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Diagnostic Assessment Knowledge and Practices among Secondary School Mathematics Teachers in Dodoma, Tanzania

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ABSTRACT

This study examined how secondary mathematics teachers understand and implement diagnostic assessments in their mathematics classes. To understand how mathematics teachers conceptualize diagnostic assessment and how they put it into practice, the study conducted in-depth interviews with 20 secondary school mathematics teachers using a phenomenography research approach and analyzed them thematically. The results showed that most mathematics teachers are unfamiliar with the concept of diagnostic assessment, misunderstand its role in the teaching and learning process, and refrain from using it because they don't know how to do so efficiently. Due to the overcrowding in classes and the widespread failure of national examinations, the few people who understood the concept admitted to not implementing it. The study recommends professional development for mathematics teachers to improve their conceptual understanding of diagnostic assessment as well as their capacity to integrate it in classrooms to improve the teaching and learning of mathematics and hence improve students' performance in the subject.

Keywords: Assessment, Diagnostic Assessment, Cognitive Assessment, Non-Cognitive Assessment

I. INTRODUCTION

According to recent educational reforms implemented globally, assessment is now seen as a means for aiding students' learning (Black & Wiliam, 2018; Sa'ad et al., 2014; Shepard et al., 2018; Sun & Suzuki, 2013). Among other countries, Tanzania considers assessment a significant tool essential to successful teaching and learning. The educational system has changed from an assessment culture, in which teaching and assessment were viewed as distinct entities, to an assessment culture, in which assessment is done both formally and informally and tied to classroom instruction to enhance students' learning (Azim & Khan, 2012; Ndoye, 2017). This change in the assessment methodology has been motivated by the need to enhance students' competencies that are appropriate for the current world market (Kitta & Likinjiye 2020; Mkimbili & Kitta 2021; Mbwile et al., 2023).

Ketterlin-Geller et al. (2019) posited that assessment is essential in identifying students' weaknesses and supporting teachers in developing strategies to address them since assessment is key for guiding and assisting student learning. As students pursue the program, formative assessment is employed to monitor their learning progress (Miller et al., 2009). Based on teaching and learning proficiency, students with varying challenges are present in mathematics classrooms. Among these challenges are persistent learning difficulties, which emanate from diverse sources; some of these sources are cognitive and others are non-cognitive. If these challenges are not identified and addressed accordingly, the affected students may not be able to benefit effectively from learning (Zhao, 2013).

Such challenges can be addressed accordingly if formative assessment is integrated with diagnostic assessment (Van der Kleij et al., 2015). According to Miller et al. (2009) and Airasian (2005), a highly specialized process of diagnostic assessment addresses recurrent or chronic learning challenges that formative assessment does

not address. In this view, diagnostic assessment is an essential tool for bridging a gap between learners with diverse levels of learning.

Tanzanian secondary schools are experiencing students' massive failure in mathematics (Kyaruzi et al., 2019; Mazana et al., 2020). Even though there are a variety of factors that may affect a student's ability to acquire mathematics competencies (Sa'ad et al., 2014), assessment methods have a significant role. According to Suurtamm et al. (2010) and Nisbet & Warren (2000), teachers are the most reliable resource for learning in low-resource countries like Tanzania. In this view, they must be adaptable to relevant assessment techniques to enhance mathematics learning.

Apart from various efforts being invested by the educational practitioners, including the integration of diverse teaching and learning strategies, the students continue to experience failure in mathematics subjects (Mkimbili & Kitta, 2020; William & Kitta, 2021). Diagnostic assessment is inevitable in determining the causes of these persistent learning problems and formulating a plan for remedial action. According to the study conducted by Kahembe (2017) and Kyaruzi (2018), Tanzanian teachers agree that assessment enhances teaching and learning and encourages teachers' and students' accountability. However, very little is known about the teachers' understanding and application of diagnostic assessment in teaching and learning. As the problem of learning difficulties is large and has existed for a long time without a solution, there is doubt about whether teachers are practicing diagnostic assessment in limited ways or if they don't do it at all. According to this perspective, it felt legitimate to carry out this study to learn more about mathematics teachers' understanding and implementation of diagnostic assessment.

