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Instructional Materials for Learners with Disabilities (LWDs) in Teaching Mathematics

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Abstract: ***This study addresses the persistent challenges faced by learners with disabilities (LWDs) and mathematics teachers in inclusive secondary classrooms, particularly in accessing and delivering effective mathematics instruction. It aimed to develop and validate instructional materials tailored for LWDs based on teachers' experiences. Using a descriptive-developmental research design with a narrative approach, data were collected through a focus group discussion involving twelve secondary mathematics teachers with experience teaching visually impaired and deaf or hearing-impaired learners. Thematic analysis revealed key challenges such as the visual nature of mathematical concepts, communication barriers, limited assessment strategies, inadequate training in inclusive education, and lack of appropriate instructional resources. Guided by these findings, specialized instructional materials were developed and evaluated using the Department of Education Evaluation Rating Sheet for Non-Print and Manipulative Materials. Results of the validation showed that the materials were relevant, accessible, and responsive to the needs of LWDs. The materials were further refined based on feedback from both teachers and learners. This study offers a novel contribution by grounding material development in actual classroom experiences, thereby providing practical support for teachers and enhancing inclusive mathematics instruction. The findings imply that context-responsive instructional materials can improve participation and learning outcomes among LWDs.***

Keywords: inclusive education, instructional materials, learners with disabilities, mathematics instruction, thematic analysis

1. Introduction

Inclusive education emphasizes the right of all learners, including Learners with Disabilities (LWDs), to access quality education within mainstream classrooms. In mathematics instruction, LWDs often experience difficulties related to abstract concepts, language demands, memory, and problem-solving skills, which may hinder their academic progress if appropriate instructional support is not provided. Mathematics, being a foundational subject for logical thinking and daily life application, requires teaching approaches and materials that are responsive to diverse learning needs.

Special Education Curriculum

The Special Education (SPED) curriculum in the Philippines is designed to ensure that learners with disabilities receive instruction that is responsive to their diverse cognitive, sensory, and developmental needs. It operates within the framework of the K to 12 Basic Education Program while incorporating specialized adaptations such as differentiated instruction, curriculum modifications, and individualized support mechanisms. Central to this framework is Department of Education Order No. 044, s. 2021, which provides policy guidelines on the provision of educational programs and services for learners with disabilities across all levels of basic education. This policy emphasizes flexible curriculum implementation, the use of appropriate instructional strategies, and the integration of functional and life skills alongside academic competencies. It positions the SPED curriculum as both standards-based and learner-centered, ensuring that instruction remains accessible and meaningful for all learners.

In support of ongoing curriculum reforms, Department of Education Order No. 010, s. 2024 highlights the need for a more responsive, streamlined, and relevant curriculum that reflects the actual learning conditions of Filipino students. Within the context of SPED, this reform reinforces the importance of contextualization and adaptability in instructional delivery. The SPED curriculum, therefore, adopts a flexible structure that allows teachers to adjust content, pacing, and assessment based on learners' needs. It also underscores the use of assistive technologies, multisensory approaches, and scaffolded learning experiences. Studies have shown that effective SPED curricula integrate evidence-based practices such as explicit instruction, visual supports, and structured interventions to improve learning outcomes among learners with disabilities (Hallahan et al., 2020; Tomlinson, 2017). These approaches are particularly relevant in mathematics education, where abstract concepts often require concrete representation and repeated reinforcement.

Despite these policy directions and pedagogical advancements, gaps remain in the implementation of the SPED curriculum, particularly in content-specific areas such as mathematics. Research indicates that teachers often encounter difficulties in translating curriculum standards into inclusive instructional practices due to limited training, insufficient resources, and lack of specialized instructional materials (Reyes, 2023). Furthermore, there is a noted scarcity of contextually developed materials that directly address the needs of learners with visual and hearing impairments in mainstream classrooms. This gap highlights the need to strengthen curriculum support through the development of targeted instructional resources. In this context, the present study contributes to the SPED curriculum by developing and validating instructional materials for teaching mathematics to learners with disabilities, grounded in the actual experiences of teachers. By aligning with existing curriculum policies while addressing identified gaps, the study supports the effective implementation of inclusive and responsive mathematics instruction.

Legal Basis for Learners with Special Education Needs

The legal foundations of special education provide the framework that ensures the protection, inclusion, and development of learners with disabilities within the educational system. These policies are essential in guiding schools, educators, and stakeholders in implementing equitable and responsive educational practices. In the context

of this study, the legal bases establish the mandate for inclusive and quality mathematics instruction for learners with special education needs, thereby reinforcing the necessity of developing appropriate instructional materials that address their diverse learning requirements.

