Differentiated Instruction in Teaching Mathematics: Teachers' Understanding and Barriers to Practice in Inclusive Secondary School Classrooms in Makambako Town Council

Leila Mtweve[1], Ombeni Msuya[1], Asia Rubeba[2]
[1]Department of Educational Foundation and Continuing Education, College of Education, The University of Dodoma
[2]Department of Educational Psychology and Curriculum Studies, College of Education, The University of Dodoma
Corresponding Author: Email: rubeba2016@gmail.com

Abstract
The study assessed the teachers' practices of differentiated instruction *(DI) in teaching mathematics in inclusive classes in secondary schools in Makambako Town Council. This study specifically focused on exploring the teachers' understanding and resource limitations towards the practices of DI in teaching mathematics in the inclusive classrooms in secondary schools. The phenomenology study design, informed by the qualitative approach, was employed. The data for the study were collected through interviews and classroom observations. 15 participants, including 8 teachers, 4 heads of school, and 3 ward educational officers were used as a sample size for the study as conducted in 4 public secondary schools. The collected data were analysed thematically. In order to maintain ethical issues, ethical clearances were obtained from the respective organs, whereby informed consent forms were filled by the informants. The study findings revealed multiple DI understandings and resource limitations as among the stumbling blocks towards teachers' practices of DI in teaching mathematics in inclusive classes. Resources like availability of mathematics teachers, materials, and time were found to be the major resource challenges towards the practices of DI in teaching mathematics. Based on the findings, the study concludes that for the successful practice of DI, efforts have to be made to address these resource challenges. Therefore, the study suggests hiring more mathematics teachers in secondary schools and providing them with guidance on implementing DI effectively. The government should provide sufficient materials for improving the teaching of mathematics in inclusive classes*.

Keywords: *Differentiated Instruction, Inclusive Classroom, Teaching, Mathematics, Resource limitation.*

INTRODUCTION

The recognition and celebration of learning diversity is pivotal in fostering an educational environment that honours the unique strengths and needs of every learner. The increase in the student's diverse needs in the classroom is the result of the response to the human rights movement that requires all the learners to have the right to quality education regardless of their disabilities and differences (UNESCO, 2015). Inclusive education stands as a transformative approach that not only embraces diversity but also champions for equity and access within the educational settings. Inclusive education is a system of education in which all children, youths and adults are enrolled, actively participate and achieve in regular schools and other educational programmes regardless of their diverse backgrounds and abilities, without discrimination, through minimisation of barriers and maximisation of resources (URT, 2021). In the dynamic landscape of education, teaching in an inclusive classroom requires a nuanced approach that values diversity, equity, and individualised support to ensure every student has the opportunity to thrive. Differentiated instruction is among the strategies that have been indicated by various researchers that it can be used to address the diversity present in today's classrooms.

Differentiated instruction in an inclusive classroom means that a teachers is consistently and proactively creates different pathways to help all students with different needs in the class to become successful (Muhammad, 2024). In this kind of classroom, teachers do not need any more to teach basing on the media and learning methods they like, but they must adapt to the characteristics of students. According to Thakur (2014), differentiated instruction is an organised, yet flexible way of adjusting teaching and learning methods to accommodate each child's learning needs and preferences in order to achieve his or her maximum growth as a learner. This strategy provides multiple approaches to content, process, and product, is student-centred, a blend of the whole-class, group, and individual instruction.

Empirical studies have revealed that differentiated instruction has brought positive results in teaching in the inclusive classes. The study by Lindner et al. (2021) asserts that the differentiated instruction, when is used in the inclusive and even in the special school, brings positive achievement to the students. The most strategies teachers were found to be usingwere like the groupings in both the inclusive and the special

schools. Also,the study by Letzel-alt et al. (2022) provided the information that the practice of DI was very useful during the period of DI where by the teachers practised it in the form of open education/granting autonomy, which relied on students' own ability to take responsibility of their own learning although it was not effective for the students with special needs as they needed much assistance from the teacher. A study by Rosi (2024) recognises the significance of implementing the differentiated instruction (DI) strategy in an inclusive classroom setting, that it allows for customised learning experiences that can lead to the success of all students in the class as they acknowledge the consequence of integrating the differentiated instruction (DI) strategy in inclusive classroom environments as it caters for the diverse needs of all students, including those with special needs.