It has been believed that teachers' approaches to diagnostic assessment in the context of teaching and learning are influenced by their understanding of the concept itself (Kemp & Scaife, 2012). Specifically, the study intended to fulfill the following inquiries;

1. What is the mathematics teachers' understanding of diagnostic assessment?
2. Do mathematics teachers practice Diagnostic assessment in teaching and learning processes?

II. LITERATURE REVIEW

2.1 The Concept and Types of Assessment

Assessment is the process of inquiring whether students have acquired the knowledge, skills, and competencies necessary to make decisions regarding the following stages of the teaching and learning process (Clarke-Midula & Dede, 2010). It is implied by the processes that learners' aptitudes, attitudes, learning styles, progressions, and results are taken into account. Assessment procedures have been classified in terms of the functional roles they play. Some scholars assert that there are two major types of assessment: formative and summative (Kennedy et al., 2008). Others claim that there are three types: diagnostic, formative, and summative (Hanna et al., 2017). Other experts in educational assessment (Miller et al., 2009; Airasian, 2005) posit that there are four types of assessment. They include placement, formative, diagnostic, and summative. This paper favors the four types as propounded by Miller et al. (2009) and Airasian (2005). The clarification of the four types describes the functional roles each type plays in the teaching and learning process.

According to Miller et al. (2009), the placement assessment is focused on the student's performance upon arrival, and it intends to know about the following: (a) Does the student have the necessary knowledge and abilities to start the scheduled instruction? Or, does the student possess an adequate understanding of fundamental mathematical concepts? (b) How much of the knowledge and abilities that the planned lesson aims to impart has the student already mastered? When students reach acceptable levels of understanding and competence, it may be appropriate to move them to a more advanced course or level or to skip some units or courses. (c) To what degree do the student's interests, work habits, and personality traits suggest that one type of instruction might be preferable to another?

As students pursue the program, formative assessment is used to monitor students' learning progress (Miller et al., 2009) and to continuously inform teachers and students of their learning successes and failures. In addition to highlighting specific learning faults and misconceptions that require repair, providing feedback to students serves as an incentive for effective learning. Instructional modifications and group and individual work prescriptions can be made with the help of feedback provided to teachers. Specially designed assessments and examinations for every unit or chapter of instruction are a major component of formative assessment. Personalized tests made available by textbook and instructional material producers can also be used for formative assessment purposes. Teachers typically create tests and other forms of assessment assignments for this purpose. Learning errors can be detected and student development can be tracked with the help of observational approaches.

Students may encounter learning challenges that formative assessment is unable to address. A diagnostic assessment is useful in this situation. Miller et al. (2009) and Airasian (2005) both state that diagnostic assessment is an extremely specialized process. It addresses the enduring or recurrent learning challenges that the typical formative assessment remediation recommendations fail to address. A more thorough assessment is necessary if a student still struggles in mathematics even after trying the suggested alternate teaching strategies informed by formative assessment. To use a medical example, formative assessment looks for the root reasons for learning problems that do not respond to first-aid treatment, whereas diagnostic assessment looks for more serious issues. The diagnostic assessment is, therefore, more thorough and precise. It uses a variety of observational methods in addition to diagnostic tests that are specifically designed for that purpose. If a proper diagnosis is made, individuals with severe learning difficulties may also need the assistance of educational psychologists or medical professionals. Determining the root reasons for enduring learning difficulties and developing a strategy for corrective action are the main goals of the diagnostic assessment.

