CONTINUOUS ASSESSMENT PRACTICE TOWARDS STUDENTS' MATHEMATICS PROFICIENCY: THE CASE OF FIRST-CYCLE PRIMARY SCHOOLS IN DIRE DAWA, ETHIOPIA

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Abstract. This study was conducted in three phases taking the case of 10 first-cycle primary schools at Dire Dawa, in Ethiopia. In phase I, qualitative base line survey was conducted in the selected schools for a month. In phase II, 40 teachers participated in one-day seminar on the formative assessment use, and then they co-designed assessment tasks and rubrics on mathematics proficiency spectrum in three workshops for two weeks. In phase III, continuous assessment implementation was studied in the selected schools to describe the extent to which instruction and assessment constructively aligned towards mathematics proficiency based on classrooms observations, semi-structured interviews and content analysis of assessment tasks for three months. Additionally, a closed ended questionnaire instrument was administered to examine teachers' assessment practice. The findings of this study suggested primary teachers need close follow up and support rather than requesting them just to implement continuous assessments for developing students' mathematics proficiency.

Keywords: continuous assessment practice, mathematics proficiency, primary school

Introduction

Continuous assessment

Primary education is seen as the first step in laying the foundation for future educational opportunities and lifelong skills. Mathematics is basic to develop reasoning and numeracy skills for students' later academic success (Papadakis et al.,2021). Students should get quality mathematics education starting from primary school level so that our students use the power of mathematics whenever appropriate in their daily and future life. Mathematics education is very large enterprise. Failure in mathematics would lead our students to repeat classes and eventually dropping out of school. Everyone depends on the success of mathematics education; everyone is hurt when it fails. More than any other subject, mathematics filters students out of programs leading to scientific and professional careers (NCTM, 1989; OCED, 2014).

It is vitally important to maintain high quality mathematics education beginning from basic primary school. But this depends on effective teaching and learning of mathematics in schools along with quality evidence using assessment (Sintayehu, 2016; Mandinach & Schildkamp, 2021). According to *World Development Report: Learning to Realize Education's Promise 2018* (2018, pp. 3-4) 'schooling without learning is a wasted opportunity' and the report argued further that evidence-based assessment practice is critical for learning to happen in schools. Assessing lower and high order students thinking in primary schools has been an important arena in the field of mathematics education for developing students' skillfulness in mathematics (Schoenfeld, 2004; Jones & Inglis, 2015; Smit et al., 2017; Litkowski et al., 2020; Leo & Muis, 2020).

The essence of using tests and other evaluation instruments during the instructional process is to guide, direct, and monitor students' learning progress towards the attainment of learning objectives. Assessment can be used for summative or formative purpose. Formative assessment is very important for teacher to make decision on the fly on the process of instruction (Black & Wiliam,

2009). This study resides in studying formative assessment practice in primary mathematics education. Formative assessment is concerned with the creation of, and capitalization upon, 'moments of contingency' in instruction for the purpose of the regulation of learning processes (Black & William, 2009; Tebeje & Abiyu, 2015; Litke et al., 2021).

Contribution to the literature

Primary mathematics school teachers in different countries need to use continuous assessment as evidence for learning to happen as indicated in policy documents and curriculum frameworks (MoE, 2019; Yan & Brown, 2021). Despite the documents and frameworks, there were different reasons why continuous assessment was difficult to implement at schools for students' effective learning. Hence, this study attempts to show implementation gaps of continuous assessment practice.

When implementing continuous assessment, teachers need to consider seriously the mathematics proficiency strands to develop mathematics skillfulness in students aligning instruction with assessment evidences. Thus, this study is a show case to show missing links between assessment and instruction towards students' mathematics proficiency.

Giving short training for teachers may not be enough to effective implementation of continuous assessment and teachers need support and close follow up through on the job CPD rather than just being requested to use different assessment types. The study will recommend what type of CPD teachers need to undertake for proper implementation of continuous assessment

Ethiopian Primary Education still faces big challenges regarding to its quality, even though the challenge of access and equity problems resolved to the great extent (MoE, 2010; 2015; UNESCO, 2009). Though mathematics education has come into spotlight in Ethiopian Education Policy (MoE, 2010), studies done by Abreha (2016) and Sintayehu (2016) among others showed that the assessment practice has been seriously misaligned with the instructional practice

and the quality of mathematics education is alarmingly declining. In addition, there are clear indications that improving the assessment practice to improve mathematics education is a source of concern not only to the primary schools but also to the nation which aspires to accumulate competent human capital in science and technology (MoE, 2020). Many mathematics educators have showed that assessment is one pillar of an education system (Niss, 1993; Schoenfeld, 2016); however, teachers need proper training and professional development to align instruction with assessment.

Continuous assessment considered highly important to revamp the decreasing quality of Mathematics Education as many documents indicated (MoE, 2009a; 2010; 2015). The gap in the practice for aligning instruction with assessment in mathematics education is observed by Sintayehu (2016) and Abreha (2016) among others as the path connecting the key processes of formative assessment with instruction on setting up 'where the learners are in their learning, where they are going and what needs to be done to get them there' may be missing. According to MoE, (2009b) in nearly four out of five schools the structure of Continuous Professional Development (CPD) is either absent or inadequate. According to the Ministry of Education in Ethiopia a teacher should spent at least sixty hours for CPD each year. There is no document that mentioned how much of time should be devoted to implement continuous assessment in mathematics.