In Tanzania, mathematics is among the compulsory subjects in the lower secondary education With respect to its importance, the mathematics instructions in the inclusive classes require that teachers have the knowledge on the students' different needs and for being able to incorporate different approaches to teaching that will help students to have the understanding towards the subject content.

Various empirical studies have mentioned differentiated instruction to be among the successful strategies toward teaching mathematics in different levels of education. A study by Lestari et al. (2024) on the implementation of DI in teaching mathematics in elementary classes found that the students' mathematical critical thinking improved when they were being taught through the differentiated instruction more than when they were not. This study concluded that it was evident that the application of differentiated learning was quite effective in improving students' critical and creative thinking skills in the volume of rectangular prisms and cubes compared to conventional teaching methods.

Furthermore, Padmore and Ali (2024) reported that mathematics teachers agreed that differentiated instruction was important in teaching mathematics. Aguhayon et al. (2023) in their study identified the benefits of using DI in teaching mathematics as it improves students' achievements. The study concluded that differentiated instruction effectively bridges students' mathematical learning gaps, particularly when tackling integer-related issues because DI allows the teachers to tailor the instruction with the consideration of the student's different

needs in their minds. Despite its importance, teachers claim that it is not easy to attend each child's needs because the classes have a large number of students (Padmore & Ali 2024), time constraints (Lavania, & Mohamad 2021) and lack of teaching and learning resources (Onyishi and Sefotho, 2020).

In Tanzania few studies have been done on the teachers' practices of DI in teaching in secondary schools. A study by Nguvava and Meremo (2021) identified that teachers had knowledge about DI and they were implementing the strategy in teaching and learning process through the use of various methods of teaching such as group discussion, think pair and share. Despite the evidence that the differentiated instruction brings positive outcome in teaching in the inclusive classes as well as in teaching mathematics subject, the trends in mathematics performance in the selected Secondary Schools in Makambako Town Council is low. This trend has been exhibited consecutively over years (See Table 1 below).

Table 1

Trends in Mathematics Performance at Sampled Secondary Schools with Inclusive Education in Makambako TC

	Mathematics Pass rates	**Mathematics Competency Level (GPA-Grade)**	**Mathematics Performance National Wise (GPA-Grade)**	**Mathematics Pass rates**	**Mathematics Competency Level (GPA-Grade)**	**Mathematics Performance National Wise (GPA-Grade)**
School A	37%	4.34-D	3.33-D	19%	4.68-F	3.72-D
School B	25%	4.59-D	3.79-D	17%	4.74-F	3.75-D
School C	40%	4.36-D	3.57-D	11%	4.84-F	3.96-D
School D	32%	4.25-D	3.45-D	26%	4.65-F	3.83-D

Source: NECTA Form Four Examination Mathematics Results (2023 & 2024)

Based on Table 1, the findings indicate that mathematics performance in Makambako Town Council declined across all sampled secondary schools from 2023 to 2024, as revealed by this study. For example, in 2023, School C's mathematics performance rate was 40%, but in 2024, it declined to 11%. Therefore, this study was crucial to be conducted in order to assess teachers' understanding of Differentiated Instruction (DI) and to explore the resource barriers they were facing in implementing DI practices in mathematics instruction, particularly in inclusive secondary school classrooms.

Specific Objectives

i) Assess teachers' understanding of Differentiated Instruction (DI) in mathematics instruction.
ii) Explore the resource barriers faced by teachers in implementing DI practices in inclusive secondary school classrooms.

