Isabela State University Linker:
Journal of Education, Social Sciences, and Allied Health
Volume 1, Issue 2
ISSN (Print): 3082-3692 ISSN (Online): 3082-3706
DOI: https://doi.org/10.65141/jessah.v1i2.n3

Differentiating Mathematics Instruction: Teachers' Experiences in Inclusive Classroom

April Joy T. Aribbay[1], Ivy Rose D. Baccay[2], Joshua T. Cordova[3], Kei Kirstine G. Lopez[4],
Chriselle B. Tandayu[5], Chezy Ivy S. Villamor[6], Jose B. Rosario[7]
College of Education, Isabela State University, Cabagan, Isabela, Philippines [1,2,3,4,5,6,7]
jose.b.rosario@isu.edu.ph

RESEARCH ARTICLE INFORMATION	ABSTRACT

Received: August 16, 2024
Reviewed: November 15, 2024
Accepted: December 8, 2024
Published: December 30, 2024

As the Philippine basic education system moves toward inclusive education, teachers must adapt instructional approaches to meet the needs of every learner. Examining how teachers implement such approaches can provide valuable insights into effective strategies and techniques to improve the teaching and learning process. This phenomenological study investigated the narratives of two female mathematics teachers in differentiating instruction in an inclusive classroom. The data gathered from the interviews was analyzed using thematic analysis. The findings revealed that teachers give pre-assessments, varying levels of activities, interest-based activities, personalized instruction, and standards-based assessments with accommodations for differentiated instruction. Teachers' challenges in delivering instruction and classroom management seemed to be mostly caused by a lack of training. Moreover, use of modified learning activities, internet dependency, and community collaboration emerged as their coping strategies to address certain challenges. Furthermore, teachers believed that differentiated instruction improved students' logical-mathematical intelligence. To enhance the quality of education in an inclusive classroom, a comprehensive needs analysis is recommended as input for the design and conduct of intensive

training programs for teachers on differentiated instruction.

Keywords: *challenges, coping strategies, differentiated instruction, inclusive education, logical-mathematical intelligence*

Introduction

The global movement toward inclusive education is rooted in the principle of ensuring access to quality education for all. The World Declaration on Education for All (1990) emphasizes this fundamental right, recognizing the diversity of learners. This declaration serves as a foundation for national policies that promote inclusive education practices like Department of Education (DepEd) Order No. 72, series of 2009, which specifically highlights the importance of providing appropriate education for all within normal classroom settings. This policy shift acknowledges the benefits of inclusive settings for both students with special needs and regular students. Following this, Republic Act (RA) 11650 of 2022, also known as the "Instituting a Policy Inclusion and Services for Learners with Disabilities in Support of Inclusive Education Act", strengthens the mandate for inclusion policies in basic education. This legislation will guarantee the accessibility of all schools to the resources and support networks they need to successfully adopt inclusive education practices.

DepEd Order No. 72, s. 2009 was supported by the Commission on Higher Education (CHED) before RA 11650 was signed into law by adding "Foundation on Special and Inclusive Education" to the list of foundation courses that pre-service teachers must take as part of the curriculum revisions for the teacher education programs (CHED Memorandum Order No. 74-80, s. 2017). The objective of this course is to provide legal, philosophical, and theoretical information about inclusive education to pre-service teachers. Future teachers are also expected to be familiar with the different strategies they need and equip them with managerial skills to handle diverse learners in a typical classroom.

Teachers worldwide, including in the Philippines, lack trainings in differentiated instruction (Lavania & Nor, 2020) and preparation for inclusive education (Alcosero et al., 2023; Muega, 2016). Muega (2016) noticed that teachers are concerned about the lack of experts among educators that will capacitate them. A recent study by Padmore and Ali (2024) found that a lack of resources and support from stakeholders makes it difficult for many teachers to differentiate instruction. Also, teachers are not prepared to teach because they lack knowledge, resources, or experience in an inclusive classroom (Alcosero et al., 2023). They recommended that to successfully implement differentiated instruction, regular teachers should receive practical training as well as programs that offer them professional and psychological support. On the other hand, schools must seek the help of the community (Macabenta, 2023) and stakeholders must contribute in any way (Toquero, 2021).

Additionally, Geel et al. (2019) highlighted the content of the lesson, group composition, school support, curriculum material, and data regarding student achievement and progress as the complexity factors of differentiated instruction. These lists of complex factors provide the basis for developing a professional path. Besides, Bal (2023) noted that students have experienced challenges in the implementation of

differentiated instruction in terms of grouping, distribution of tasks, environment, and pacing of learning.

A number of studies have shown beneficial effects of differentiated instruction on the mathematics proficiency of students. Differentiated instruction has a significant effect on gifted and talented students' mathematical-thinking processes (Mohd et al., 2022). And as per Kettler's (2021) assertion, the curricular paradigm in special education, consistently emphasizes the development of critical thinking skills. Differentiated instruction has significant effects on student achievements in mathematics (Maslovarić et al., 2023). This includes the increasing self-esteem, interests, achievements, and participation of students in mathematics class.