Furthermore, only a little CPD is given for primary mathematics teachers on continuous assessment (Desalegn, 2010). During the era of COVID-19, researchers recommend that teachers are supposed to be ready for using continuous assessment to plan their instruction based on the data collected for formative and summative purpose (Chigonga, 2020). As a consequence, it is important and timely to assess the practice of continuous assessment of primary education and align the assessment with mathematics instructional practice through CPD (Gashaw, 2014).

Conceptual framework

The conceptual Framework of this study as shown in Fig. 1 begins with having the end in mind of the five mathematics proficiency strands as learning outcomes in primary mathematics education. Sullivan (2011) examines the importance of five mathematical proficiency strands or actions. Two of these actions – procedural fluency and conceptual understanding – would be familiar to teachers, while the actions of strategic competence and adaptive reasoning probably might be less familiar. The study done by Sullivan indicated that students can learn strategic competence and adaptive reasoning but the instructional methods essential to support such learning, even when we know what these look like, present still further challenges to existing ways of mathematics instruction. Mathematics proficiency strands or mathematical actions developed for K-8 school mathematics has five components which are listed in the following (Kilpatrick et al., 2001):

- *conceptual understanding*—comprehension of mathematical concepts, operations, and relations
- *procedural fluency*—skill in carrying out procedures flexibly, accurately, efficiently, and appropriately
- *strategic competence*—ability to formulate, represent, and solve mathematical problems
- *adaptive reasoning*—capacity for logical thought, reflection, explanation, and justification
- *productive disposition*—habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.

These five mathematical actions – understanding, fluency, problem solving, reasoning and productive disposition – somehow have been included in the new national *Ethiopian mathematics curriculum Framework* (MoE, 2020).

Teachers assess what they value and students value what they are assessed. Thus, the study investigates how continuous assessment was used towards meeting these proficiency strands. Explicitly, the general objectives of Mathematics education in the document are stated in the following (MoE, 2020):

- Acquire knowledge of facts, concepts, theories, laws, principles, proofs of Mathematics;
- Develop the ability to communicate mathematical ideas with precision and accuracy;
- Develop interest and positive attitude towards Mathematics;
- Apply mathematical knowledge to solve real life problems;
- Develop the skill to use algorithms in problems solving;
- Appreciate the contributions of mathematicians;
- Develop mastery of algebraic skills, drawing skills, deducing interpretations, finding patterns, making connections, analyze, organize data, reasoning, critical thinking, etc.

Then, to feed forward students' learning and thereby to enhance students' mathematics proficiency formative assessment need to be used with purpose. According to William & Thompson (2007), formative assessment has five strategies such as expounding and partaking learning objectives and criteria for attainment; engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding; giving feedback that feed forward the learning; triggering students as instructional resources for collaborative learning; and initiating students for self-oriented learning. Then, teachers and students will hold effective classroom discussions and other learning tasks that

build on assessment evidence of students' mathematics proficiency to get the desired level of learning outcomes.

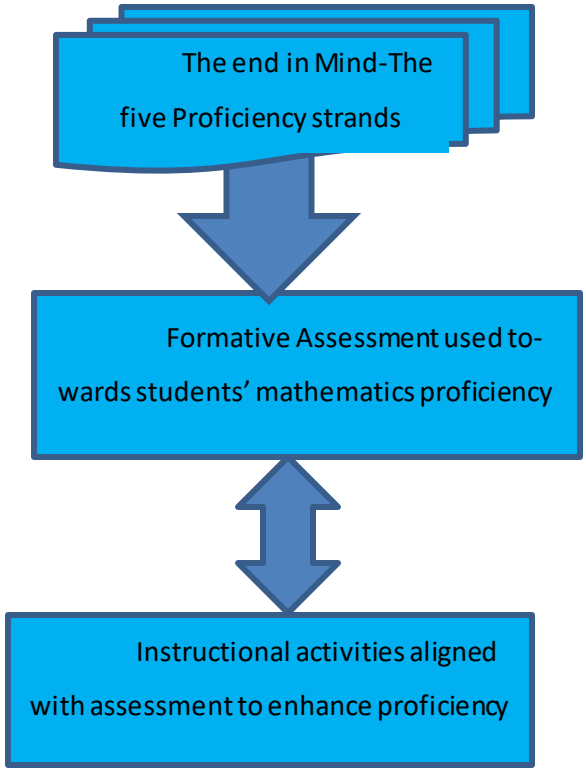


Figure 1. Conceptual framework of the study

Objective of the study

The study aims to investigate continuous assessment practice towards mathematics proficiency strands in First-Cycle Primary schools. With this intent the study tried to address the following specific objectives: (1) to assess the extent to which teachers have implemented continuous assessment in First- Cycle Primary schools; (2) to identify missing links that caused gaps in aligning instruction with assessments towards mathematics proficiency strands; (3) to recommend inputs for how a professional development on continuous assessment

improve first-cycle primary school mathematics teachers' practice of assessment.

Based on the objectives stated above this study answered the following basic questions: (i) to what extent teachers in First- Cycle Primary schools have implemented continuous assessments: (ii) what are the missing links in aligning instruction with assessment at First- Cycle Primary schools towards meeting the mathematics proficiency strands; (iii) what recommendations can be drawn to suggest professional development on continuous assessment?