At the end of a course or instructional unit, summative assessments are employed (Miller et al., 2009). Although It is intended to ascertain the degree to which the learning objectives have been met and is mostly utilized for certifying that students have mastered the specified learning outcomes or for issuing course marks. Summative assessment methods vary depending on the learning objectives but usually involve creating achievement assessments. Summative assessment is carried out by the teacher, aiming at assessing different kinds of work, including oral and laboratory reports, and evaluating products like research, topics, drawings, and reports. It is possible to highlight or compile the student's achievements and development using data from these diverse sources of students' learning achievement. Summative assessments are primarily used for certification of student achievement through grading, but they also yield data that may be used to examine the efficacy of instruction and the suitability of the course objectives.

2.2 Importance of Assessment in Teaching and Learning of Mathematics

Assessment is an integral part of instruction, as it determines whether or not the goals of education are being met (Black & Wiliam, 2018). Educational goals and objectives can be attained when assessment procedures match with curriculum goals (Kapambwe, 2010). Assessment affects decisions about grades, placement, advancement, instructional needs, curriculum, and, in some cases, funding. Assessment inspires us to ask these hard questions: "Are we teaching what we want to teach?", "Are students learning what they are supposed to be learning?" or "Is there a way to teach the subject better, thereby promoting better learning?"

Mathematics teachers have always conducted assessments of their students learning through chapter tests, semester tests, district tests, state tests, and norm-referenced standardized tests, just to name a few. This reason for assessment is an important component of a mathematics program. However, the National Council of Teachers of Mathematics [NCTM] (2000) recommends that:

"Assessment should be more than merely a test at the end of instruction to see how students perform. It should be an integral part of instruction that informs and guides teachers as they make instructional decisions. Assessment should not merely be done to students; rather, it should also be done for students to guide and enhance their learning".

Thus, a comprehensive mathematics program will include assessments for student learning in addition to traditional assessments of student learning (Black & Wiliam, 2018; Shepard et al., 2018). According to Black and Wiliam (2018), learning becomes meaningful if information obtained by formative assessment is used diagnostically to improve teaching and learning.

2.3 Why Diagnostic Assessment in Mathematics?

Sun and Suzuki (2013) argued that most mathematics classrooms are occupied by students with different challenges about the teaching and learning of the subject. Among these challenges are persistent learning difficulties, which emanate from diverse sources. Some of these sources are cognitive, and others are non-cognitive. In this view, if these challenges are not identified and addressed accordingly, the affected students may not be able to benefit effectively from learning. Brookhart & Nitko (2019) added that many schools have lost a considerable number of potential mathematicians, not because they were not capable of learning the subject, but due to the failure of early diagnosis of students' learning difficulties. In this view, diagnostic assessment is very important in promoting learning for students with diverse learning challenges.

2.3 Cognitive diagnostic assessment

According to Pierre et al. (2014), cognitive ability is the capacity to understand complex ideas, adapt effectively to the environment, learn from experience, engage in various forms of reasoning, and overcome obstacles

by taking thought. They comprise mental skills like reading, writing, and arithmetic that are utilized in cognitive tasks (Green, 2010). In a learning context, assessment procedures are typically employed in schools to gauge students' performance on examinations and tests (Hor, 2015). The majority of teaching and learning activities are finished by the time the traditional techniques of measuring student learning are applied, which usually happen at the end of the term or academic year when it is too late to make any adjustments. These tests are intended to rank, forecast, and sort; they typically don't provide the exact detail required to focus on improvement (Barton, 2002). Only aggregated performance data, such as a grade or total score, is provided to students. Only a broad picture of the student's accomplishments is provided by this feedback. According to Hor (2015), it doesn't offer precise conclusions regarding a student's strengths and deficiencies in the subject areas that were assessed.