One of the primary legal frameworks is Republic Act No. 7277, or the *Magna Carta for Disabled Persons*, as amended by Republic Act No. 9442. This law promotes the rehabilitation, self-development, and integration of persons with disabilities into mainstream society. It emphasizes that education plays a critical role in achieving these goals by ensuring access to appropriate learning opportunities. In line with this, policies on special education highlight that the ultimate objective of SPED is the mainstreaming or integration of learners with special needs into the regular school system and, eventually, into the broader community. Educational programs are therefore designed to develop not only academic competencies but also self-help skills, social proficiency, and positive self-concept among learners.

Complementing these national laws, Department of Education Order No. 72, s. 2009 defines inclusive education as a strategy for increasing participation and ensuring that all learners, particularly those with disabilities, receive appropriate education within regular classroom settings. This is further supported by international commitments such as the United Nations Convention on the Rights of Persons with Disabilities, which the Philippines ratified in 2008, affirming the right of every child to inclusive and quality education. These legal instruments collectively underscore the obligation of educational institutions to remove barriers and provide necessary support systems for learners with disabilities.

Despite the existence of these policies, challenges in access and participation remain evident. National data from the Department of Education indicate that only a small percentage of children with disabilities are able to access educational opportunities, with many facing barriers such as limited resources, accessibility issues, and social stigma. Enrollment data further reveal disparities in participation across educational levels and types of disabilities, as well as a decline during the pandemic due to shifts in learning delivery modalities. These realities highlight the gap between policy and practice, emphasizing the need for more responsive and accessible instructional approaches within inclusive classrooms.

At the school level, similar trends may be observed, further underscoring the urgency of addressing these gaps. Legazpi City National High School (LCNHS), one of the largest public secondary schools in the region, has a total number of approximately 3,000 diverse learners, including learners with physical disabilities such as hearing, speech, and visual impairments. Two (2) percent or 56 of this population is learners with special needs or under the special needs education (SNED) program Such localized data provide concrete evidence of the existing conditions and strengthen the contextual relevance of the study.

In this regard, the present study aligns with these legal mandates by contributing to the development of instructional materials that support inclusive mathematics education. By addressing the identified gaps in accessibility and instructional delivery, the study responds to the call of these legal frameworks to provide equitable, relevant, and quality education for learners with special education needs.

Research Questions

The general objective of this study is to develop and validate instructional materials for teaching mathematics to learners with disabilities in mainstream secondary classrooms. Specifically, it aims to (1) describe the experiences of mathematics teachers in handling learners with disabilities in terms of (a) visually impaired learners and (b) deaf learners; (2) validate the developed instructional materials.

2. Methodology

This chapter outlines the research design, participants, instruments, and procedures used to investigate the experiences and challenges of mathematics teachers handling learners with special educational needs. It also describes the methods employed for data collection and analysis to ensure the rigor and credibility of the study's findings.

Research Design

The present study employed a descriptive-developmental design using a narrative approach. As Mahat et al. (2024) explain, descriptive research commonly employs various methods to identify the major patterns and variations within a dataset, aiming to portray the current status of a phenomenon as it exists in its natural context. In this study, the descriptive design was employed to document and examine the challenges teachers face, the strategies they currently employ, and the gaps in existing instructional materials for LWDs in mathematics; thereby providing the baseline from which the developmental phase of the study proceeds.

The developmental component situates the study within the tradition of design and development research. Richey and Klein (2014) defined developmental research as the systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet criteria of internal consistency and effectiveness.

The narrative approach was adopted as the qualitative lens through which teachers' experiences were gathered and interpreted in the descriptive phase. Connelly and Clandinin (1990) first introduced narrative inquiry into educational research, positing that humans are storytelling organisms who individually and socially lead storied lives, and that the study of narrative is, in essence, the study of the ways humans experience the world. In this study, the narrative approach enabled the researcher to gather rich, firsthand accounts from mathematics teachers navigating inclusive classrooms, capturing not only what challenges they encounter and what materials they use, but how they make sense of these experiences, and why they matter. These narratives, in turn, directly informed the development of the instructional materials that are the study's primary output.

Source of Data

The study utilized primary source of data to support the development and validation of instructional materials for learners with disabilities (LWDs).