Method

To answer the research questions on teachers' implementation practice of continuous assessment both quantitative and qualitative data were used to answer the research questions which need mixed method approach (Creswell, 2014). This study conducted in three phases completed in year 2020 (Table 1).

Table 1. The three phases of the Study from 2019 to 2020

Phase	Description	Method	Timeline	Period length
Phase I	Qualitative Base line Survey	Classroom Observation and content analysis	September 2019 to October 2019	4 weeks
Phase II	Seminar and workshop	Reflection and interview	December 2019	2 weeks
Phase III	Assessment Implementation Practice	Classroom observation, content analysis, survey and Semi-structured Interview	January 2020 to March 2020	12 weeks

In Phase I, qualitative survey was accomplished on assessment practice from September 2019 to October 2019. In Phase II, the 40 teachers were participated in one-day seminar on the purpose and nature of formative assessment

towards on how to develop the five mathematics proficiency strands and, on the basis of these, assessment tasks were developed and designed that were used in mathematics education studies and formative assessment practice (see in the "Material" section) in three workshops for two weeks in December 2019. In Phase III, teachers' implementation practice in the ten schools was studied to explain the extent to which instruction and assessment constructively aligned towards mathematics proficiency based on classrooms observations, semi-structured interviews and content analysis of assessment tasks for three months from January 2020 to March 2020.

Participants

In Phase I, for classroom observation and content analysis of the assessment tasks for the qualitative base line survey 5 university instructors were selected purposely to see the existing assessment practice. In Phase II, from 27 government primary schools in Dire Dawa city only 10 of them were selected and then 40 mathematics primary teachers were selected with purposive sampling technique for the study seminar and workshop. Additionally, 4 principals from the ten schools were the participants of the study for the interview on assessment implementation. Four mathematics education experts were also purposely selected among those who had experiences in teaching both at primary schools and primary teacher education institutions to rate the alignment of the instruction with assessment towards mathematics proficiency strands.

Materials

Spectrum of assessment items on how to assess the mathematics proficiency strands were developed in the workshop. The assessments items related with the mathematics contents the specific grades the teachers teach based on mathematics. The assessment items were designed based on principles that mirrors the three questions students and teachers attempt to answer about students' mathematical proficiency in mathematics education: where the student is going,

where the students are right now, and how to get there (Wiliam &Thompson, 2007).

For example, assessment items for feedbacks include two tier items to see students reasoning as shown in Fig. 2. Students may guess on multiple choice items, but using the second two tier question items teachers could probe further students reasoning of their responses to give quality feedback. Teachers also investigated alternate assessment tasks on how to use concepts maps, journal writing, problem solving probing sheets, my learning goal reflection sheets.

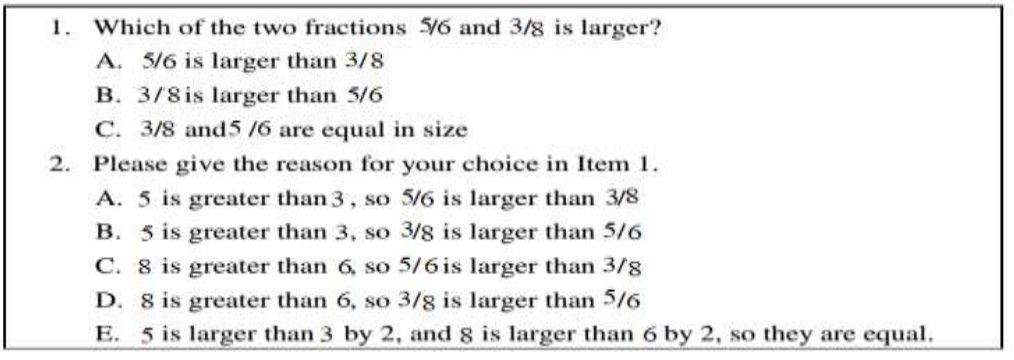
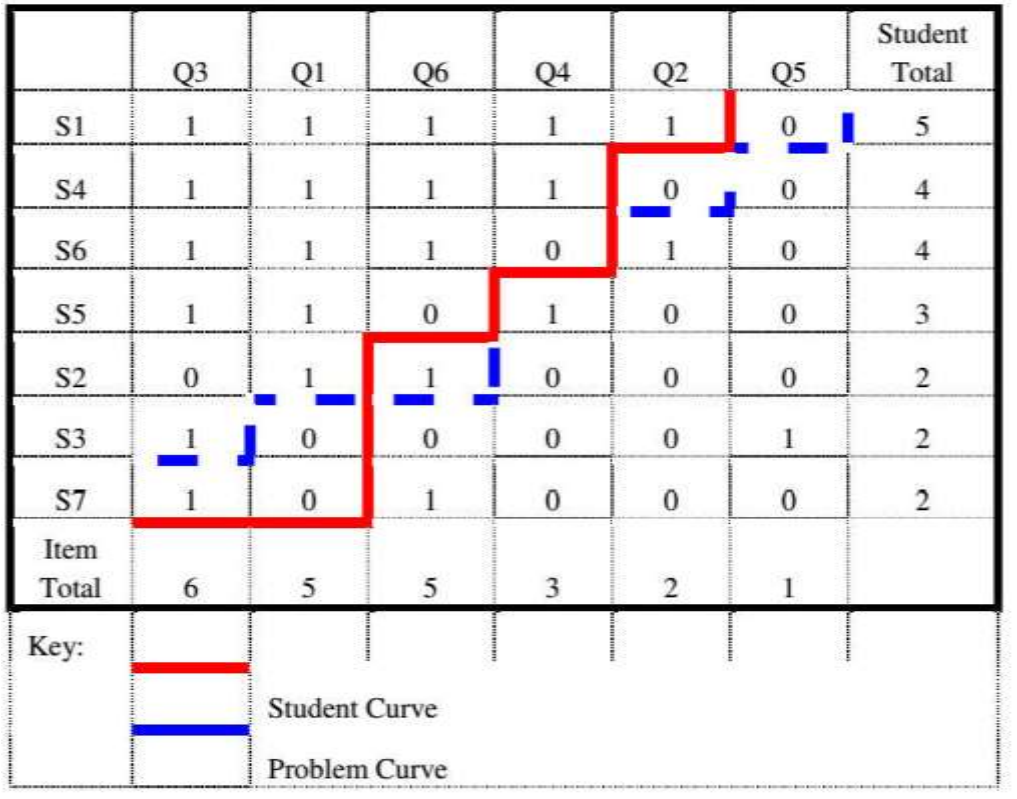

