended assessment approach (formative) by in – service science teachers Z and G. Therefore the BED Mathematics and Science ODeL, programme is congruent with in – service Mathematics and Science teachers' views on the use of blended assessment approach to improve mathematics and science teaching and learning in schools, hence promoting developing STEM skills in learners.

4.3 Student – Centred Assessment

In describing understanding of the CBT – OBT blended assessment approach to science teacher preparation in – service Biology teacher D said:

CBT – OBT blended assessment approach is a student – centred approach to learning, because when students do the OBT they reflect on how they wrote the CBT. This encourages self – evaluation and critical thinking by the trainee teachers.

In – service Biology teacher D agrees with Redden, Simon and Aulls (2007) who posit that assessment methods in constructivist learning environments emphasise learning processes which encourage students to engage in reflective activities.

Probing in – service Biology teacher D on how critical thinking could be enhanced by the CBT – OBT blended assessment approach, the response was;

Questions in the CTB and OTB should be aligned to curriculum implementation as guided by the syllabus. They should provoke one's thinking and be linked to real life situations. This empowers trainee teachers to relate learning to solving practical problems. Using this assessment approach when teaching in schools helps to actively involve pupils in their assessment and this improves performance, since pupils can identify learning areas in which they are weak.

In – service teacher D's response concurs with MoPSE (2015)'s view on the nature of competences mathematics and science teachers of the 21st century should have to help learners to solve practical problems. In agreement with MoPSE (2015)'s view, the current author argues that mathematics and science educators should use preparation strategies which help trainee teachers to reflect on their practice, and use reflections to improve mathematics and science teachers' preparation.

Traditional approaches to assessment as CCSSO (2011) notes, involve the teacher determining the required learning, the related assessment tasks and criteria, the performance of the student, and the grade awarded. Such approaches mean the student takes a passive, rather than active role in assessment. This is contrary to the need for sustainable assessment practices that help prepare students for lifelong learning beyond formal learning (MoPSE, 2015). The BED Mathematics and Science ODeL assessment approach promotes constructivist approach to learning. This is in agreement with Boud and Falchikov (2006) in Coll, Exames and Hodges (2014), who argue that assessment activities should address both

immediate needs of certification or feedback to students on their current learning, and the need to for prospective learning.

4.4 Use of Multiple Assessment Techniques

When in – service Physics teacher F was asked whether using the OBT in addition to the traditional CBT for assessment was beneficial the response was:

It is very beneficial to me as a teacher in two ways. First I learn to assess my work as I compare my performance in the CBT with performance in the OBT. Second I develop the assessment skills which I can use to assess pupils' work during my lessons at the school I work.

Also asked the same question as in – service Physics teacher F, in – service Mathematics teacher R said:

Multiple methods of assessment help to produce a balanced assessment, because the strength of one method is the weakness of another, so positive or negative bias is minimised.

In – service teachers F and R's responses are supported by UNESCO, (2010) saying it is unlikely that a single assessment can serve all assessment purposes. Rather than using a single assessment approach, CCSSO (2011) argues that assessment systems need to include both formative and summative assessment processes, aligned with instructional and curricular goals and objectives. Formative assessment findings should be used as a continuous feedback aiming to improve teaching and learning. Summative assessment results should be used to make final decisions about knowledge and skills gained in a teaching and learning programme. Also supporting the same view of multiple assessment techniques use, (Chiwiyé, 2012) advocates for the diversification of assessment, because no one single method of assessment can meet all of the varied needs of all varied students. Corroborating, Kuhs in Chiwiyé (2012) argues that in the name of equity, students should be offered more than one way to show them what they have learnt.

It is noteworthy that in –service Mathematics teacher R and Physics teacher F focused on qualitative benefits of blended assessment rather than quantitative or grades. This shows that teachers appreciate the role of blended assessment of developing skills to analyse and assess pupils' work, and producing fair assessments. Concurring, William (2013) argues that although feedback is considered by many to be the heart of formative assessment, the quality of the feedback hinges on the quality of both qualitative and quantitative evidence that is elicited by the assessment. Therefore, effective assessment feedback should be based on comprehensive credible findings. In line with this, in – service mathematics and science teachers' views for using multiple assessment techniques (Wilson, Yates & Purton, 2018) are consistent with triangulation which increases credibility of formative assessment results.