The primary sources of data were the 15 mathematics teachers and the five (5) learners with disabilities from Legazpi City National High School. The teachers served a dual role in the study: first, as key informants who participated in the focus group discussion (FGD), and second, as validators who evaluated the developed instructional materials. They were selected through purposive sampling, a non-random technique that involves choosing participants based on specific criteria relevant to the research objectives (Palinkas et al., 2015). The inclusion criteria for the teachers were: (1) currently teaching mathematics to learners with disabilities in Grades 7 to 11; (2) handling classes in either Junior High School or Senior High School; (3) having at least one (1) year of experience teaching learners with disabilities; and (4) willingness to participate in the study. Teachers who did not meet these criteria or who did not provide informed consent were excluded. Based on these conditions, twelve (12) secondary mathematics teachers were included as participants and validators of the study.

Research Instruments

The study utilized three research instruments administered in sequence: the Focus Group Discussion (FGD) Interview Guide, the Expert Validation Tools, and the Interview Guide for Feedback on the Developed Instructional Materials. These instruments were developed and organized to correspond with the objectives of the study, from data generation to evaluation and refinement of the instructional materials.

The Focus Group Discussion (FGD) Interview Guide was a semi-structured instrument designed by the researcher to gather the experiences of mathematics teachers in handling learners with disabilities (LWDs). It served as the primary tool for generating qualitative data that informed the development of the instructional materials. The guide contained open-ended questions focusing on teachers' instructional challenges, strategies, and material needs in teaching mathematics to hearing-impaired and visually-impaired learners. It also included prompts specific to each type of learner to ensure differentiated insights. Prior to its use, the content of the interview guide was reviewed and validated by three (3) experts in mathematics education and inclusive education to ensure clarity, relevance, and alignment with the objectives of the study.

The Expert Validation Tools consisted of standardized instruments adopted from the Department of Education's Learning Resource Management and Development System (LRMDS), specifically the Evaluation Rating Sheet for Non-Print Materials (Tool 6.6) focusing on content quality, instructional quality, technical quality, and other factors and the Evaluation Rating Sheet for Charts, Posters, Drill/Flash Cards, and Manipulatives (Tool 6.5) focusing on content, other factors, and additional requirements for manipulatives. The researcher prepared the materials and submitted them to the teacher-participants, who also served as validators, for systematic evaluation using these tools. The results of the validation provided quantitative and qualitative bases for determining the acceptability and areas for improvement of the materials.

Data Collection

Data collection was carried out in several phases corresponding to the objectives of the study: gathering teachers' experiences, developing the instructional materials, validating the materials through expert review, collecting feedback from teachers and LWDs, and enhancing the materials based on the results. Prior to the commencement of any data collection activity, the researcher secured ethics approval from the Bicol Regional Hospital and Medical Center Institutional Review Board (BRHMC-IRB). Following ethics clearance, a formal letter of intent was addressed to the Schools Division Superintendent of the Department of Education – Legazpi City Division, and a separate letter was addressed to the School Principal of Legazpi City National High School, seeking permission to conduct the study within the school premises. Data collection commenced upon receipt of the corresponding approvals.

Gathering Teachers' Experiences. The first phase of data collection aimed to describe the experiences of mathematics teachers in handling learners with disabilities mainstreamed in regular classes. The researcher personally coordinated with the school administration to identify the eligible teacher participants based on the established inclusion criteria. Of the total pool of qualified mathematics teachers, two were on official leave at the time of data collection and were therefore unable to participate, yielding a final group of ten (10) Key Informant teachers. Before the focus group discussion was conducted, the researcher explained the purpose of the study to the participants, discussed the confidentiality of their responses, and obtained their written informed consent. Participants were also informed of their right to decline any question or withdraw from the discussion at any time without consequence.

The FGD was conducted in March of School Year 2025–2026 over a period of one (1) month following ethics approval. The session was held at the school library to ensure comfort and privacy. The discussion lasted approximately 60 to 90 minutes on a day agreed upon by all key informants. With the participants' permission, the session was audio-recorded to ensure accurate and complete documentation of responses. The researcher served as facilitator and guided the discussion using the prepared FGD Interview Guide, covering the teachers' general experiences in inclusive mathematics classes, their differentiated experiences with visually impaired learners and deaf learners, and their perspectives on existing instructional materials and what effective materials should look like. Probing questions were used when necessary to clarify or deepen participants' responses. Participants were allowed to respond in the language they were most comfortable with, either Filipino or English, to facilitate natural and open communication. The audio recordings were subsequently transcribed, and the transcriptions were analyzed to identify the common themes, challenges, and instructional needs that would serve as the empirical basis for developing the instructional materials.