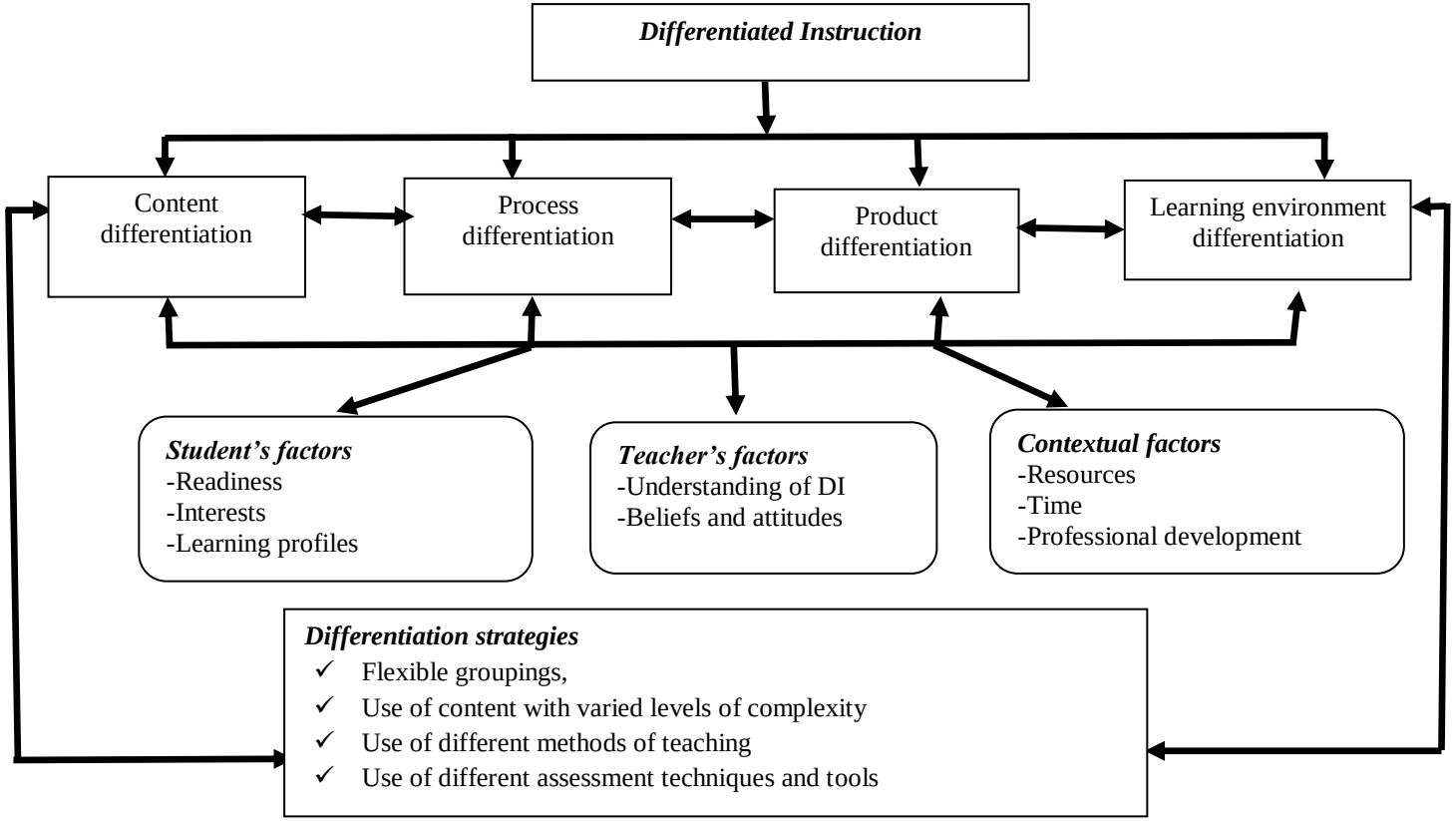
Differentiated instruction Conceptual Model

This Differentiated instruction model shows the interplay of the variables in the stated problem. Explanations of the variables are given below in Figure 1. It has been modified from Tomlinson's model (1999), and modification has been done by adding the two factors for consideration in the implementation of DI: the teachers and context factors. Only the student's interest, readiness, and learning profiles were featured in the Tomlinson model. The model highlighted in Figure 1 illustrates the key elements and their relationship in implementing DI in teaching mathematics in inclusive classes. Where differentiated instruction can be done in the four elements: the content, process, product, and learning environment. Mathematics teachers can differentiate these four elements of DI.