Moreover, positive impacts of differentiated instruction were identified such as how it can significantly enhance students' achievement (Mićanović et al., 2023) and students' mathematical thinking processes, including those of gifted and talented students (Mohd et al., 2022). Likewise, Kettler (2021) suggested that differentiated instruction can effectively integrate critical thinking skills into the mathematics curriculum. These studies indicate that differentiated instruction leads to higher student achievement in mathematics, including greater student participation, interest, and self-esteem. Therefore, understanding how differentiated instruction can be employed to optimize the development of logical-mathematical intelligence is important for teachers seeking to prepare students for the challenges of the 21st century. Furthermore, it also offers actionable insights for administrators for them to provide technical and professional support to their teachers.

As the world is geared towards addressing inclusion in education (UNESCO, 2020), it is vital to examine the experiences of teachers in differentiating instruction in an inclusive classroom setting more so in teaching mathematics. By exploring these, the study can address the gaps by contributing to improving teacher training programs, providing targeted support for teachers implementing differentiated instruction like resource allocation, and eventually enhancing the learning outcomes. Hence, this study generally aimed at gaining valuable insights from the experiences of mathematics teachers in differentiating instruction in an inclusive classroom. Specifically, it sought to answer the following questions:

1. How do mathematics teachers in inclusive classrooms differentiate their instruction?
2. What challenges do mathematics teachers face in implementing differentiated instruction?
3. How do mathematics teachers handle the challenges they encounter in implementing differentiated instruction?
4. What is the perception of the teachers on the logical-mathematical intelligence of their students after implementing differentiated instruction?

Theoretical Framework

According to UNICEF (1990), the best way to guarantee that each child has an equal opportunity to attend school, study, and acquire the skills that will enable them to thrive is through inclusive education. Thus, teaching in an inclusive classroom allowing students of all backgrounds must be anchored on the fundamental principle of differentiated instruction theory by Tomlinson (2001), that teaching strategies ought to be modified and aligned to each unique and diverse student in the classroom. The effectiveness of the teacher and the students in comprehending and implementing the

learning objectives in a course of study depends on both individuals having an in-depth knowledge of the fundamentals of differentiation. Hence, differentiated instruction calls for teachers to be adaptable in how they modify the curriculum and how students are presented with information.

Inclusivity in the classroom values the contributions of each student allowing them to progress alongside one another. As such, Gardner's Theory of Multiple Intelligences (1983) is vital in the instructional delivery for a personalized approach that incorporates activities and assessments targeting multiple intelligences. Differentiated instruction caters to these multiple intelligences by offering varied learning experiences as a suitable strategy or approach in teaching. Additionally, Lev Vygotsky's Zone of Proximal Development (ZPD) highlights the importance of scaffolding instruction to meet students at their current level and challenge them to reach their full potential (Shabani et al., 2010). Differentiated instruction should operate within the student's zone of proximal development, requiring the teacher to understand the student's current level, their learning goals, and the necessary steps to achieve them (Suleyman, 2019).

Inclusive classroom caters to diverse students with diverse needs. Thus, understanding the Theory of Social Learning by Bandura (1977), which emphasizes the role of collaboration and peer interaction in learning, and the principle of the Least Restrictive Environment (Copenhaver, 2006) of the Individuals with Disabilities Education Act (IDEA), which aims to educate students with disabilities alongside their peers to the greatest extent possible, are crucial. Differentiated instruction supports LRE by providing a framework for individualizing instruction within a general education classroom.

Methods

Research Design

This study employed a qualitative research design, particularly the phenomenological research design. Phenomenology seeks to describe the lived experiences of individuals in a certain phenomenon as narrated by the research participants (Creswell & Creswell, 2023). This phenomenological approach, using thematic analysis, is ideal for providing a thorough examination of teachers' lived experiences in differentiating mathematics instruction in an inclusive classroom as well as their challenges and coping mechanisms.

Participants and Locale of the Study

The main sources of data for this study were two female mathematics teachers from San Pablo National High School in San Pablo, Isabela; one taught in Grade 9 and the other in Grade 10. Using purposive criterion sampling, the participants were selected according to the following criteria: (a) teaching mathematics while having at least three (3) diverse students such as students with autism, developmental problems, ADHD, OCD, and visual impairment, among others; and (b) implementing differentiated instruction in the classroom. The second criterion was set with the understanding that the participants were considered to have proper knowledge and training in differentiated instruction. These criteria were set in order to ensure that they aligned with the research objectives and to identify potential participants who could offer their perspectives and experiences related to the phenomenon. The researchers used two (2) respondents because there were only two teachers who fit the predetermined criteria, despite Creswell (2013) suggesting that an appropriate sample size may range from 3 to 25

participants for a phenomenological study. Moreover, no universal rule dictates the minimum and maximum number of participants for qualitative research (Bliss, 2016; Bekele & Ago, 2022, Creswell & Creswell, 2023).