To enhance their lesson planning, teachers require additional data regarding the learning benefits and drawbacks of the particular knowledge and abilities that each student displayed during the assessment. The data acquired differs from that provided by the current standardized test. To obtain insight into students' cognitive capacities, teachers require additional advice and information when assessing students' cognitive strengths and limitations (Hor, 2015). According to Scott (2014), learning is dependent on cognitive or physical differences, so there is a need for teachers to identify the cognitive abilities of individual students. To identify students' cognitive ability, the teacher needs to identify the attributes within the intended domains that can be observable in the teaching and learning process. According to Hor (2015), the attribute is a description of the conceptual knowledge and procedural skills needed to perform a task in a specific domain. Examples of these attributes may be conceptual knowledge and processing skills utilized by the students to correctly solve mathematical problems (Hor, 2015).

2.4 Non-cognitive diagnostic assessment

According to Borghans et al. (2008), non-cognitive skills are "a set of thoughts, emotions, and attitudes" that can be developed throughout a person's career to add value. Personal characteristics, motivations, and attitudes are examples of non-cognitive talents. They are commonly accepted to be essential to student performance, even if they are challenging to identify and measure. By developing these abilities, students can become more adept at managing their time, thinking clearly about the material, getting along with peers and teachers, persevering through challenges, and navigating the complex web of academic and extracurricular requirements those college students must meet from the time they enroll until they graduate (Conley, 2010). Strategies for assessing students' performance in non-cognitive skills have been developed in response to the growing emphasis on developing and valuing these abilities. For example, Lipnevich et al. (2011) focused on the importance of students' attitudes towards mathematics learning. The findings revealed that students with positive attitudes toward learning mathematics perform better than those with negative attitudes. In this view, non-cognitive skills have a direct impact on cognitive domains. That is why in recent years there has been great emphasis on developing 21st-century skills for learners such as problem-solving skills, communication, and collaboration to help them compete in the global market (Lipnevich & Roberts, 2012).

2.5 The theory underpinning the study

This study was guided by the social constructivist learning theory outlined by Vygotsky (1978). The theory emphasizes that learning takes place within a social context. Through the theory, investigating learning difficulties on the subject matter provides the first step in solving learning challenges and achieving intended competence (Van der Kleij et al., 2015). These challenges must be understood by teachers since they have a big impact on students' learning. Within this context, diagnostic assessment turns into a potent instrument for identifying and comprehending these prejudices. Teachers can determine what students already know and the areas of their misconceptions by conducting diagnostic assessments. This knowledge enables instructors to better adapt their training, building on students' prior knowledge while resolving misunderstandings and knowledge gaps. In addition to that, the understanding and practice of diagnostic assessment depend greatly on how teachers perceive the concept. As social interaction has an impact on creating meaningful learning, teachers may develop a common understanding of the concept of diagnostic assessment collaboratively and come up with one stand.

III. METHODOLOGY

3.1 Study area

The study was carried out in the Dodoma region located in the central part of Tanzania. The region was randomly sampled from a total of 31 Regions within the country as the performance of mathematics teachers is

generally low all over the country. Specifically, 20 mathematics teachers were purposively selected from 20 schools within 20 schools located in Dodoma City and Chamwino districts.

3.2. Research Approach and Design

The study used a qualitative research approach to investigate mathematics teachers' perceptions and practices of diagnostic assessment (Creswell & Creswell, 2018). The phenomenological design allowed participants to share their experiences (Merriam, 2002), providing a holistic and contextual portrayal of the phenomenon, minimizing bias, and enhancing validity.

3.3. Sampling Procedures

Participants were sampled from a total group of mathematics teachers in two districts within the Dodoma Region. A total of 20 mathematics teachers were randomly chosen from a total of 97 mathematics teachers in the selected districts. However, the issue of inclusion was taken into consideration to ensure the data were obtained from diverse statuses of participants including gender, teaching experiences, as well as special needs considerations.

3.4. Data collection procedures

The data on teachers' perceptions and practice on diagnostic assessment in mathematics were collected through semi-structured interviews with participants. Each participant was interviewed individually by asking one-by-one questions and the responses were recorded using a voice recorder. Each interview took an average of 50 minutes to complete. The collected data were transcribed to obtain verbal data.