1. Which of the two fractions 5/6 and 3/8 is larger?
   A. 5/6 is larger than 3/8
   B. 3/8 is larger than 5/6
   C. 3/8 and 5/6 are equal in size
2. Please give the reason for your choice in Item 1.
   A. 5 is greater than 3, so 5/6 is larger than 3/8
   B. 5 is greater than 3, so 3/8 is larger than 5/6
   C. 8 is greater than 6, so 5/6 is larger than 3/8
   D. 8 is greater than 6, so 3/8 is larger than 5/6
   E. 5 is larger than 3 by 2, and 8 is larger than 6 by 2, so they are equal.

Figure 2. Two tier items in multiple choices

They do also practical activities to assess mathematical processes such as problem solving and design rubrics for open ended items such as projects. The teachers on the workshop also worked on group reflective tools, analytic and holistic rubric tools, and observation tools. They have also work on tools for assessment for learning to give feedback for formative use of summative tests (Wiliam &Thompson, 2007). For example, to see the level of difficulty of assessment items with the students understanding levels of the questions items can be charted in student-problem curve in the following Fig. 3. In the sample examples, majority of students attempted question Q3. Students S1 have attempted all questions except Q5. No students can answer question Q5 except S3. Thus, further investigation is needed on S3 who have answered question S3.

It is possible to see item difficulty and students' response level so that they could give quality feedback and to prepare assessment banks.



	Q3	Q1	Q6	Q4	Q2	Q5	Student Total
S1	1	1	1	1	1	0	5
S4	1	1	1	1	0	0	4
S6	1	1	1	0	1	0	4
S5	1	1	0	1	0	0	3
S2	0	1	1	0	0	0	2
S3	1	0	0	0	0	1	2
S7	1	0	1	0	0	0	2
Item Total	6	5	5	3	2	1	

Figure 3. Student-problem curve

Instruments

The instruments of data collection were: (a) survey questionnaire; (b) semi-structured interview; (c) classroom observation checklists; (d) content analysis of documents and (e) expert judgment protocol.

Survey questionnaire

The survey questionnaire was conducted for the selected 10 first-cycle primary governmental school mathematics teachers who were teaching mathematics from grade 1 to 4. The survey had been closed ended items and open

ended items on teachers' implementation practice of continuous assessment. Both open-ended and closed-ended questions were conducted to see the existing gap between the intended and implemented continuous assessment practice. Then, the instrument was provided for experts in the field to review the instrument and for language experts if there was any difficulty in the language use. The Likert scale questionnaire survey instrument on the purpose of continuous assessment is pilot tested for reliability and 0.71 Cronbach alpha reliability score was obtained.

Interview

Interviews were conducted on 10 mathematics teachers from first-cycle primary governmental schools. The sampling technique was purposive sampling in that they gave potential evidence on the existing practice of continuous assessment. In addition, 4 first-cycle primary school principals of were taking part in the interview on continuous assessment practice. The content of teachers' semi-structured interview included the following points: (1) teachers' views about their knowledge and practice on mathematics continuous assessment and (2) their future plan in relation to continuous assessment, and (3) reasons that are not conducive for aligning instruction with assessment. Teachers were being asked to identify those factors that were responsible for declining quality mathematics education in light of the assessment practices in the school towards mathematics proficiency strands.

A total of 10 first-cycle primary governmental schools in Dire-Dawa city were observed by four experts over one-month period of time. Before their deployment to carry out the classroom observations, the research assistants were provided orientation training. The observations were supposed to assess the extent to which continuous assessment was practiced in aligning instruction with assessment towards mathematics proficiency strands as per the checklists and field notes.

Data analysis

In the present study, qualitative and quantitative statistical analysis procedures were employed. Accordingly, the content analysis, the interview and observational data were presented in narrative format while quantitative data were analyzed using descriptive statistics. The qualitative data analysis was in the first place aimed at explaining how teachers used formative assessment in their classrooms to align the instruction with assessment for developing students' mathematics proficiency triangulating data sources of all data from the observations, informal interviews, discussions, and content analysis of assessment tasks and feedback forms.