The baseline of differentiated instruction lies in the student's readiness, student learning profiles, and the student's interests. The student's readiness refers to the current knowledge, understanding, and skill level related to a particular learning sequence. Students' interests are what they enjoy learning about and thinking about, and doing that evokes curiosity and passion. Furthermore, learning profiles focuses on a student's preferred learning mode and how students learn best. Considering the students' readiness, interest and learning profiles, implementation of differentiated instruction depends on the teachers' understanding of the concept of DI and how to apply it in the classes. Contextual factors like

resources and time are more important factors for implementing DI in teaching mathematics. As a result of considering the necessary factors for the implementation of DI, mathematics teachers can implement DI through various strategies to differentiate each element. Such strategies are flexible groupings, the use of content with varied levels of complexity, the use of different methods of teaching, the use of different assessment techniques and tools, etc.

Figure 1:
Conceptual model for differentiated instruction adapted from Tomlinson (1999)



STUDY METHODOLOGY

This study was conducted at Makambako Town Council (TC) in the Njombe Region. Makambako TC was selected due to the fact that it has large number of schools that are already implementing the inclusive education compared to other districts in the region. Makambako TC has a total of 11 secondary schools that admit both special needs and non-special needs students. The research involved 15 participants including the mathematics teachers, head of schools and the ward educational officers were selected from 4 public secondary schools. Purposive sampling was used to select the teachers, head of schools and the ward educational officers.

Mathematics teachers are the ones who are involved in the process of teaching and learning mathematics in the classroom. Head of schools were involved in this study because they are the immediate supervisors of the teachers on the day to day activities. They understand the challenges that the teachers face in the implementation of DI. Ward education officers also possess the necessary information on the challenges that teachers face in the teaching mathematics in the classroom because they are the key immediate administrators in the school activities.

To ensure data triangulation, different methods of data collection were used to collect data from the respondents. The semi-structured interview and classroom observation were used. The semi-structured interviews were conducted with mathematics teachers, head of the schools and the ward educational officers. The participatory classroom observations were conducted during the classroom session and the teacher's lessons plans were reviewed to see the teachers' plans for implementation of the DI. The interview guide and observation checklist were used as tools to collect the data. Thematic data analysis was employed in analysing the data. Thus, the researcher familiarised herself with the data, followed by transcription and translations since interviews were conducted in both Swahili and English. Thereafter, the initial codes were generated followed by defining and naming the themes.

RESULTS AND DISCUSSIONS

This section presents the findings that were guided by two research questions which were: how do the teachers understand the concept of DI? and what are the barriers towards the practices of DI in teaching mathematics in inclusive classrooms in secondary schools?

Understanding of the DI in teaching mathematics in Inclusive classes

The study entailed the understanding of the DI and its applicability in teaching mathematics in inclusive classes. The study identified that teachers had varied understanding of the DI. Various ideas were raised by the teachers some of them being the use of different teaching methodologies, use of teaching aids during the process of teaching and other said that it was a new term to them.

DI as the use of different teaching methodologies

The findings generated from the data collected from the respondents revealed that some of the respondents had understanding of DI as the use of different teaching and learning methodologies. This means that when they were teaching while using different teaching methods; to them it was the differentiation of the instruction as they were helping students to learn through different ways. On this regard, during interview, one of the mathematics teachers had these to say:

> To me, differentiated instruction is the use of different teaching methods to teach a single lesson. It is like teaching a certain concept by starting with the question and answers method, followed by lecture method and then students' discussion and lastly presentation (Interview with Teacher 4 in school B, April, 2024).

He further added:

> The use of this strategy is beneficial to the students as the students learn from one another in different ways. So, using this approach is helpful to them as they can understand better through the different methods that are used. But we need trainings about it so that we can understand it clearly what it is and how it is used (Interview with Teacher 4 in school B April, 2024).