3.5. Data analysis procedures

The study used thematic analysis to identify patterns or themes in data, focusing on the data analysis steps of Clarke et al. (2015). The process involved reading and re-reading the data, generating initial codes, organizing codes into broader themes, examining their support, and defining and naming themes. The final report on mathematics teachers' understanding and practice of diagnostic assessment in their classrooms was written using these themes.

3.6. Ethical Issues

The research followed established protocols such as receiving approval from the President's Office of Regional Administration and Local Government, the University of Rwanda, Chamwino District, and Dodoma City authorities. Participants were informed about the study's goals, and their identities were kept confidential.

IV. FINDINGS & DISCUSSIONS

4.1 Mathematics Teachers' Understanding of Diagnostic Assessment

Respondents were requested to share their insights on their conceptual understanding of diagnostic assessment. It was sought to be the first thing to know from them since the way people practice something is mainly influenced by their conceptual understanding of a subject. Their conceptual understandings of diagnostic assessment are presented by respondents as reiterated by one respondent who expressed that

> "Diagnostic assessment is the type of assessment intended to position the student where he or she is supposed to be so that he or she can be on the same level with their fellow, there now he or she can learn well. For example, after form two national examination results, for those who did not reach 30% of the total marks, they are supposed to repeat the year, and those who obtained at least 30% of the total marks they go Form Three" (Respondent A).

Another respondent added a similar thinking by remarking that:

> "Diagnostic assessment is the type of assessment used to identify the level of understanding of the student and place him or her in the class that he or she fits on. For example, to categorize students according to their level of understanding teachers provide the test and the result of the test will help the students who to take science subject, business subjects or social science subjects" (Respondent H).

On the other side, some of the respondents opined that diagnostic assessment is the type of assessment involving the identification of students' problems who seem to be weak in their learning, identifying the cause of it, and finding solutions so that they can improve their learning. This is supported by the remarks made by one respondent:

> "Diagnostic assessment is the type of assessment used to identify the point of student weakness in learning so that he or she can be helped. Most students have different problems which may cause their learning to be ineffective, so it is the responsibility of a teacher to find a way of helping that student" (Respondent J).

Another mathematics teacher opined that,

> "Diagnostic assessment in education resembles the diagnostic assessment acted by Doctors in hospitals to have the idea of the kind of sickness the person might be suffering so that he or she may be given appropriate medication. The Doctor starts by asking a patient how he or she feels, assigning laboratory tests according to the idea of the type of sickness, and then providing treatment for a particular disease. So even in education, when you see a student having difficulties in learning especially when you provide an activity to assess for understanding, the teacher must find a way of helping that student so that he or she can improve his or her learning" (Respondent C).

On the other side, some of the respondents explained that,

> "Diagnostic assessment is the way of giving rewards to students. For the students who perform well, we provide a positive reward but for those who perform badly we punish them so that when they feel the pinch, they will struggle to improve" (Respondent I).

From participant responses, it was observed that mathematic teachers have a diverse understanding of diagnostic assessment. Most respondents viewed diagnostic assessment as an inquiry involving the act of providing students with different activities such as tests to identify the level of their understanding for placing them in the classes or streams according to their level of understanding. They further explained that they make diagnostic assessments to know the level of understanding of the students so that they can know whether the students have enough requisite knowledge for the coming stage of learning. From four types of assessment described by Miller et al. (2009) and Airasian (2005) show that mathematics teachers' conceptual understanding of diagnostic assessment is confused between formative, placement, and diagnostic assessment.

On the other side, some mathematics teachers seem to understand the key idea of diagnostic assessment in teaching and learning as they were able to differentiate between the four types of assessment and viewed diagnostic assessment as a process of identifying student reasons that cause difficulties in learning and find the way of helping the student so as he or she can improve learning. This concurs with Miller et al. (2009) who viewed effective diagnostic assessment as a way of intervening in the persistent or recurring students' learning difficulties that are left unresolved by the standard corrective prescriptions of formative assessment.