Data Gathering Instrument

To gather necessary data for this study, the researchers developed interview guides to facilitate discussions regarding the narratives of teachers in teaching mathematics in an inclusive classroom using differentiated instruction. The interview guides also include questions regarding participants' perceptions of their students' logical-mathematical intelligence. The said instrument was validated by two (2) experts to ensure reliable responses.

Data Gathering Procedure

After the validation of the instruments, the researchers proceeded to the participating school and sought approval from the school head and teacher participants. The participants were fully oriented about the study and provided consent forms indicating information about confidentiality and anonymity. Then, the researchers conducted individual interviews followed by the transcription of the interview responses. Coding was done next, after which themes were identified.

Data Analysis

Braun and Clarke's (2006) thematic analysis procedures were used to analyze the collected data. This involves the familiarization of the interview data to understand the content and context of the responses, followed by systematic coding to generate themes related to teachers' experiences with differentiated instruction. The themes were then thoroughly reviewed and refined based on recurring concepts, after which the themes were clearly defined and named appropriately. Lastly, a detailed and coherent write-up encapsulating the respondents' narratives was constructed to provide a comprehensive account of the data.

Ethical Considerations

The researchers provided informed consent and fully oriented the participants regarding the data-gathering procedure. Participants were made aware of their freedom to withdraw during the interview and that there was no coercion or forced participation. They were also assured of the confidentiality of the data gathered, and code names were used to anonymize their identities. To ensure the secrecy and integrity of the data, the researchers stored the gathered digital data in a folder encrypted with a passcode. Moreover, the researchers presented the findings of the study to the participants to confirm the accuracy and alignment of their responses with the themes generated.

Results and Discussion

Delivery of Differentiated Instruction

Teachers are responsible for the efficient delivery of teaching in the sense that they prepare, plan, and carry out instruction. As a consequence, measures for assessments are made and activities are modified to further enhance the delivery of instruction. This cycle is evident from the following subthemes that arose from the responses.

Pre-Assessing the Students

Pre-assessing the students is the first thing being considered by the teacher participants as it provides them a background of their students, their prior knowledge, interests, abilities, and learning styles. These serve as a guide for them in designing differentiated instruction strategies. One of the teacher participants said: *"Hmmm I'm conducting a pre-assessment first to identify background knowledge, interest, and even the learning styles of the students"* (Participant 1). While Participant 1 credits the background knowledge and learning style of the students, Participant 2 used the scores of the students in pre-assessment to identify the needs of the students. She stated:

> *"The first thing I do is to assess the needs of my students. So, I administer a pre-test or pre-assessment, and then, based on their scores, I can see who needs support and who is ready for the next lesson."* (Participant 2)

As per statements of the participants, they are both conducting pre-assessments for this is a crucial step in differentiating instruction. This has been affirmed by Chen and Ginja (2020) who noted that assessing the students regularly allows the teachers to know their students' learning histories, background, prior knowledge, interests, readiness, and skills. This method acknowledges the student's diversity and helps the teachers to address the challenges that they will face. Differentiated instruction puts importance on recognizing and adapting to the diverse needs of every student, providing them with relevant and stimulating learning opportunities, and encouraging participation (Cruz et al., 2019; Whitely et al., 2021). Hence, the data gathered can help teachers in identifying students who need additional support. As a consequence, following the principle of differentiated instruction theory by Tomlinson, teachers can make adjustments or modifications to their teaching and learning plans to cater to the needs of these students.

Leveling of Activities and Assessments

The respondents benchmarked on what they found out in their pre-assessment to create varied learning activities and assessment methods to cater to every student with varying needs, talents, and abilities. By providing tiered activities and varying assessments, teachers cater to diverse student needs and knowledge levels. Participant 1 said:

> *"What I do, especially for topics that are somewhat complex, especially in math, of course those with special needs might not be able to write anything, so I just give them basic activities that I know match their level of understanding."*

Participant 2 has the same opinion and said:

> *"…the task I give them are easier compared to their classmates. So, for example, in quadratic equations, if their classmate is solving a quadratic equation, I would give them the formula already written down, while their classmate would still have to substitute values."*

The respondents evidently differentiate instruction by varying the activities based on the student's skills, interests, and abilities. The respondents also adjust the difficulty level of tasks given to students based on their ability. Likewise, Celik (2019) indicated that differentiated instruction will take place in the student's zone of proximal development, which requires teachers to understand their current level, besides goals and learning capabilities. This supports the participants' responses where they employ a range of assessments based on the interests and abilities of the students, nurturing engagement and accommodating diverse learning styles. Gardner's theory on multiple

intelligences provides a wide perspective on varying the activities based on student's knowledge levels. This ensures that they have equal opportunities to succeed and develop higher-order thinking abilities.