Ethical consideration

Prior to conducting the study, the proposal was approved by the research directorate at Dire Dawa University and then, the study had gotten local permission from the school directors and education offices. Ethical issues in the research were considered starting from proposal writing, to carrying data collection, to the interpretation and reporting of the research results. From the onset of this study the aim of the study was described for each participant in the study, and then approval was obtained from the Research Directorate at Dire Dawa University and education offices in Dire Dawa, Ethiopia. All the concerned bodies were debriefed on the study on how they would be benefited from the study. During data collection, the researchers respected the site and disrupt as little as possible. During data collection informed consent were collected from participant. Anonymity and confidentiality of the participants were assured during this research report.

Results

Background data

The total number of primary mathematics teachers surveyed was 40, but due to non-response only 38 teachers were the participants in this study. Most

of the teachers are with an age range of 31-36. Majority of participants (94.7%) were first degree graduates. With regard to teaching experience, most of them had more than 8 years of experience.

Table 2. Participants' background data of the study

Factor	Classification	Percent
Gender	Male	23.7
	Female	76.3
Age	25-30	14
	31-36	24
Educational Level	Diploma	7.9
	Bachelor	94.7
Teaching experience	1-3 years	7.9
	3.5-7 years	13.1
	> 7.5 years	78.9

Continuous assessment practice

During Phase I, only few assessment items such as oral questioning, closed ended items like true or false, give short answer and multiple choice items were commonly used across the schools based on classroom observations and content analysis of assessment tasks. Among the mathematics proficiency strands, procedural competency was given much emphasis. Some teachers had been observed to teach with sense making relating the mathematics with every-day life. But, assessment items that attempts to assess mathematics productive dispositions were lacking in the primary mathematics classes. Similarly, simple word problems were used for assessing the skill of computing in one or two steps rather than developing problem solving ability. In all school, assessment practice is oriented towards assessing content rather the process aspect of mathematics.

During Phase II, when the participants of the study asked whether they take any course on the continuous assessment, 39.5% of the respondents had not

took any course on continuous assessment while 60.5% of them took a course on continuous assessment. The majority of the respondents (68.4%) also said they had taken a training on continuous assessment, but 31.6% of the participants hadn't taken any training on continuous assessment. As shown in figure 4, majority of teachers (81.6%) in the study responded that they used continuous assessment in their plan, however only 13.2% of them said they put continuous assessment in their plan once and sometimes.

Only two teachers among the respondents said they had never used continuous assessment in their plan. Majority of the respondents (71.05%) responded that their school had a guideline on continuous assessment. In general, 59.26% obtained the format from their schools, 29.63% got from school guide. Few of the respondents (7.14%) said they had department format while 3.7% of them responded that they got the idea of using continuous assessment from training (Fig. 4). .

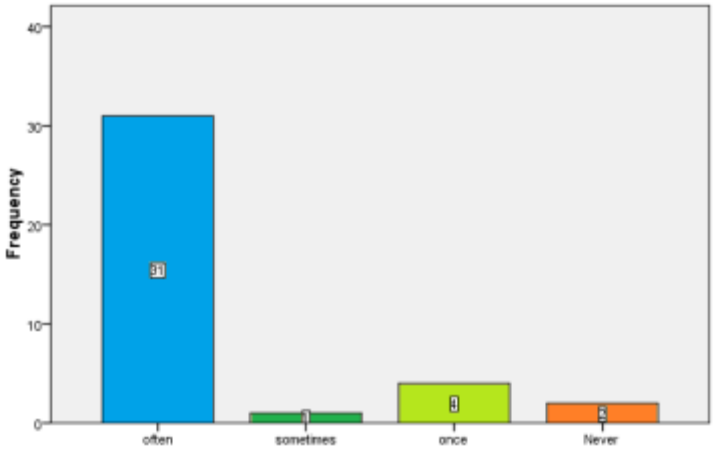


Figure 4. Teachers' continuous assessment use in their plan

During Phase III, after taking the seminar and workshop, majority of the respondents often and sometimes used different kinds of assessment as shown

in Table 3. Respondents said they used the following kinds of assessments rarely: Journal writing (7.9%), project work (5.3%) and surprise test (7.9%).

Table 3. Teachers' practice on assessment types

Item	Never	When needed	some-times	Often
How often you use oral questions?	0%	18.4%	13.2%	68.4%
How often you use class work?	10.5%	5.3%	7.9%	76.3%
How often you use written exam?	0%	15.8%	39.5.3%	44.7%
How often you use observation?	2.6%	21.1%	31.6%	44.7%
How often you use group work?	2.6%	5.3%	42.1%	50.0%
How often you use explanation and demonstration?	5.3%	23.7%	10.5%	60.5%
How often you use peer evaluation?	7.9%	31.6%	42.1%	18.4%
How often you use self evaluation?	23.7%	23.7%	12.2%	39.5%
How often you use project work?	28.9%	31.6%	34.2%	5.3%
How often you use surprise tests?	12.2%	31.6%	47.4%	7.9%
How often you use questionnaire?	15.8%	34.2%	34.2%	15.8%
How often you use interview?	13.2%	28.9%	39.5%	18.4%
How often you use homework?	2.6%	0%	26.3%	71.1%
How often you use concept map?	5.3%	15.8%	18.4%	60.5%
How often you use Journal Writing?	39.5%	39.5%	13.2%	7.9%

Looking at the respondents' answer in Table 4 on the item that asks the frequency of the kind of assessment they used, majority of the respondents' have said they used class work (78.9%), explanations and demonstration (65.8%) and homework (84.2%) on daily basis.