4.2 How do mathematics teachers conduct diagnostic assessments among their students?

Another objective was to know how mathematics teachers conduct diagnostic assessments of their students. Mathematics teachers expressed how they practiced diagnostic assessment, how they provided feedback, the usefulness of the feedback as well as their suggestions on how they can best improve diagnostic assessment practices.

4.2.1 The diagnostic practice in the classroom.

Participants had different views on how they conduct diagnostic assessments in their classes. Some of them they confused with formative assessment as they mentioned the provision of assessment tasks to assess students' understanding. One of the teachers explained that,

> "I do diagnostic assessment by providing tests and assignments to my students, and after marking, I identify the students who perform poorly and those who perform well. And for those who perform poorly, I use another alternative to help them. Sometimes I conduct remedial class with them so that to improve their learning" (Respondent B).

On the other side, one respondent explained that,

> "I do diagnostic assessment by first identifying students who face challenges in learning, this can be done through assessing their progress in learning some topics when I give them exercises and realize that the student does not show any improvements. After identifying them I decide to call the student and ask what is the problem causing him or her not to perform well in studies I advise him or her but sometimes I share with the school administration and the parent to see how to help the student" (Respondent J).

Another responded by saying,

> "I conduct a diagnostic assessment by providing a test to students and after marking I arrange the marks in descending order to identify the students who perform poorly. For those who perform well, I give them positive rewards but for those who perform badly, I use punishment and arrange for another test to see if

they improve. Some of the students when you punish them improve learning by working hard" (Respondent I).

From respondent insights on diagnostic assessment, it is revealed that mathematics teachers practice diagnostic assessment in different ways according to how they perceive the concept. Few of them practice in the same way as how diagnostic assessment is supposed to be according to Miller et al. (2009) and Airasian, (2005).

4.2.2 How do mathematics teachers use the feedback they get from diagnostic assessments?

Mathematics teachers were asked on how they use the diagnostic assessment feedback from their diagnostic assessment practices. This question aimed to know how mathematics teachers make use of assessment feedback from the diagnostic assessment they conduct on their students. Teachers had different views on the use of diagnostic assessment feedback as one of the respondents reported that,

> "We use assessment feedback to place the student in the class where he or she is supposed to belong. If the students perform well, they are shifting to the next level of learning, but those who perform poorly are retained in the same class or even love that, according to their performance. For example, from form two national examination, for students who do not achieve at least 30% of the total marks, he or she will repeat on the same class but for those who achieve at least 30% will shift to form three" (Respondent M).

Another respondent reported that,

> "Assessment feedback helps to identify the problem of a student. The problem can be financial problems, some may be social issues like sexual relationships, conflicts at home, or loss of parents or guardians and some may be health problems. After knowing the kind of the problem there now I can find the way of helping the student" (Respondent C).

Another mathematics teacher responded by saying,

> "I use the feedback I get from diagnostic assessments to motivate my students so that they can perform better. I use negative motivation for those who perform poorly and positive for those who perform well. For example, I retain students who performed poorly in mathematics exercises in the class when their fellow students went to play or went home. I remain with them for remedial sessions so that they can improve their learning" (Respondent E).

From respondent expressions, it is revealed that mathematics teachers use the feedback they get from diagnostic assessment practice differently from one another according to how they perceive the concept as well as how they practice it. According to Kyaruzi (2018), the important aspect of assessment is that the use of feedback should reflect the essence of doing it.