4.5 Learner and Teacher Motivation

In – service chemistry teacher Q was asked about the personal benefits of blended assessment in the BED Mathematics and Science ODeL programme and the response was:

I get inspired by getting immediate feedback as I compare my performance in the CBT and the OBT, and find personal strategies to adjust the way I learn. Of course I will benefit when we revise the test as a class, but the fact that I have been able to identify my strengths and weaknesses, enhance my understanding through critical analysis and reflection.

In – service teacher Q's views are consistent with the Ministry of Primary and Secondary Education (MoPSE) (2015) in its Handbook on Teacher Professional Standards (TPS) which stresses the importance of self evaluation by the teacher. In – service teacher Q reveals that the blended assessment approach of CBT and OBT develop self assessment skills in in – service mathematics and science teachers which they can implement in schools to improve teaching and learning of mathematics and science. This will produce 21st century compliant mathematics and science teachers who are able to meet Zimbabwe's goal of stimulating national socio – economic development by equipping school graduates with appropriate STEM competences, such as critical thinking and reflection on one's practices with the view to improve.

4.6 BED Mathematics and Science ODeL Assessment Model versus the New Curriculum

In – service Mathematics teacher K raised presentation as another aspect of blending which was being used in the programme very well. When asked how presentations were appropriate assessment techniques to use during lessons with pupils at secondary science school level, in – service Mathematics teacher K's response was quick and emphatic.

Definitely. Why not? This strategy motivates learners as well as assisting them to develop confidence.

In – service Biology teacher W also commenting on the benefits of blending OBT – CBT assessment technique said:

This is an excellent way of giving feedback and corrective measures to both trainee teachers and tutors. The feedback is used by both the trainee teachers and the tutors to improve preparation of teachers.

Document Analysis findings concur with pre – service teachers K and W's responses. The documents that were analysed are Curriculum Framework for Primary and Secondary Education 2015 – 2022, and Teacher Professional Standards (TPS) (MoPSE, 2015). The Curriculum Framework for Primary and Secondary Education (CFPSE) 2015 – 2022 recommend the use of curriculum implementation formative assessment strategies like school based assessments involving learners. In the TPS MoPSE (2015) stresses that a teacher should demonstrate ability to develop, select and use formative strategies to assess the teaching and learning process with learner participation. Therefore OBTs and CBTs which prioritise learner participation as revealed by in – service teachers K and W, are very congruent with MoPSE as the Ministry under which mathematics and science teachers in Zimbabwe work. This is because these assessment strategies allow in – service mathematics and science teachers to develop competences to use self assessment before they get into the classroom. Premised on this, it is believed that the in – service mathematics and science teachers will be able to use skills they developed during training in teaching and learning at their respective schools.

Interview responses of pre – service teachers K and W and document analysis findings, clearly show that the BED Mathematics and Science ODeL assessment model of using BAA is very consistent with the New Curriculum of Zimbabwe, and also goals of producing mathematics and science teachers with STEM skills relevant for the 21st century. Such skills among others involve teamwork, self – management, problem – solving, planning and organising, learning and technological skills (MoPSE, 2015). Ultimately science teachers with these skills will produce school science graduates relevant for the 21st century and beyond.

OECD (2008) agrees with in – service teachers K and W's views positing that formative assessment is a means of meeting goals for lifelong learning, because students who have well – developed assessment capabilities are better able and motivated to access, interpret and use information from quality assessment in ways that affirm or further their learning. Such students actively build their understanding of new concepts (rather than merely absorbing information), using a variety of strategies to fit new ideas into the national and world contexts. The students also learn to judge the quality of their own and peer's work, against well – defined learning goals. Learning to learn skills developed will be invaluable throughout their lives in this global information society where knowledge is quickly created, but sometimes also quickly get obsolete (OECD, 2008).

4.7 Emerging Issues

An important finding which was not part of the purpose of the study is the use of presentations to assess in – service BED Mathematics and Science ODeL teachers. During interviews several in – service mathematics and science teachers revealed that they highly rated the use of presentations in assessing subject content areas as well as methods of teaching science, since they were motivating and empowering. For instance an in – service Chemistry teacher L said:

During presentation criticisms and the nature of questions asked by both fellow students, and tutors help me to develop skills in professional handling of academic issues in settings of diverse learners. Through this I am developing skills to respond to individual needs of learners.

Also interviewee H, an in – service Physics teacher said:

Knowing that I will present to classmates in the presence of the tutor, I always prepare my presentations thoroughly, so that I give a good image about myself.