Interest-Based Activities

Aside from identifying the learning needs and abilities of students, the respondents also identified the interests of their students. This provided them insights into offering choices in activities that allow their students to learn in ways that suit their preferences. Interest-based activities and group work can increase student motivation and participation. Participant 2 said: "*Okay, so in differentiated instruction, how do I apply… you ask the students for example, three groups, who among you likes to write poems, or who among you likes to do explanations".* Participant 1 gives alternative assessments to her students. She said that: *"What I do for my students with special needs is… alternative assessments like their performance in singing and writing poems".*

The respondents highlighted the importance of understanding student preferences in designing effective learning experiences. Differentiated instruction can be applied by offering students a choice in the format of their work. This allows students to learn through activities they enjoy, like writing poems or creating explanations. Moreover, the approach of Participant 1 with students with special needs demonstrates the value of alternative assessments. By offering singing or poems as assessment options, she tailors the evaluation to student's strengths and interests.

Personalized Instruction

This subtheme emphasizes the purpose of providing one-on-one support to address the specific needs of the students. Personalizing instruction according to their intellectual capacity, learning abilities, and interests, encourages students' engagement and promotes active participation. Participant 2 stated: *"Usually, I discuss first. I discuss everything first and ask them what is … what do you call this? … So, during activity, I go to the three students."*

In the case of Participant 1, she identified the activities she gives to her regular students and to the ones with special needs. She stated:

> *"And for those with special needs, I always ensure that they are always together because there is no leaving anyone behind when they're together. So, I make sure that sometimes when there are groupings, their activity is different compared to the regular students. It's like the difficulty of the exam depends on their level."*

The two participants demonstrate a strong commitment to personalized instruction in their classrooms. They recognize that each student learns differently and has different strengths and needs. As a result, they tailor their instruction to suit the individual needs of the student. Both involve providing students with different tasks, activities, and assessments based on their individual needs and learning styles. Moreover, they also grouped students according to their abilities to ensure collaboration and peer interaction. Lastly, both teachers allowed students to progress at their own pace, rather than being forced to keep up with a set schedule.

Standards-Based Assessment with Accommodation

This subtheme explains how teachers assess their students with disabilities. Standards-based grading with accommodations refers to how regular grading standards can be upheld while providing accommodations for students with special needs,

ensuring they have a fair chance to demonstrate their understanding. Participant 1 said:

> *"Like what I've said, grades should not be as high as the grades of regular students … 80 is the highest grade for those with special needs … because it is useless if I will give them the same exam, they have nothing to write."*

On the other hand, Participant 2 gave emphasis on the way she scored the activity of her students with disabilities, saying: *"…in paper assessment, even without solution, for example, in an item worth 3 points, I'm giving him 3 points because I know he do it independently in one corner of the classroom he prefers."*

Both respondents demonstrate different approaches to standards-based assessment with accommodation in line with the least restrictive environment principles. Participant 1 emphasizes the need for individualized assessment and grading practices for students with special needs. She believes that using the same grading standards and assessments for all students would be unfair and ineffective. Instead, she tailors her assessments to the specific needs and abilities of each student, and she assigns grades that reflect their individual progress. Participant 2, on the other hand, adheres more closely to the DepEd Grading system. She assigns weights to different assessment components, such as written work, performance, and exams, and she uses these weights to calculate students' overall grades. However, she also makes some accommodations for students with special needs, such as giving them extra time on tests or allowing them to use assistive technology.

Overall, the responses from the two mathematics teachers revealed five multifaceted subthemes in their approach to delivering differentiated instruction. Pre-assessing students emerged as their first consideration prior to designing the complexity levels of the activities and assessments as well as in the adaption of internet-based activities and personalized instruction. Moreover, standard-based assessment with accommodation was also considered for those with special needs. Figure 1 below presents the list of these themes.

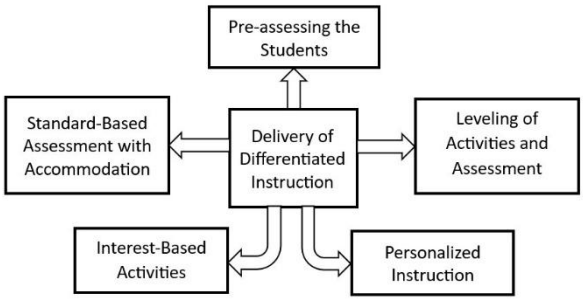

Figure 1. *Delivery of Differentiated Instruction*

Teachers' Challenges in Differentiated Instruction

The following are the persisting challenges encountered by teachers in the implementation of differentiated instruction in an inclusive classroom. Interview responses were analyzed, and the following subthemes were generated.