Data Analysis

The gathered data was analyzed through Thematic Analysis. It is a method used to describe and interpret data in the process of selecting codes and constructing themes. A distinguishing feature of thematic analysis is its flexibility to be used within a wide range of theoretical and epistemological frameworks, and its applicability to a wide range of study questions, designs, and sample sizes (Kiger & Varpio, 2020). Braun and Clarke (2006) mentioned that it is the first qualitative method required to be learned since it provides core skills that are significant in conducting various kinds of analysis. This method is also not tied to any theoretical perspective making it a flexible method to use in learning and teaching.

It is also accessible and theoretically flexible in analyzing qualitative data. In addition, thematic analysis is an appropriate and powerful method a researcher can use when trying to understand a set of experiences, thoughts, or behaviors across a data set (Braun & Clarke, 2012). Since it is designed to search for common or shared meanings, it is less suited for examining unique meanings or experiences from a single person or data item. The present study used thematic analysis to identify the common themes of the issues and challenges experienced by mathematics teachers handling learners with disabilities. This method also helped in developing an instructional material for mathematics teachers handling learners with disabilities.

Statistical Treatment for Validation of the Instructional Materials**.** The data gathered from the expert validators using DepEd LRMDS Tool 6.5 and Tool 6.6 were analyzed using the weighted mean as the primary statistical tool. The weighted mean was computed for each criterion item and for each factor of both evaluation tools to determine the overall performance rating of the developed instructional materials. The resulting mean scores were interpreted using the rating scale prescribed in each evaluation tool, as presented below.

3. Results and Discussions

This section presents the results of the focus group discussions, interviews with mathematics teachers and learners with disabilities, and the validation of the developed instructional materials. It specifically covers teachers' experiences in handling visually-impaired and hearing-impaired learners, the developed instructional materials, the results of their validation, and the feedback from both learners with disabilities and teachers.

Experiences of Mathematics Teachers in Teaching LWDs

This section presents and discusses the findings of the focused group discussion (FGD) conducted among mathematics teachers who handle Learners with Disabilities (LWDs) mainstreamed in regular classes. The experiences of the participating teachers were organized and analyzed using thematic analysis, yielding themes corresponding to two (2) types of LWDs: (a) visually impaired learners, and (b) deaf or hearing-impaired learners. The discussion of each theme is connected to the imperative of developing responsive instructional materials for teaching mathematics to LWDs in mainstream settings, which constitutes the second objective of this study.

Experiences with Visually Impaired Learners. Table 1 presents the themes that emerged from the focus group discussions of mathematics teachers regarding their experiences in handling visually impaired learners in the inclusive classroom. Three recurring themes were identified: (1) the inherent invisibility of visual mathematics as a barrier to learning, (2) the resourcefulness demonstrated by teachers in the absence of formal training and materials, and (3) the tactile and peer-based compensatory strategies that teachers independently devised to make mathematical content accessible. Each theme is described in terms of its key characteristics and is supported by direct verbatim responses from the teacher-participants, reflecting the realities of inclusive mathematics instruction.

Table 1: Themes on Mathematics Teachers' Experiences with Visually Impaired Learners

Theme	Description	Verbatim Responses
The Invisibility of Visual Mathematics	Teachers identified geometry, graphs, coordinate planes, and statistics as the most challenging topics for visually impaired learners, as standard mathematical concepts are deeply embedded in visual representation, making instructional materials structurally inaccessible without tactile or auditory alternatives.	*"Geometry is particularly difficult because it is heavily visual — lines, angles, shapes — kailangan talaga makita."*
Resourcefulness in the Absence of Training and Materials	Teachers reported being entirely unprepared when visually impaired learners were first enrolled in their classes, with no prior training or available materials, yet responded with professional agency by independently seeking strategies, communicating with parents, and improvising their own instructional resources.	*"Totally blind, wala talaga ako training kung pano sya i-handle."*
Tactile and Peer-Based Compensatory Strategies	In the absence of formal materials, teachers improvised by using real-life objects, geometric solids, and body gestures to make concepts tangible, and paired visually impaired learners with willing classmates who could guide them through activities.	*"I paired the visually impaired learner with a willing classmate who would explain and guide her through activities."*

Under the theme The Invisibility of Visual Mathematics, teachers identified several mathematics topics as particularly difficult for visually-impaired learners, including geometry, graphs, coordinate planes, fractions represented through shaded figures, and statistics. These topics were described as heavily dependent on visual representation, making them challenging to deliver and understand without visual reference. Teachers noted that concepts involving spatial relationships and mental visualization posed the greatest difficulty.

The theme Resourcefulness in the Absence of Training and Materials reflects the teachers' experiences of limited preparation in handling visually-impaired learners.