4.2.3 Usefulness of assessment feedback

Mathematics teachers were also asked to reveal the usefulness of assessment feedback they get from their practices on diagnostic assessment to their students. This question aimed to know whether the diagnostic assessment practices conducted by mathematics teachers have useful impacts on improving student learning. Among respondents, some said the feedback is useful according to how they perceive the concept and how they practice it. This was revealed by one of the respondents saying that,

> "The assessment feedback is useful since when for example the problem of a student becomes solved then the student will start to perform well. For example, one of my students was facing the problem of house rent since he had performed well previously so I decided to follow up with him and I asked him what is the problem facing after talking to him and recognizing the problem, we decided to discuss with one teacher who is a bachelor and he decided to stay with him. So now is performing well" (Respondent D).

On the other side, one of the respondents reported that the feedback on the diagnostic assessment she is making is not useful. She had the following to say

> "The diagnostic assessment feedback is not useful. This is because once I am providing negative motivation to students who fail in a test, they become demoralized and lose interest in learning mathematics" (Respondent P).

It is clear from teachers' practices of giving assessment feedback to students that the purpose of the feedback is not to enhance learning because it is given in the form of punishment. According to Wiliam (2018), feedback is useful if it may assist a student in identifying areas that require improvement.

4.2.4 Mathematics teachers' suggestions on how to improve diagnostic assessment practices

Mathematics teachers were asked also to give their insights about the suggestions on how their diagnostic assessment practices can be improved. Some of the respondents were able to give their opinions one of the mathematics teachers opined that,

> "It will be good if we get in-service training on how properly we can conduct diagnostic assessment. Sometimes we fail to conduct diagnostic assessments effectively. We don't have techniques on how to conduct diagnostic assessments for many students because we have overclouded classes. So I could be very happy if I get the techniques on how to handle many students as most of our students are performing poorly in mathematics" (Respondent J).

Another mathematics teacher opined that,

> "To conduct diagnostic assessment effectively we need to have a good working environment such as the addition of mathematics teachers to reduce the workload, it is very difficult to make a diagnostic assessment if the teacher has forty-two periods per week and more than four hundred students to teach. It becomes even more difficult to identify the problems of individual students because of this larger number of students. So if we add several mathematics teachers in schools it will be easy to conduct diagnostic assessment" (Respondent)
>
> From teachers' insights, it is evident that they are eager to learn how effectively they can use diagnostic assessment to improve students' learning.

V. CONCLUSIONS & RECOMMENDATIONS

5.1. Conclusion

The study aimed to explore mathematics teachers' understanding and practice of diagnostic assessment in teaching and learning mathematics. The findings revealed that most of the participants had misconceptions about diagnostic assessment, as most of them confused it with placement assessment. They termed it an assessment practice aimed at finding out the cognitive level of students in terms of targeted competence so that they can be placed in a respective class. Further, the study revealed that the understanding of classroom assessment among mathematics teachers significantly influenced their classroom practices. Most of them indicated limited capacity for the practice of diagnostic assessment in their classes. Furthermore, the study revealed that most teachers consider diagnostic assessment based on cognitive domains, such as assessing students' knowledge of mathematics concepts, and ignore non-cognitive assessments. Based on the findings, mathematics teachers possess a limited understanding of the concept of diagnostic assessment, and hence, they have limited capacity to practice it during the teaching and learning that could boost students' mathematics learning.

5.2. Recommendation

Through the research findings, it is evident that many mathematics teachers lack a conceptual understanding of diagnostic assessment, which leads them to have limited capacity to practice in the teaching and learning process. Diagnostic assessment to enhance students' learning in mathematics should not be confined to placement assessments at the beginning of instruction; instead, it should be integrated with formative assessment practices. The implementation of diagnostic assessment in the teaching and learning process enables teachers to identify students facing various challenges, be they academic, health-related, or emotional. By addressing these obstacles promptly, we can address the problem of leaving some students behind and help many others perform better. While there have been efforts to identify and assess students' cognitive abilities, the same attention has not been given to non-cognitive skills. Therefore, educational stakeholders must establish standards for tracking students' non-cognitive skills, define assessment criteria, and provide training for mathematics teachers on conducting effective diagnostic assessments. Doing this will contribute to enhancing teaching and learning in mathematics.

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