Table 4. Teachers' regularity of practice on assessment types

Item	Daily	Weekly	14 days	Month	Term	Semester
When do you use oral questions?	52.6%	42.1%	5.3%	0%	0%	0%
When do you use class work?	78.9%	2.6%	7.9%	2.6%	5.3	2.6%
When do you use written exam?	26.3%	63.2%	7.9%	2.6%	0%	0%
When do you use observation?	34.2%	31.6%	26.3%	5.3%	0%	0%
When do you use group work?	17.0%	15%	6%	0%	0%	0%
When do you use explanation and demonstration?	65.8%	21.1%	7.9%	5.3%	0%	0%
When do you use peer evaluation?	15.8%	36.8%	13.2%	18.4%	13.2%	2.6%
When do you use self evaluation?	15.8%	23.7%	21.1%	23.7%	7.9%	7.9%
When do you use project work?	5.3%	18.4%	13.2%	28.9%	21.1%	13.2%
When do you use surprise tests?	5.3%	15.8%	28.9%	42.1%	0%	7.9%
When do you use questionnaire?	18.4%	26.3%	7.9%	21.1%	7.9%	5.3%
When do you use interview?	36.8%	15.8%	13.2%	21.1%	7.9%	5.3%
When do you use homework?	84.2%	10.5%	2.6%	2.6%	0%	0%
When do you use concept map?	57.9%	18.4%	5.3%	7.9%	2.6%	7.9%
When do you use Journal Writing?"	16.5%	2.6%	7.9%	31.6%	18.4%	28.9%

Linking instruction with assessment

The results of the study that dealt with missing links that caused gaps in aligning instruction with assessments towards mathematics proficiency strands in mathematics curriculum implementation within and along the mathematics classroom instruction and assessment tests and tasks are described below with excerpts of evidences both from content analysis of teachers' lessons, classroom observations and using experts' judgments on the collected data with the inter-rater reliability percentage.

Table 5. Instruction and assessment alignment in practice

Proficiency Strands	Stances and evidences (% Inter-rater agreement reliability)	
	Classroom Observation of Instructional Practice	**Content Analysis of Assessment tasks and tests**
Procedural Fluency	The instructional strategies focus to develop students' algorithmic thinking but less flexible ways of doing mathematical tasks were observed. The approaches used in number operations are often procedural and counter intuitive using traditional method like 'trading' (88%).	Procedural fluency assessments were used, most of the assessment involve following one or two steps in computing mathematical tasks or exercises. Often the assessment types focus on getting one exact answer and the tests involve only timed tests and feedbacks were provided on the tasks and assessment tests. (96%).
Conceptual Understanding	Less focus was given on conceptual understanding. For instance, there is rich connection between multi-digit multiplication which includes place value, the meaning of multiplication, the rationale of multiplication by one and multi-digits, the distributive law, and the commutative law which were not observed in the lessons (96%).	Only few teachers attempted to assess conceptual understanding in tests that shows how one idea related with the other ideas. No connection of big ideas of primary school mathematics is observed in classroom assessment. The assessment tests and tasks used do not often assess the connection between concepts and within concepts (90%).
Adaptive Reasoning	Only a few instructional approaches were observed to develop students' reasoning ability and explaining power on mathematics big ideas. Most of the classes observed used monologue than dialogical approach as most considered it difficult with large class size more than 40 students. The instruction approaches often were Initiation-Response-Evaluation teaching method and less time were allotted for students' reflections and explanations (92%).	Teacher elicit student thinking very rarely and subsequent assessment tasks didn't responds to those ideas, by building on productive beginnings or addressing students reasoning and very rarely assessment tasks were given to find out students' reasoning ability using multi-tier items or using open ended items with further probing tasks as most assessment tasks and tests were closed ended with exactly one answer (96%).
Strategic Competency	There is lack of instructional strategy that help students to go through the process of problem solving steps like the ability to go through problem solving process like Poly's problem solving steps (1945). Teachers used word problems; however the problems can be solved using single or two steps which may not develop students' problem solving skills (100%)	Except word problems in contrived context form, very few assessment items or tests were used to assess the strategic competency and the assessment plan did not provide clear description of the intention of applying continuous assessment because it didn't tell the mechanisms of feedback to feedforward for developing students' strategic competency (96%)
Productive Dispositions	The tasks are not rich enough to engage them and challenge them to develop positive attitude towards math-	Often assessments tasks and tests showed only one dimensional aspect of mathematics. Alternative assessments like journal writing, concept

	ematics. Teachers and students believed that all students did not have 'math mind' that no special attention is given to self-efficacy. But, some application word problems related to their everyday life were used in the lessons (88%).	maps, reflection logs, and portfolio were not used to develop their productive dispositions. Investigative or explorative tasks and projects rarely were used as assessment types (100%).