Participants reported having no prior training and lacking available instructional materials when these learners were first integrated into their classes. Despite this, teachers demonstrated initiative by creating their own materials, seeking assistance from parents, and independently learning strategies to support their students.

Under the theme Tactile and Peer-Based Compensatory Strategies, teachers described the use of alternative approaches to facilitate learning. These included the use of real-life objects, geometric solids, improvised tactile materials, and body gestures to represent mathematical concepts. Additionally, peer support was utilized, wherein visually-impaired learners were paired with classmates who assisted them during activities and instruction.

Experiences with Deaf or Hearing-Impaired Learners. Table 2 presents the themes that emerged from the discussions of mathematics teachers regarding their experiences in handling deaf and hearing-impaired learners in the inclusive classroom. Three recurring themes were identified: (1) the centrality of visual and multi-sensory strategies in delivering mathematical instruction to deaf learners, (2) the informal but critical practice of peer mediation and interpretation that arose in the absence of formal support, and (3) the institutional gaps that characterize the mainstreaming experience of deaf learners in Philippine schools. Each theme is described in terms of its key characteristics and is supported by direct verbatim responses from the teacher-participants, capturing the day-to-day realities of inclusive mathematics instruction for learners with hearing impairments.

Table 2: Mathematics Teachers' Experiences with Deaf or Hearing-Impaired Learners

Theme	Description	Verbatim Responses
Visual and Multi-Sensory Strategies as the Core of Instruction	Teachers structured lessons around visual cues, color-coded materials, illustrated step-by-step guides, and manipulatives to accommodate the primarily visual learning mode of deaf and hearing-impaired learners, repeatedly demonstrating procedures visually to ensure comprehension.	*"I repeat instructions multiple times while showing the steps visually so the learner can follow along."*
Peer Mediation and Informal Interpretation	In the absence of formal sign language interpreters, hearing classmates assumed the informal but critical role of translating instructions and guiding deaf learners through activities, making peer mediation a de facto classroom strategy born out of necessity rather than design.	*"Classmates would translate instructions and guide the deaf learner through activities — they became our informal interpreters."*
Institutional Gaps in Supporting Deaf Learners	Teachers consistently identified the absence of sign language interpreters, shadow teachers, and specialized instructional materials as systemic gaps that exposed the disconnect between inclusive education policy and actual classroom delivery, leaving teachers to rely solely on self-created resources.	*"The school mainstreams them, but the support is not always there."*

Under the theme Visual and Multi-Sensory Strategies as the Core of Instruction, teachers described structuring their lessons around visual supports such as color-coded materials, illustrated step-by-step procedures, and manipulatives. These strategies were used to align with the learners' visual mode of understanding. Teachers also reported repeating instructions while simultaneously demonstrating procedures visually to ensure comprehension. Patterns, sequences, and visual organization were emphasized in presenting mathematical concepts.

The theme Peer Mediation and Informal Interpretation highlights the reliance on classmates to support hearing-impaired learners during instruction. In the absence of consistent sign language interpreters, teachers reported that peers often translated instructions, explained tasks, and guided learners during activities. This practice became a common classroom strategy, especially when formal support personnel were not available.

Under the theme Institutional Gaps in Supporting Hearing-Impaired Learners, teachers identified limitations in the support provided for mainstreamed learners. These included the lack of regular sign language interpreters, absence of shadow teachers, and limited availability of appropriate instructional materials. Teachers also noted their own limited proficiency in sign language and the need to create materials independently to address the learning needs of hearing-impaired students.

Validation of the Developed Instructional Materials

This section presents and discusses the results of the validation of the instructional materials developed for Learners with Disabilities (LWDs) in the teaching of mathematics in mainstream regular classes. The materials were evaluated using the Department of Education's DepEd Evaluation Rating Sheet for Charts, Posters, Drill/Flash Cards, and Manipulatives (Tool 6.5) and Non-Print Materials (Tool 6.6) under the Learning Resource Management and Development System (LRMDS) Guidelines for Assessment and Evaluation of Learning Resources.

For Visually Impaired Learners: Braille Number Line Material. The Braille line number material was subjected to content validation using Evaluation Template 6.5 from the Learning Resource Management and Development System (LRMDS). The results are shown in Table 5.