Lack of Training

Lack of training seemed to be a major problem for the teacher participants in the implementation of differentiated instruction in mathematics in an inclusive classroom. Consequently, this problem gave rise to the emergence of other problems. The teacher respondents have limited knowledge and skills for differentiated instruction. Participant 1 stressed that:

> *"… their problem is how to differentiate instructions in an inclusive classroom because they are used to using only one strategy. Ahmm…they are, somehow, taken back on how to ensure that a student will not be left behind because they are not like the regular ones."*

Participant 1 also emphasized that there is a problem with the curriculum because of a lack of courses or subjects being implemented in teacher education institutions resulting in having no background on how to handle an inclusive classroom, especially implementing differentiated instruction effectively. She stated: *"It's difficult when you don't have a knowledge or training. I hope there are subjects related to these in college so that we will have enough knowledge about implementing differentiated instruction in an inclusive classroom."* (Participant 1)

Participant 2 supported this statement saying she has experienced having a subject related to inclusive education but finding it still not sufficient. She said:

> *"Actually, we had a subject like that when we were in college. I think we are the first batch since that subject was implemented. And ahmm, for me, even though we had that subject, it is still not enough… that's just a 3-unit course, right? So, do you think that is enough to teach in an inclusive classroom… yes, you have that knowledge in different cases of the students but it is not in toto that will lead you to teach in that setting. We are not SPED after all."*

The primary problems include lack of training and not enough background and knowledge, which stem from the gap in pre-service education and limited opportunities for professional development. To support the statement, Lavania and Nor (2020) also found out that teachers faced a lack of training and knowledge in differentiated instruction which the two participants have said. The addition of a course or subject related to inclusive education for pre-service teachers may enhance their knowledge as they enter the real world of the teaching industry. Although there is already a course described as 'Foundation of Special and Inclusive Education' included in the teacher education institution curriculum, as per CHED Memorandum Order (CMO) 74-80, series of 2017, the problem faced by teachers who graduated before and after the implementation of CMO 74-80, series of 2017, has arisen, with concerns that it is still insufficient

Classroom Management

One of the functions of a teacher is to manage the class. However, classroom management is challenging in itself, especially in an inclusive classroom and even more for a large class size. These challenges may include a hard time creating activities for diverse students especially when there is a lack of resources. Participant 2 emphasized: *"Since we are not really trained to teach in that way because we are more accustomed to a normal class, we find it difficult to come up with the activities that are required for them."*

Hence, lack of resources, time constraints, large class sizes, and hard time to create activities for diverse students were identified as problems in the implementation of differentiated instruction. The data gathered reveals that time constraints and lack of

resources further complicate the effective delivery of differentiated instruction. The large class size worsens these problems, making classroom management and getting the attention of each student more difficult.

Behavior of Students

Although dealing with the behavior of students is part of classroom management, it appears to be one of the compelling issues faced by the teacher respondents. The respondents had difficulty managing their student's behavior because of their limited theoretical and pedagogical knowledge as a result of their lack of training. Participant 2 said that:

> *"One of the problems I find difficult to handle is…uhmm... their behavior because, compared to regular students, it's really different. With regular students, when you tell them to be quiet, they can still listen to you and follow your instructions. But with those who have special needs, uhmm… like one student who is smart in math but has challenging behavior, it's hard to manage."*

The different behavioral problems of students with special needs require customized management strategies, which many teachers feel unprepared for. Because of a lack of training, the teachers struggled with how they would manage the behavior of their students, especially those students with special needs. The respondent noted the level of difficulty on how she will handle such behaviors without undergoing training on inclusive education.

Lack of Community Support

Lack of community support also emerged to be a problem for the teacher participants. The respondents experience a lack of community support. The school, parents, barangay, and local government officials must work together to address the problems of inclusivity among learners. Participant 2 mentioned that:

> *"One of the problems we teachers ahhh… face the lack of community support. It would be helpful if they could establish a facility specifically for those with special needs, especially since there are many cases now. Parents want their children to study even if they have special needs, so they enroll them in regular schools. As a result, we struggle as well."*

One of the concerns and trends affecting inclusive education in the Philippines is a continuous lack of services and support from the community. For this reason, each stakeholder must participate in the process and offer their contributions in whatever way they can (Toquero, 2021). In order for the strategies designed for students with disabilities to be implemented to the fullest extent possible, they need to be firmly supported by the services and assistance of experts who are qualified to assess the limitations of the students in question and offer relevant treatments.

In summary, four subthemes surfaced as the main contributors to the challenges faced by the two respondents in employing differentiated instruction. Figure 2 presents these four contributors.

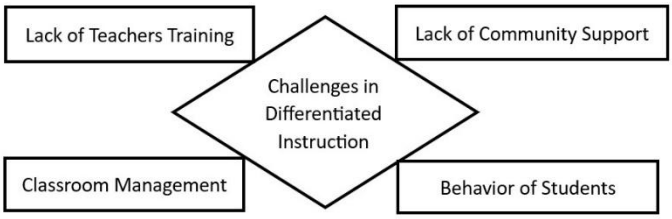

Figure 2. *Teachers' Challenges in Differentiated Instruction*

Teachers' Coping Strategies

Teacher participants were interviewed to find out how they handle problems in using different teaching methods in inclusive classrooms. The following emerged from the responses of the participants as significant coping mechanisms.