Teachers' views on implementing continuous assessment

First, the primary mathematics school teacher took professional development on goal synchronizations on the purpose of continuous assessment. Seminar was held for two days on the type of assessments and then practical sessions were held on how to prepare assessment items. For example, assessment items for feedbacks include two tier items to see students reasoning as shown in Fig. 2. Students may guess on multiple choice items, but we can find students using the second two tier question items. Teachers also investigated alternate assessment tasks on how to use concepts maps, journal writing, problem solving and project rubrics. Majority of teachers strongly and partially agree (from 74% to 100% agreement) on the purpose of continuous assessment that it prepares students to learn, improves teaching and learning, helps teachers to build looking at students' weakness, increases students' motivation and confidence, and creates positive relation between students and teachers as shown in Table 6.

Table 6. Teachers view on the use of continuous assessment

Item	**1- Strongly Disagree**	**2**	**3**	**4**	**5- Strongly Agree**
Continuous assessment prepares students.	0%	2.6%	2.6%	15.8%	58.9%
Continuous assessment improves teaching and learning.	2.6%	0%	5.3%	21.1%	71.1%
Continuous assessment helps to improve students' weakness.	0%	0%	0%	18.4%	81.7%

Continuous assessment helps high learning retention.	0%	0%	0%	31.6%	64.4%
Continuous assessment assures quality.	0%	0%	7.9%	26.3%	63.2%
Excel in competency means excel in national exam.	10.0%	6.7%	0%	40.0%	43.3%
Continuous assessment increases motivation.	0%	0%	2.6%	26.3%	71.1%
Continuous assessment increases confidence.	0%	5.3%	5.3%	23.7%	65.8%
Continuous assessment creates good relations between teachers and students.	0%	5.3%	0%	26.3%	68.4%

In an addition the following findings were drawn:

The following are some of teachers' response on continuous assessment before the training:

- Continuous assessment is always given at the end of a period and it is used for evaluation purpose
- Continuous assessment is useful for students own learning than the teacher
- Continuous assessment simply means frequent assessment by giving them tests
- It is done in the middle of teaching and at the end of teaching
- Continuous assessment is important but difficult to use it in large classrooms

The following are some of teachers' response on continuous assessment after taking the seminar and the workshop:

- Continuous assessment is not meant giving tests repeatedly several times
- The training gives motivation to use continuous assessment in their teaching

- For the entire classroom period, students will have active engagement through continuous assessment

The following are some of teachers' response on the necessary things and conditions needed to implement continuous assessment and mentioned some of the challenges in implementing it:

- To monitor continuous assessment implementation support has to be given by the school director and education office
- Class size must not be greater than 40 and students need to have motivations
- Nothing is needed except preparations and careful planning
- Students chairs must be movable not fixed to implement continuous assessment
- Understanding what assessment entails is essential
- If students' readiness to learn is lacking, it is difficult to use different assessment
- Large class size is difficult to develop every students' competency and proficiency
- Teachers are overloaded with 20-30 periods that it is difficult to give feedbacks on tests and assessment tasks
- Negative attitude that some students can't do mathematics and difficult to change their attitude with assessment
- No exemplary sample items and documentation to prepare assessment varieties
- Teachers do not share their assessment practice experiences with one another
- There is no documentation of assessment items like question bank
- Teaching at different grade levels will affected on continuous assessment because of difficulty of preparing alternate assessments

- Lack of enough time to implement continuous assessment due to insufficiency of time to cover the contents at the grade level
- Lack of infrastructure to give different assessment types in classes
- Students have fear of tests and exams that assessment don't serve for learning purpose
- It is difficult to assess the affective and psychomotor domains

Discussion

Overall, teachers have more than 8 years' experience of teaching and most of them had some training in the course of their teaching experience. The majority of them said they have used continuous assessment in their lesson plan. Findings of the study had showed that majority of the teachers agreed on the multipurpose of continuous assessment. However, majority of teachers have not considered different assessment types uniformly before the training. There were assessment types they have never used before; however, there were some progress in their understanding of an assessment as an event at the end of a unit to assessment as ongoing and embedded in instruction. Implementing novel assessment practices may need a profound conceptual change which may demand longer period of time and additional experiences in collaborative learning and teaching environment and do experiments on assessment notions in classrooms that there were no fundamental changes in using multiple formative assessment types and strategies (Earl & Timperley 2014; Timperley, 2014; Webb, 2012).

Though teachers had been doing practical aspects on designing assessment types like Journal writing, conceptual map, project work and assessment tools like developing analytic and holistic rubrics, multitier assessment types and student problem curve and the like, little change had been observed in adopting these tools to change the assessment practice. These may be for different

reasons. One reason could be teachers need a prolonged practice on how to design powerful items to assess students' mathematics knowledge, skill and attitude. Teachers confronted with instructional challenges as they wrestle with different strategies and methods of assessment practices in creating and enacting assessment opportunities. Teachers needed support rather than being requested to use different assessment types. Furthermore, they had to be given on the job CPD where they could learn a lot by implementing the assessment items and tools in their real classrooms to regulate teaching and learning (Veugen et al., 2021). Teachers also reflected that they need to have sample items in handout forms so that they could adopt the tools and refer whenever they liked to use variety of assessment types.