Table 5: Validation Ratings of the Braille Number Line by Factor

No.	Criterion	Mean	Description
Factor A. Content Quality			
1	Content reinforces, enriches, and/or leads to the mastery of certain learning competencies for the level and subject it was intended.	4.00	VS
2	Material has the potential to arouse interest of the target users.	4.00	VS
3	Facts are accurate.	4.00	VS
4	Information provided is up-to-date.	4.00	VS
5	Visuals are relevant to the text.	4.00	VS
6	Visuals are suitable to the age level and interests of the target user.	4.00	VS
7	Visuals are clear and adequately convey the message of the subject or topic.	4.00	VS
8	Typographic layout/design facilitates understanding of concepts presented.	4.00	VS
9	Size of the material is appropriate for use in school.	3.92	VS
10	Material is easy to use and durable.	4.00	VS
	Weighted Mean for Factor A	**3.99**	**VS**
	Total Points	**39.92**	**PASSED**
Factor B. Other Findings			
1	Conceptual errors.	4.00	VS
2	Factual errors.	4.00	VS
3	Grammatical and/or typographical errors.	4.00	VS
4	Other errors (i.e., computational errors, obsolete information, errors in the visuals, etc.).	4.00	VS
	Weighted Mean for Factor B	**4.00**	**VS**
	Total Points	**16**	**PASSED**
Factor C. Additional Requirements for Manipulatives			
1	Adequate support material is provided.	4.00	VS
2	Activities are summarized; extension activities are provided.	4.00	VS
3	Suggested activities support innovative pedagogy.	3.92	VS
4	Manipulative is safe to use.	4.00	VS
5	Size and composition of manipulative is appropriate for intended audience.	3.92	VS
6	Suggested manual tasks within the activities are compatible with the motor skills of the intended users.	4.00	VS
	Weighted Mean for Factor C	**3.97**	**VS**
	Total Points	**23.84**	**PASSED**
	Overall Weighted Mean	**3.99**	**VS**

Legend: VS = Very Satisfactory; S = Satisfactory; P = Poor; NS = Not Satisfactory

Content Quality. Factor A assessed ten criteria related to the content and physical design of the material, with a maximum possible score of 40 and a passing threshold of 30. Nine of the ten criteria received a perfect mean score of 4.00 (Very Satisfactory) from all twelve validators. The sole exception was Item 9, which pertains to the appropriateness of the material's size for use in school, where one validator assigned a rating of 3, yielding a mean of 3.92 (Very Satisfactory). The weighted mean for Factor A was 3.99 (Very Satisfactory).

Other Findings. Factor B examined the material for the presence of conceptual, factual, grammatical/ typographical, and other errors, with both the maximum and required passing score set at 16. All twelve validators rated all four error-detection criteria at 4.00 (Very Satisfactory), indicating that no errors of any kind were detected in the material. The weighted mean for Factor B was a perfect 4.00 (Very Satisfactory).

Additional Requirements for Manipulatives. Factor C evaluated six criteria specific to manipulative materials under the domains of instructional design and technical design, with a maximum possible score of 24 and a passing threshold of 18. Four of the six criteria received perfect mean scores of 4.00 (Very Satisfactory) from all twelve validators. Item 3, which pertains to whether the suggested activities support innovative pedagogy, and Item 5, which concerns the appropriateness of the manipulative's size and composition for the intended audience, each received a rating of 3 from one validator, yielding a mean of 3.92 (Very Satisfactory) for both items. The weighted mean for Factor C is 3.97 (Very Satisfactory). The overall weighted mean across all three factors is 3.99 (Very Satisfactory).

Instructional Material 2: Tactile Coordinate Plane Board. Just like the Braille Number Line, since this material is manipulative in nature also, this was validated using the same LRMDS Evaluation Template 6.5.

Table 6: Validation Ratings of the Tactile Coordinate Plane Board by Factor

No.	Criterion	Mean	Description
Factor A. Content Quality			
1	Content reinforces, enriches, and/or leads to the mastery of certain learning competencies for the level and subject it was intended.	4.00	VS
2	Material has the potential to arouse interest of the target users.	4.00	VS
3	Facts are accurate.	4.00	VS
4	Information provided is up-to-date.	4.00	VS
5	Visuals are relevant to the text.	4.00	VS
6	Visuals are suitable to the age level and interests of the target user.	4.00	VS
7	Visuals are clear and adequately convey the message of the subject or topic.	3.92	VS