Internet Dependency

Teachers use the internet as their main way to handle the challenges of differentiated instruction in inclusive education. They find information, and resources, and align teaching methods with students' learning styles to create effective strategies. Participant 1 said:

> *"On the internet, (laughs)... it's a good thing we have the internet now, right? Because you know, it's a huge help for us. With just one click, information comes up right away that we can use. However, sometimes it's not reliable, right? Not everything on the internet is useful because some of the things we find are relevant to other countries, (laughs)".*

She emphasized that using the internet helps enhance the teaching and learning process.

Collaboration with the Community

This subtheme outlines the ways in which teachers intend to collaborate with the community in order to promote education. It highlights the need for collaboration with various groups to create programs and training for teachers, helping them build better relationships with students and develop affecting teaching strategies. Participant 1 mentioned collaborative planning to address the challenges in inclusive education. She explained that: *"To address the challenges in implementing differentiated instruction in an inclusive classroom, the school will engage in collaborative planning…"*

According to Macabenta et al. (2023), schools aiming to improve their continuum of services should seek support from administrators, support specialists, and local government organizations. They emphasize the need to address challenges related to inconsistent provision of instructional aids and services to meet diverse learner needs. To effectively implement inclusive education, schools should prioritize training and seminars for general education teachers, while fostering collaboration among local community education committees, parents, teachers, and school personnel.

Modifying Learning Activities

This subtheme describes how teachers modify learning activities to suit the needs and abilities of their students. Participant 1 said: *"When we have an activity, I separate*

the three students with special needs from the regular students. In other words, the regular students have a different activity from the three with special needs."

Teachers modify learning activities, acknowledging their substantial influence on students' learning progress, even in the face of the challenges they encounter in delivering differentiated instruction in an inclusive classroom. According to Padmore and Ali (2024), many teachers struggle to implement differentiated instruction in mathematics due to challenges like crowded classrooms, insufficient resources and time, limited support from stakeholders, and lack of experience and knowledge. Despite these challenges, differentiated teaching remains crucial for addressing diverse learning styles in mathematics education, supported by several research studies as an effective pedagogical approach.

Addressing the challenges enumerated in Figure 2 necessitates the respondents to be dependent on browsing the internet to find information that they can use to enhance their efficiency in differentiating instruction. Also, the respondents resorted to modifying learning activities in line with the interests and abilities of their students. Moreover, collaboration with various groups in the community through collaborative planning was seen to gain insights and support to address the challenges faced by teachers in implementing differentiated instruction, which in turn, will help the diverse students in an inclusive classroom. Figure 3 shows the list of these three coping strategies.

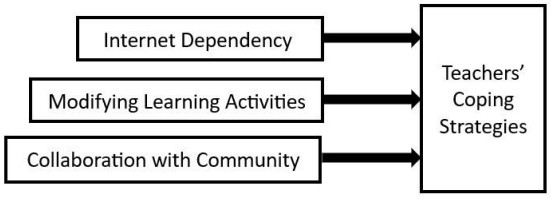

Figure 3. *Teachers' Coping Strategies*

Teachers' Perception of the Logical-Mathematical Intelligence

Teacher participants were interviewed to explore their perceptions of the logical-mathematical intelligence of their students after implementing differentiated instruction. The interview responses were analyzed, revealing three key themes. The following section discusses these subthemes in detail.

Student Performance Analysis

Aligning diverse students' abilities and talents to activities and assessments helps implement differentiated instruction in the logical-mathematical intelligence of the students. By conducting pre-assessment, teachers identify students' talents and align activities to enhance their capabilities and boost their self-esteem in a mathematics classroom. This approach brings out the best in students, especially in inclusive mathematics classrooms. Participants 1 and 2 specified that they were able to recognize the talents of the students and use them to enhance logical-mathematical intelligence. Participant 1 said: *"...ahmm, while I'm doing the differentiated instruction, I bring out their talents, where they excel. And because of using differentiated instruction, you get to know the child better... you can identify where they excel."* Similarly, Participant 2 said:

> *"There are times that I use differentiated activities, if they like dancing then they will dance ohh but it should be related to your subject. If you ask them to create a jingle, they'll dance and add steps, they really enjoy that. ...and that's where I see their progress, the impact of differentiated instruction in math class."*

Enhanced Learning Outcomes

This subtheme shows that teaching mathematics in an inclusive classroom employing differentiated instruction had a positive impact on students' learning outcomes. Participant 1 said:

> *"For me, the impact of differentiated instruction is good. You can say there's progress because at least you're integrating their talents into the lessons so they can enjoy it more because that's what they want to do. Especially in math, where it's difficult to come up with activities, differentiated instruction is really a big help in developing their logical-mathematical intelligence."*

Using Mnemonics

This subtheme emphasizes the beneficial effect of using mnemonics to improve the understanding of the students on the mathematical concepts and procedures taught to them. Participant 2 also said that:

> *"...one time, I had them create spoken word poetry because that was popular back then, they knew about it. While they were making a jingle, they seemed to remember the rules... Isn't it? Because those are the most challenging parts in math, the rules. At least they can master the process while singing and dancing."*

Both teachers focus on identifying and leveraging the talents of the students highlighting how differentiated instruction helps students understand lessons better by using their talents. This personalization fosters engagement and logical-mathematical intelligence of the students. According to Mićanović et al. (2023), differentiated instruction significantly enhances student achievement in inclusive mathematics classes, increasing self-esteem, interest, achievements, and participation. Hence, these strategies create dynamic learning environments where students can enjoy and relate to mathematical concepts.

As evident from the interview responses, the teacher participants perceived that differentiating instruction had an impact on the logical-mathematical intelligence of their students. By examining students' performances and recognizing their talents, individualized activities were designed for a better understanding of mathematical concepts. Techniques like using mnemonics also helped students remember mathematical procedures and concepts taught to them.

Conclusion and Future Works

In light of the discussions above, the researchers, therefore, conclude that pre-assessment is crucial in understanding the diverse abilities and learning needs of the students in an inclusive classroom. Teachers can use the information they can get from pre-assessment to identify individual student strengths, weaknesses, and learning references, enabling them to tailor lessons that cater to a range of abilities. Differentiating instruction based on this information could lead to increased student engagement, as lessons will be relevant and accessible to everyone. The information can also aid in the selection of formative and summative assessments that align with the interests and needs of the students. Leveling activities and assessments are also vital

in differentiating instruction as it allows teachers to tailor lessons to the different needs of students. By adjusting the difficulty or complexity of tasks, teachers can provide appropriate challenges to each student. Leveling activities help students work within their zone of proximal development. Leveling assessments, on the other hand, allow teachers to accurately gauge each student's progress providing a clearer picture of their abilities and areas of improvement. In addition, differentiating instruction by giving interest-based activities can help teachers in the teaching and learning process. It can foster intrinsic motivation and an atmosphere where students feel valued, as students see the learning experience as enjoyable building a supportive classroom community.

Moreover, teachers can personalize their instruction, particularly for students with disabilities or learning difficulties. Personalized instruction allows teachers to provide scaffolded instruction to those who need extra support and enrichment activities to those who are more advanced. However, they need to be highly adaptable and flexible to meet the diverse needs of the students. Lastly, standard-based assessment with accommodation can help teachers ensure that students master the same learning content if not reduce the achievement gap between students with disabilities and their typically developing peers.

The lack of training by teachers in differentiated instruction can lead to limited knowledge in differentiating strategies, underutilization of available resources of the school, ineffective assessment practices, poor classroom management, or mishandling of students' behavior. Thus, teachers need more of these trainings to augment and broaden their knowledge on the effective delivery of instruction and proper classroom management. Psychological training and other training relevant to handling students with special needs is also essential. On the other hand, the lack of community support may lead to feelings of isolation for teachers or discouragement. The lack of reinforcement at home may hinder the progress of students who are struggling academically. Hence, schools must build collaborative networks to gain more access to resources and educate parents on how to provide better support for their children at home.

Adapting to challenges is an integral part of the teaching and learning process. Internet dependency can increase efficiency in teaching as it allows teachers to find ready-made activities and digital tools that align with different learning styles. Modifying learning activities allows flexibility in teaching. This could increase students' motivation and engagement as they are given more agency and choice in their learning. Collaboration with the community, on the other hand, may increase external resources that can support the differentiation efforts of the teachers. Collaboration with other teachers or specialists in the community can also contribute to the professional development of the teachers through the sharing of strategies and best practices.

Teachers perceived that differentiated instruction in inclusive mathematics classrooms enhances logical-mathematical intelligence by recognizing and using the talents of diverse students and integrating those strengths into their teaching strategies. Performance analysis can help teachers identify which students excel in abstract reasoning, pattern recognition, and logical problem solving and which students need additional support. By focusing on enhancing learning outcomes, teachers are more likely to employ methods that promote the development of higher-order thinking that can boost the logical-mathematical intelligence of the students. Moreover, using mnemonics combined with conceptual understanding can serve as a scaffold to aid in recalling computational steps or strategies in solving problems and retaining critical

mathematical processes, which students can later build on through reasoning and problem-solving.

Considering the practical applications of the study, a comprehensive and thorough needs analysis should be conducted. This analysis will provide valuable information for the planning and implementation of teacher training programs focused on differentiated instruction, ultimately improving the quality of instruction in inclusive schools. Additionally, future researchers are encouraged to investigate a similar study on a larger scale by using the triangulation method, which involves multiple classroom observations. Furthermore, a quantitative study is recommended to assess the students, complementing the observational data.