This was also supported by another teacher who said:

> I think that this is the use of both modern and traditional teaching methods in the process of teaching and learning. I normally teach using lecture, discussion, questions and answers. In this, I think I am providing different opportunities for the learners to understand the lesson. (Interview with Teacher 6 in school C April, 2024).

DI is the use of teaching aids during the process of teaching

Respondents also said that DI was the use of various resources in the process of teaching. This involved the use of teaching aids during the process of teaching and other resources. In connection to this, during the interview, the respondent had these to say:

> To me I think DI is teaching while using various materials like teaching aids when teaching a certain concept in the classroom. This is helpful to the students because they always understand much when I demonstrate with the teaching aids or real objects. (Interview with Teacher 7 in school D April, 2024).

This also was supported by another teacher who said

> Differentiated instruction is the provision of different instructions to help the students understand the lesson. This involves the use of different teaching aids and techniques to help the students grasp the knowledge of what is being taught (Interview with Teacher 3 in school B, April 2024).

DI is among the learner centred approaches

Some of the respondents also referred to DI tas among the learner centred approaches where by the teacher would needsto understand the students and involve them actively in the process of teaching and learning.

Making a reference to this, another teacher added It is one of the learner centred strategies that require the teacher to understand the students' understanding level and their special needs to be able to teach them all (Interview with teacher 8 school D, April, 2024).

On the same regard, another teacher said that

> DI is among the modern teaching methods or approaches that need a learner to be an active participant in the lesson. It is used in the classroom when we make student do most of the activities. Like teaching using discussion methods, letting them demonstrate I think it is differentiating instruction (Interview with teacher 5 in school C, April 2024)

Despite their positive views concerning the application of DI, the findings revealed that some teachers still lacked the knowledge of DI and its practices. The findings of this study are supported by the findings of Yetnayet (2020) who found out that teachers' knowledge on differentiated instruction was crucial for the effective implementation of DI. Knowledge of what DI is and how it can be applied in a given context is of most significance and has impact on its implementation. This means that teachers' understanding of the DI can determine how they are going to implement it during the process of teaching mathematics. Also the findings by Onyishi and Sefotho, (2020) revealed that, for effective implementation of the DI, teachers needed more information on how to differentiate the instruction without watering down the curriculum.

Barriers towards the practice of DI

Several barriers were identified during the interview and the classroom observation. This paper will shed tlight on the resource related barriers that hinder teachers from the effective practice of the DI. The respondents shared various barriers like the shortage of time, shortage of mathematics teachers, and lack of training and limited resources.

Shortage of mathematics teachers

During the interview, teachers claimed that it was hard for them to reach out to the needs of each and every student due to the large work load that was caused by the small number of mathematics teachers in the school.

Reacting on this, teacher 2 from school C said

> The major challenge is the shortage of the mathematics teachers who would meet needs of different students. This is because teachers need to have enough time to prepare for each class, but teachers here have many lessons to teach that they have to teach even despite the fact that the school has employed some part time teachers. However, despite this, we still have a big load that makes us not concentrate much on assessing the progress of each student in the class (Interview with Teacher 2 in school B, April, 2024).

Also,the WEO from ward B said:

> The schools have less numbers of teachers. This makes the teacher student ratio t be high which makes it difficult for teachers to reach out all students. For the case of one of the schools in my ward, it has only 4 teachers who are employed by the government while the number of students in ordinary level is about 1400 . Thus, I think the government should consider the students' ratio when employing teachers (Interview with WEO 2 in ward B, April, 2024)

The above finding presents that teachers have large workload that makes it difficult for them to differentiate instruction in their classes. This means that meeting the needs of students in the inclusive classroom needs enough time for teachers to design the mathematics instruction that will be easily understood by all the learners with respect to their needs. This also needs a teacher to understand their students very closely to understand their specific needs to make it easy to address them. However, the reality shows that teacherswere few and this was making them have a large number of classes under their care that automatically makes it difficult for them to attend their needs.