Asked what effect this had on the process of training, in – service Physics teacher H quickly answered:

Ohoo yes, it has an effect. In preparation for the presentation I read widely with the view to understand. This increases my subject content knowledge thereby making me a good teacher. A teacher without enough content will not adequately help pupils. This also gives me the opportunity to self – assess my performance based on feedback from my peers and the tutor.

In – service Physics teacher H concurs with MoPSE (2015)'s notion of assessment as learning whereby learners reflect on their own learning, identifying weaknesses and strengths, as wells as setting personal targets which foster their own learning. Self – assessment allows learners to judge their work in order to improve performance, as they identify discrepancies between current and desired performance. Peer assessment (Kocaman and Balçoğlu (2013) as a formative strategy, gives the learners the key role to evaluate the teaching and learning process, and give feedback to other learners about the quality of their work. This way, learners in this case the in –service mathematics and science teachers, are exposed to a learning environment which encourages development of generic skills and competences like critical thinking, personal evaluation and evaluation of others (MoPSE, 2015). Applauding presentations as way of giving feedback to both tutors and learners (in – service teachers) in the BED Mathematics and Science ODeL programme by in – service Physics teacher H, shows the strength of the BAA to mathematics and science teacher preparation.

Blended assessment approach in the programme is consistent with William (2013)'s view who posits that the quality of the feedback hinges on the quality of evidence that is elicited. For

instance, if a learner scores 79% on a test, the mark says nothing about the student's learning needs, other than saying the student has passed what was expected. However, assessment through blended assessment approach allows the learner to interrogate self as she / he compares performance in CBT with OBT as revealed by in-service mathematics and science teachers. Also, through presentations, the presenting in-service science teacher interrogates self as interaction with classmates and the tutor proceed, and at the same time the presenting in-service science teacher is interrogated by the tutor and classmates. The immediate feedback from this kind of formative assessment has the net effect of improving mathematics and science teacher preparation. From in-service teachers K, W, L and H it is clear that blending CBT – OBT assessment with presentations is an assessment strategy which has currency in the BED Mathematics and Science ODeL programme. Its use has potential to improve the preparation of mathematics and science teachers, hence improving achievement of intended learner outcomes.

4.8 Focus Group Discussion

All the 12 in-service teachers in the study agreed that administering the OPT after the CBT ensured that learners concentrated both on areas they had challenges, and consolidating what they got correct in the CBT. This tended to broaden and deepen frontiers of knowledge of the in-service teachers in their respective subject areas. The in-service teachers concurred that the learner-centred nature of the BAA approach was effective in achieving curriculum objectives. Concurring, the in-service teachers (Mathematics, Physics, Chemistry and Biology) were emphatically affirmative that the BAA was aligned to the intended curriculum, and this had the ripple effect of reducing the gap between the intended and achieved curricula. They (in-service teachers) could not hide their support for the BAA by showing their preparedness to immediately implement it in teaching and learning at their schools.

4.9 Strengths of Blended Assessment Approach

From the study the blended assessment approach builds students' (in-service teachers in the programme and pupils at schools) learning to learn skills by:

1. Placing emphasis on active involvement of both teachers and students in assessment of teaching and learning, that is its learner centred;
2. Development of learner's (in-service teachers/teachers and students) peer – and self – assessment skills;
3. Development of appropriate strategies for learning to learn, and helping students to understand their own learning;
4. Blending CBT – OBT with presentations which gives the BAA currency in the BED Mathematics and Science ODeL programme, since it provides feedback to both tutors and learners;
5. Broadening and deepening frontiers of knowledge of the in-service teachers as they attempt to find solutions to subject area problems; and Aligning learner – centred approach to achievement of curriculum objectives.

4.10 Conclusion

It is concluded that the BAA has high currency in the BED Mathematics and Science Programme as evidenced by the support it got from the in-service mathematics and science teachers involved in the study. The BAA is aligned to the implementation of

the New Curriculum of Zimbabwe, since it (BAA) seeks to equip mathematics and science teachers with STEM skills like critical thinking, reflecting on personal practices aiming to improve and engage in lifelong learning. These skills are relevant for teachers to produce science school graduates compliant to, and beyond the 21st century for both individual and national socio – economic development. Although the study focuses on Zimbabwe, educational systems of other countries can borrow ideas from to improve their assessment approaches.

4.11 Recommendations

Further studies on the use of formative (continuous) assessment strategies like presentations, question setting, group projects and exhibitions by learners, are recommended to improve the blend of assessment techniques in BAA.

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