No.	Criterion	Mean	Description
8	Typographic layout/design facilitates understanding of concepts presented.	3.83	VS
9	Size of the material is appropriate for use in school.	3.92	VS
10	Material is easy to use and durable.	3.83	VS
	Weighted Mean for Factor A	**3.95**	**VS**
	Total Points	**39.5**	**PASSED**
Factor B. Other Findings			
1	Conceptual errors.	4.00	VS
2	Factual errors.	4.00	VS
3	Grammatical and/or typographical errors.	4.00	VS
4	Other errors (i.e., computational errors, obsolete information, errors in the visuals, etc.).	4.00	VS
	Weighted Mean for Factor B	**4.00**	**VS**
	Total Points	**16**	**PASSED**
Factor C. Additional Requirements for Manipulatives			
1	Adequate support material is provided.	3.92	VS
2	Activities are summarized; extension activities are provided.	3.92	VS
3	Suggested activities support innovative pedagogy.	4.00	VS
4	Manipulative is safe to use.	4.00	VS
5	Size and composition of manipulative is appropriate for intended audience.	3.92	VS
6	Suggested manual tasks within the activities are compatible with the motor skills of the intended users.	3.92	VS
	Weighted Mean for Factor C	**3.95**	**VS**
	Total Points	**23.68**	**PASSED**
	Overall Weighted Mean	**3.97**	**VS**

Legend: VS = Very Satisfactory; S = Satisfactory; P = Poor; NS = Not Satisfactory

Content Quality. Factor A assessed ten criteria related to the content and physical design of the material, with a maximum possible score of 40 and a passing threshold of 30. Six of the ten criteria — Items 1 through 6 — received perfect mean scores of 4.00 (Very Satisfactory) from all twelve validators. Items 7 and 9, which assess the clarity of visuals in conveying the subject matter and the appropriateness of the material's size for school use, respectively, each yielded a mean of 3.92 (Very Satisfactory), as one validator in each case assigned a rating of 3. Items 8 and 10, which address typographic layout/design and ease of use and durability, recorded means of 3.83 (Very Satisfactory), as two validators in each case assigned a rating of 3. The weighted mean for Factor A is 3.95 (Very Satisfactory).

Other Findings. Factor B examined the material for the presence of conceptual, factual, grammatical/ typographical, and other errors, with both the maximum and required passing score set at 16. All twelve validators rated all four error-detection criteria at 4.00 (Very Satisfactory), indicating that no errors of any kind were detected in the material. The weighted mean for Factor B is a perfect 4.00 (Very Satisfactory).

Additional Requirements for Manipulatives. Factor C evaluated six criteria specific to manipulative materials under the domains of instructional design and technical design, with a maximum possible score of 24 and a passing threshold of 18. Items 3 and 4, which concern whether the suggested activities support innovative pedagogy and whether the manipulative is safe to use, received perfect mean scores of 4.00 (Very Satisfactory) from all twelve validators. The remaining four criteria — Item 1 on the adequacy of support materials, Item 2 on the provision of extension activities, Item 5 on the size and composition appropriateness of the manipulative for the intended audience, and Item 6 on the compatibility of suggested manual tasks with users' motor skills- each yielded a mean of 3.92 (Very Satisfactory), as one validator in each case assigned a rating of 3. All twelve validators surpassed the passing threshold of 18. The weighted mean for Factor C is 3.95 (Very Satisfactory). The overall weighted mean across all three factors is 3.97 (Very Satisfactory).

For Learners with Hearing Impairment: Tri-Geo Board. Table 7 presents the evaluation results of the Tri-Geo Board as rated by twelve validators using the LRMDS Evaluation Rating Sheet for Charts, Posters, Drill/Flash Cards, and Manipulatives (Template 6.5).

Content Quality. Factor A assessed ten criteria related to content quality and physical design, with a maximum possible score of 40 and a passing threshold of 30. Items 1, 3, 4, and 7 — pertaining to the reinforcement of learning competencies, accuracy of facts, currency of information, and clarity of visuals in conveying the subject matter — received perfect mean scores of 4.00 (Very Satisfactory) from all twelve validators. Items 2, 5, 8, and 9, which concern the material's potential to arouse learner interest, the relevance of visuals to the text, typographic layout and design, and the appropriateness of the material's size for school use, each yielded a mean of 3.92 (Very Satisfactory), as one validator in each case assigned a rating of 3. Items 6 and 10, pertaining to the suitability of visuals for the age level and interests of target users and to the material's ease of use and durability, recorded the lowest means in this factor at 3.83 (Very Satisfactory), as two validators in each case assigned a rating of 3. All twelve validators surpassed the passing threshold of 30. The weighted mean for Factor A is 3.93 (Very Satisfactory).