References

[1] Alcosero, A., Carcueva, H., Abasolo, M. C., Arranchado, W. M., & Cabanilla Jr., A. (2023). Preparedness of regular teachers in the implementation of inclusive education in the Philippines: A meta-synthesis. *International Journal of Research in Engineering and Science, 11*(3), 259–266. https://doi.org/10.13140/RG.2.2.17249.79205

[2] Bal, A. P. (2023). Assessing the impact of differentiated instruction on mathematics achievement and attitudes of secondary school learners. *South African Journal of Education, 43*(1), Article 2065. https://doi.org/10.15700/saje.v43n1a2065

[3] Bandura, A., & Walters, R. H. (1977). *Social learning theory*. Prentice Hall.

[4] Bekele, W. B., & Ago, F. Y. (2022). Sample size for interviews in qualitative research in social sciences: A guide to novice researchers. *Research in Educational Policy and Management, 4*(1), 42–50.

[5] Bliss, L. A. (2016). Phenomenological Research: Inquiry to Understand the Meanings of People's Experiences. *International Journal of Adult Vocational Education and Technology, 7*(3), 14–26. https://eric.ed.gov/?id=EJ1155631

[6] Celik, S. (2019). Can differentiated instruction create an inclusive classroom with diverse learners in an elementary school setting? *Journal of Education and Practice, 10*(6). https://doi.org/10.7176/JEP/10-6-05

[7] Commission on Higher Education. (2017). *CHED Memorandum Order No. 74–80, series of 2017.* (Philippines)

[8] Copenhaver, J. (2006). *The least restrictive environment: A primer for parents and educators. Legal requirements and best practices.* Mountain Plains Regional Resource Center (MPRRC).

[9] Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Sage.

[10] Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). Sage.

[11] Cruz, E. B., Schlendorf, C. P., Nicolino, P. A., & Morote, E.-S. (2019). Instructional strategies in differentiated instruction for systemic change. *Journal for Leadership and Instruction, 18*(2), 18–22.

[12] Department of Education. (2009). *DepEd Order No. 72, series of 2009.* https://www.deped.gov.ph/2009/07/06/

[13] Gardner, H. E. (2000). *Intelligence reframed: Multiple intelligences for the 21st century.* Hachette UK.

[14] Ginja, T. G., & Chen, X. (2020). Teacher educators' perspectives and experiences towards differentiated instruction. *International Journal of Instruction, 13*(4), 781–798. https://doi.org/10.29333/iji.2020.13448a

[15] Lavania, M., & Nor, F. B. M. (2020). Barriers in differentiated instruction: A systematic review of the literature. *Journal of Critical Reviews, 7*(06). https://doi.org/10.31838/jcr.07.06.51

[16] Mićanović, V., Vučković, D., Maslovarić, B., Šakotić, N., & Novović, T. (2023). Effects and challenges to implement differentiated mathematics teaching among fourth graders in Montenegro. *South African Journal of Education, 43*(3), 1–11. https://doi.org/10.15700/saje.v43n3a2100

[17] Muega, M. A. G. (2016). Inclusive education in the Philippines: Through the eyes of teachers, administrators, and parents of children with special needs. *Social Science Diliman, 12*(1), 5–28.

[18] Padmore, E. A., & Ali, C. A. (2024). Exploring effective differentiated instruction in the teaching and learning of mathematics. *ASEAN Journal for Science Education, 3*(1), 41–54.

[19] Republic Act No. 11650. (n.d.). *Supreme Court E-Library.*

[20] Shabani, K., Khatib, M., & Ebadi, S. (2010). Vygotsky's zone of proximal development: Instructional implications and teachers' professional development. *English Language Teaching, 3*(4), 237–248. https://doi.org/10.5539/elt.v3n4p237

[21] Tomlinson, C. A. (2001). Differentiated instruction in the regular classroom: What does it mean? How does it look? *Understanding Our Gifted, 14*(1), 3–6.

[22] Toquero, C. M. D. (2021). "Sana all" inclusive education amid COVID-19: Challenges, strategies, and prospects of special education teachers. *International and Multidisciplinary Journal of Social Sciences, 10*(1), 30–51. https://doi.org/10.17583/rimcis.2020.6316

[23] UNESCO. (2020). *Inclusion and education: All means all.* Global Education Monitoring Report.

[24] UNICEF. (1990). *Meeting basic learning needs: A vision for the 1990s.* Inter-Agency Commission for the World Conference on Education for All.

[25] Whitley, J., Duquette, C., Gooderham, S., Elliott, C., Orders, S., & Klan, A. (2021). Implementation of a differentiated instruction initiative: Perspectives of leaders. *Canadian Journal of Educational Administration and Policy, 196*, 49–64. https://doi.org/10.7202/1078517AR

Acknowledgment

The researchers would like to express their sincere thanks and appreciation to Dr. Nilda T. Aggabao, Dr. Adona S. Abana, and Mrs. Koni Bernadette T. Bancud for their insightful and helpful feedback and recommendations that helped improve the study.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.