The teachers workload as the challenges toward the practice of DI in teaching have also been supported by Njagi (2014) who stated that teachers were claiming that the workload that they had, was giving them a hard time to implement DI in teaching. This is because, the DI requires overtime in planning to be able to support students.

Time Constraints

Through interviews, time limitation also was cited as another barrier in implementing DI in teaching mathematics in inclusive classes. . Teacher respondents claimed that it was difficult for them to consider each and every student's needs in the class when teaching mathematics because they had a lot of classes. Teachers were being triggered by the needs of accomplishing the syllabus in time as it was set by the school. Thus, having enough time to help each and every student in the class was the major challenge to them. This was also accompanied with a larger number of classes a single teacher had to teach.

Regarding this, during the interview, one of the teachers said

> To meet the needs of different students, teachers need to have enough time to prepare for each class considering the different needs of the students and assessing the students. However, teachers here have many classes that they have to teach (Interview with Teacher 5 in school C, April 2024).

In relation to the same matter, another teacher said

> The focus of accomplishing the syllabus is the main challenge to me to focus on each student in my class. We have been given the school plan that at the end of June, the syllabus should be complete and then be able to make revision for the exams. Thus, sometimes, I have to focus on the plan that I have made instead of the needs of the students in the class because of the time limitations (Interview with Teacher 3 in school D, April, 2024).

With a focus on the same issue, the head of school A said

> Dealing with the students with different needs gives challenges to the teachers due to the limited time they have. To make sure all the students have understood in the classroom, they have to spend more time with them. For the case of our school, the students with low vision and hard of hearing are among those with special needs in the classes and they need much more time to accomplish every activity that is done in the classroom. Activities like taking notes on what the teacher is teaching, completing tests and assignments or quizzes have to be done. Thus, sometimes, it is hard for the teachers to consider these students because of the time and the need to accomplish what they have planned (Interview with Head of school A, April 2024).

Teachers claimed that it needed much time to attend the needs of students in the inclusive classes . Teaching mathematics also needed much time to help students understand the concepts being taught . So having the limited time, many of the students in inclusive classes were noted to have been leaving their classes without understanding the mathematics concepts as the teachers did not get enough time to attend their specific needs.

These findings are in line with the findings obtained by Lavania and Mohamad (2021) who identified that the limited time for teachers' preparation and the time to be in the classroom, was the constraining factor towards the implementation of DI. Also, the workload the teachers had included the courses they were teaching, services provided to school and students together with the other administrative roles given to them. Also, the findings by Onyishi and Sefotho (2020) identified time as the major challenge for the teacher to implement DI in teaching in the inclusive classroom. For such teachers, using differentiated instruction was making it difficult for them to cover the syllabus in the stipulated time.

Lack of training

Another concern was the lack of seminars and workshop for the teachers which would make them share experiences and update their strategies towards teaching mathematics. They claimed that if the trainings and workshops that would involve several teachers from different places were conducted, they would help them learn from others how they were doing especially those with good performance in mathematics:

> The main challenge is that we do not have any training on how to deal with the students who are having different needs. Sometimes, they come to class having no mood to learn. Thus, as a teacher, you have to understand that. Otherwise, if you will be harsh to them, you will end up making them hate the class so it needs a teacher to be extra careful. Hence, without training, we cannot be able to help these students with special needs (Interview with Teacher 1 in school A, April 2024).

Also, the WEO of ward C said

> All schools are needed to accept all the students with special and with no special needs. But the main issue is that teachers are not equipped with knowledge on how to accommodate the students with varieties of special needs. This makes it difficult for the teachers to reach out to them as a result they are left behind (Interview with WEO 1 in ward C, April, 2024).

As presented in the above findings, the teachers have less opportunities to trainings and workshops especially on the ways to help the students in the inclusive classes. This limited opportunities to trainings mean that teachers have insufficient knowledge on how to accommodate students with diverse needs in their classes. Thus, this will make it difficult for the teachers to assist the learners and help them thrive in their academic journey.