The other reason may due to the usual practice of conducting assessment in schools. If they used new assessment tools, strategies and approach, the usual practice of assessment will be contrary to the new assessment creating 'cultural dilemma' scenario. For instance, students might confront the teacher with questions if, asking them to write a journal in mathematics topics or do a project. But, by recording students' portfolio and project works it is possible to show students learning with evidences. The third reason appeared when teachers struggle with particular national, district, or school policies with respect to assessment. These might occur because of focusing on large-scale assessment for evaluation purpose only. Large scale assessments may be reliable using closed ended items like multiple choice items used in Ethiopian National Assessments; however, they may luck validity to assess the required mathematics proficiency in students. Assessment may serve multiple purposes such as assessment for learning, assessment of learning and assessment as learning. Focusing on large scale assessment only does not reflect teacher has to use closed ended items or teach for the test which gives emphasis only report card grades and comments but doesn't fit the purpose of mathematics education.

Policy and curriculum documents may support developing the students' high cognitive thinking such as problem solving and adaptive reasoning; however,

they do not necessarily consider the implementation challenges and the mechanisms of assessing the necessary mathematical proficiency such as procedural fluency, conceptual understanding, strategic competency, adaptive reasoning and productive dispositions. Teachers mentioned that one of the challenges of not practicing continuous assessment was large class size and lack of good infrastructure. This can be improved by designing assessment items that will include more groups of students and the school has to work in coordination of education office and key stakeholders to create conducive environment to conduct continuous assessment for quality mathematics education.

Teachers must share experience one another and work collaboratively to design powerful assessment items for large class size. The other challenge is related to attitude that continuous assessment is taking time and students fear of exams and tests. But the primary purpose of continuous assessment is for students learning and must takes places every time informal and formally by giving feedback and feed forward for better learning (Watson, 2006). Teachers need to work strategically to avoid the fear of assessment by including self-assessment tools and collaborative tests that continuous assessment is more suitable for self-directed learning rather than putting students solely for evaluative purpose.

Limitation of the study

This study was done in three phases descriptively on the practice of continuous assessment without assessing its effects on the students. Teachers could able to see the usefulness of continuous assessment but they need support using on the job professional development for extended period of time. A (small) number of professional development sessions and activities will not be suffice to implement formative classrooms to investigate for effects on changes in student mathematics proficiency over an academic year. However, as one cohort of teachers were selected for professional development it was difficult to see the changes having a comparison group on the implementation of continuous assessment towards developing students' mathematics proficiency. Furthermore,

implementing formative assessment could have been not challenging for teachers through CPD on the use of variety of assessment tools if the school culture led by evidence-based practices and curriculum resources are available at specific mathematics topics. However, teachers need an extended professional development and support to implement formative assessment which may need a longitudinal study by assessing its impact in several comparison groups.

Conclusion

The findings of this study had indicated that for proper implementation of continuous assessment, teachers need longitudinal support and close follow up by giving them on the job professional development. The implementation of continuous assessment in mathematics deserve attention in designing tasks that fit for purpose which can assess mathematics proficiency that include procedural fluency, conceptual understanding, strategic competence, productive dispositions and adaptive reasoning with the purpose of assessment as learning, for learning and as learning.

Recommendations

Implication for practice

Mathematics continuous assessment need to include the content and process aspect of mathematics in order to develop students' skillfulness in mathematics. The types of assessment portrayed the purpose and the value of assessment. To ensure quality mathematics education, every student needs to develop every aspects of the mathematics proficiency strands. Assessment is one education pillar for students to develop the mathematical actions- understanding, fluency, problem solving, reasoning and productive disposition aligning it with the instructional approach. The knowtice (knowledge and practice) on mathematics continuous assessment had to be developed by teachers learning from one another and by implementing alternative assessment through CPD developing assessment culture collaboratively.

Teachers should try to use different assessment items for teaching mathematics. They need to collaborate and work together on designing assessment items. Teachers also need to adapt and adopt assessment tools and lead their teaching with evidence based practice based on assessment portfolio working with stakeholders such as education offices and universities. Documentation of practice on continuous assessment by recording and keeping it for future use is important. Setting up test and assessment banks is a starting point for documenting assessment practices. New assessment items like open ended items on mathematics actions have to be developed that can be easily handled for large class size.

Implication for research

Longitudinal research has to be done on the nature of professional development that can improve the implementation of continuous assessment on primary mathematics education. In particular, how to give professional development on designing different task items in mathematics lessons merit especial attention. Often the assessment practice focus on content assessment of mathematics rather than the process aspect of mathematics which also need further study. Research is also needed how to make intervention on changing the usual practice or the traditional culture of assessing students to improved one that includes assessment for learning, assessment of learning and assessment as learning through CPD.

Suggestions for future research

The advent of technology changes the practice of continuous assessment and it is more critical during the pandemic and post-COVID era. Many technological software and programs are developed that can ease and organize the implementation of continuous assessment. Students' mathematics skillfulness can be enhanced through simple technology using tablets and PCs which can be adapted in developing nation like Ethiopia (Fjørtoft, 2020; Papadakis et al.,

2018; 2021). Thus, it is highly recommended how to transform the tradition of implementing continuous assessment using affordable technology that can improve the assessment practice on blended learning environment to incorporate the process aspect of mathematics rather than focusing on content alone. Students need to develop the habit of mind in doing mathematics assessing them by designing problem solving tasks and research is needed to design assessment items in line with developing students cognitive thinking, meta-cognition and problem solving abilities towards the proficiency strands (Leo & Muis, 2020).

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