This finding correlates with Yetnayet (2020) that there is a lack of teachers trainings concerning the DI. Because they lack the understanding of DI and, in the case of new instructors, the expertise to instruct diverse learners, teachers are thereby intrinsically unable to give meaningful and successful instruction for all students unless they receive the appropriate training. Thus, it is imperative that DI be given enough consideration in pre-service education and subsequent in-service teacher training.

Shortage of materials

Another challenge revealed was the shortage of materials. It was found to be one of the major challenges standing in the way of the implementation of DI in inclusive classroom in secondary schools. Teachers claimed that the materials were not enough for all teachers to use during teaching.

On this, during the interview, a teacher from school B said

> Things like rulers and different equipment used in teaching mathematics are scarce in the school. Sometimes, you may need to usethem but you can find that the other teacher has taken them already. Or sometimes, I might need to prepare different teaching aids but the materials like manila and others are not available . So, I have to teach without the teaching aids (*Interview with Teacher 4 in school B, April, 2024).*

As it can be seen above, the teaching materials in the visited schools were not enough for the teachers to use in the classrooms. This shortage of the materials means that teachers could not provide instructions to the students with respect to their needs. This is because, they have to use what is available and not what is needed by the students in their classes.

These findings also support those by the study of Yetnayet (2020) who found that, the availability of instructional resources was another issue brought up as a barrier to the implementation of DI. A greater range of resources, such as a tape recorder, customised sports materials, textbooks,

and pictures prepared with braille orchanged instructional materials, were all mentioned by the supervisors to be very beneficial.

CONCLUSION AND RECOMMENDATIONS

The study concludes that majority of the informants showed clear understanding of the DI although a few of them were not aware of it. Despite their understanding of what DI was, as applied in inclusive classes, they were not able to implement it during the teaching and learning process.. Furthermore, limited materials, time constraints, shortage of mathematics teachers and lack of training were observed to be obstacles in the implementation of DI in teaching mathematics in inclusive classes. Based on the conclusion made, the study recommends teachers to be equipped with enough information on how to implement DI in teaching so as to practise it well during teaching in the inclusive classes.

The study also concludes that there should be the provision of enough resources to support teachers' practices of DI in teaching especially mathematics in the inclusive classes. Teachers should be provided with different teaching materials like books and teaching aids. Also, time is necessary to be made enough for the teachers to implement DI in teaching. This problem can be solved by employing more mathematics teachers to reduce teachers' workload thus making them have enough time to plan and practise DI in teaching mathematics.

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APPENDICES

Appendix 1: Reliability Analysis

The overall alpha maximum value was α=0.914 suggesting that the scale used was highly reliable(strong). The value for each item reached the minimum reliability ($\alpha \geq 0.70$) (reasonable) value suggesting that they all measured related construct.

S/N	Questionnaire items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	Access to past and current data on climate change	0.64	0.91
2	Preparation of space dynamic-teaching and learning resources	0.77	0.90
3	Align teaching and learning resources, with the competence	0.82	0.89
4	Align teaching and learning activities, with the competence	0.79	0.90
5	Align teaching and learning assessment, with the competence	0.91	0.89
6	Mobilize learners/resources to mitigate climate change	0.75	0.90
7	Recommend teaching and learning resources for learners	0.72	0.90
8	Suggest a specific web site for learners to access	0.43	0.93

Overall alpha is 0.67 (reasonable)

S/N	Questionnaire items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	Availability of equipment used to measure weather elements	-0.11	0.78
2	Availability of good textbooks	0.39	0.63
3	Availability of enough supplementary books	0.63	0.52
4	Availability of electronic/digital sources	0.56	0.55
5	Availability of other teaching and learning materials	0.67	0.49

Overall alpha is 0.68 (reasonable)

S/N	Questionnaire items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	Lack of teaching and learning materials for teaching climate change	0.42	0.64
2	Lack of clear knowledge of some concepts in space dynamics	-0.23	0.72
3	Overcrowded space dynamic content	0.59	0.60
4	Mismatch between the syllabus and text book	0.48	0.62
5	Assessing beyond the syllabus in final examination	0.53	0.61
6	Insufficient time to effect students' competence	0.16	0.69
7	Lack of past and current data on climate	0.13	0.70
8	Poor background of space dynamics topic	0.62	0.59
9	Lack of teachers' workshops to improve knowledge on space dynamics	0.53	0.65
10	Lack of some instrument used to measure weather elements	0.21	0.67

Appendix 2: Interview Analysis Matrix

Challenge	Representative quotes
Incompetence	*Of course, now if I myself have a challenge to understand some concepts, how can I know whether the students have acquired the competence or not* ***(TM03-01, 2024).***
	The challenge is that teachers do not understand how to compose questions that measure competence ***(TM01-02, 2024).***
	The challenge is on how to construct question to assess competence. You know that we are in competence-based curriculum and I don't know how to assess the competence ***(TM04-01, 2024).***
Focus on examination	*Due to time and interest of our students we are forced to concentrate on helping learners to answer national examinations. We focus much on questions that will appear in national examinations. Another challenge is that when you ask students questions that focus on competence it became very difficult for them* ***(TD01-02, 2024).***
Lack of Weather measuring instruments	*Lack of equipment is a challenge. In teaching, the teacher needs to use teaching aid so that the topic is understood, now the challenge is the availability of equipment. For example, you need measuring devices so as to teach well. The problem is that many schools do not have the devices, so the teachers teach more theoretically or superficially (****TM01-02, 2024).***
	The modern teachers do not like to prepare the instruments by themselves, we expect the school to buy or the government to bring those devices but they are so expensive. The challenge is that teachers do not make the devices using the local available materials ***(TM04-02, 2024).***

Lack of quality reference materials	*Lack of enough teaching and learning materials. Sometimes you want to give them task or assignment but they cannot accomplish because they don't have reference materials. (**TD01-01, 2024).* *Sometime the text books and supplementary materials lack of some concepts. We lack books that are straight forward and sometimes the languages used in the books are difficult to students. (**TM02-02, 2024).***
Lack of Technological facilities	*Lack of projector so that we can use ICT in teaching space dynamics. There is a problem of depth of information in some concepts or sub topics (**TM04-01, 2024).*** *We lack assistive technology teaching as well as videos that can be used as learning aids (**TM02-02, 2024).***
Insufficient Fund	*It is difficult to organize a study tour to a weather station because of the distance…. I tried to convince students to contribute money only few managed to do so, now it is difficult to go with five students **(TM02-05, 2024).*** *There is a challenge to organize a study tour because the students do not have money and the school does not have fund **(TD01-02, 2024).***
Lack of resources	*There is a challenge of providing activities especially when you want your students to measure and record weather elements. This is because there is no equipments **(TD01-01, 2024)*** *Challenge is on providing practical activities such as measuring and recording weather elements because of lack of the instrument **(TM01-04, 2024).***
Lack of students'	*The students prefer the use lecture method to participatory methods such as discussion in learning*

motivation to learn and incompetence	*space dynamics. If you give them assignment, they claim that it is difficult to find the materials* ***(TD01-02, 2024)***
	Some students have negative perception of learning the topics. Some terminologies used are difficult to students ***(TD01-05, 2024)***
	The content is very wide so, some activities are difficult to provide. For instance, interactive teaching and learning activities because they take time compared to lectures ***(TM04-03, 2024).***
Difficultness	*It is difficult to explain some concept that are not seen by learners. For instance, the arrangement of air masses, pressure differences.... When you tell them that an area has high pressure, they don't understand what it is because they cannot see it (****TD01-01, 2024).***
Inadequate training	*I have never participated in any seminar…. In our school we just observe science teachers going to participate in seminars and workshops but Geography teachers we have never had that opportunity. We are still waiting for the Government to remember us* ***(TM02-02, 2024).***
Inability to effect practical activities	*We teach the topic without going to the field. We do not have devices to teach the topic practically* ***(TD04-02, 2024).***