Table 7: Validation Ratings of the Tri-Geo Board by Factor

No.	Criterion	Mean	Description
Factor A. Content Quality			
1	Content reinforces, enriches, and/or leads to the mastery of certain learning competencies for the level and subject it was intended.	4.00	VS
2	Material has the potential to arouse interest of the target users.	3.92	VS
3	Facts are accurate.	4.00	VS
4	Information provided is up-to-date.	4.00	VS
5	Visuals are relevant to the text.	3.92	VS
6	Visuals are suitable to the age level and interests of the target user.	3.83	VS
7	Visuals are clear and adequately convey the message of the subject or topic.	4.00	VS
8	Typographic layout/design facilitates understanding of concepts presented.	3.92	VS
9	Size of the material is appropriate for use in school.	3.92	VS
10	Material is easy to use and durable.	3.83	VS
	Weighted Mean for Factor A	**3.93**	**VS**
	Total Points	**39.34**	**PASSED**
Factor B. Other Findings			
1	Conceptual errors.	4.00	VS
2	Factual errors.	4.00	VS
3	Grammatical and/or typographical errors.	4.00	VS
4	Other errors (i.e., computational errors, obsolete information, errors in the visuals, etc.).	4.00	VS
	Weighted Mean for Factor B	**4.00**	**VS**
	Total Points	**16**	**PASSED**
Factor C. Additional Requirements for Manipulatives			
1	Adequate support material is provided.	3.92	VS
2	Activities are summarized; extension activities are provided.	3.92	VS
3	Suggested activities support innovative pedagogy.	3.92	VS
4	Manipulative is safe to use.	4.00	VS
5	Size and composition of manipulative is appropriate for intended audience.	3.92	VS
6	Suggested manual tasks within the activities are compatible with the motor skills of the intended users.	3.92	VS
	Weighted Mean for Factor C	**3.93**	**VS**
	Total Points	**23.6**	**PASSED**
	Overall Weighted Mean	**3.95**	**VS**

Legend: VS = Very Satisfactory; S = Satisfactory; P = Poor; NS = Not Satisfactory

Other Findings. Factor B examined the material for the presence of conceptual, factual, grammatical/typographical, and other errors, with both the maximum and required passing score set at 16. All twelve validators rated all four error-detection criteria at 4.00 (Very Satisfactory), indicating that no errors of any kind were detected in the material. The weighted mean for Factor B is a perfect 4.00 (Very Satisfactory).

Additional Requirements for Manipulatives. Factor C evaluated six criteria specific to manipulative materials under the domains of instructional design and technical design, with a maximum possible score of 24 and a passing threshold of 18. Item 4, which concerns the safety of the manipulative for use, received a perfect mean score of 4.00 (Very Satisfactory) from all twelve validators. The remaining five criteria- Item 1 on the adequacy of support materials, Item 2 on the provision of summarized and extension activities, Item 3 on support for innovative pedagogy, Item 5 on the size and composition appropriateness of the manipulative for the intended audience, and Item 6 on the compatibility of suggested manual tasks with users' motor skills- each yielded a mean of 3.92 (Very Satisfactory), as one validator in each case assigned a rating of 3. All twelve validators surpassed the passing threshold of 18. The weighted mean for Factor C is 3.93 (Very Satisfactory). The overall weighted mean across all three factors is 3.95 (Very Satisfactory).

Video Lesson. The Video Lesson is a digital, audio-visual instructional material developed for learners with hearing impairment in secondary mathematics. Designed to cover selected topics across the secondary mathematics curriculum, including number operations, algebraic expressions, and geometry, the material incorporates visual-first presentation strategies such as on-screen text, animated graphics, and captioned narration to ensure that mathematical content is accessible to learners who are deaf or hard of hearing. Unlike the three preceding tactile manipulatives, the Video Lesson is a fully digital, multimedia resource evaluated using the DepEd Evaluation Rating Sheet for Non-Print Materials (Tool 6.6) under the LRMDS Guidelines for Assessment and Evaluation of Learning Resources. All four factors of this tool- Factor A (Content Quality), Factor B (Instructional Quality), Factor C (Technical Quality), and Factor D (Other Findings)- are directly applicable to this material and are included in the computation of the grand mean and the pass/fail determination.

The validation was conducted by the same panel of twelve validators- mathematics teachers with direct classroom experience handling learners with disabilities in mainstream educational settings. Each criterion was rated on a four-point scale where 4 = Very Satisfactory (VS), 3 = Satisfactory (S), 2 = Poor, and 1 = Not Satisfactory.

Content Quality: Factor A assessed ten criteria related to the content quality of the material, with a maximum possible score of 40 and a passing threshold of 30. Nine of the ten criteria received perfect mean scores of 4.00 (Very Satisfactory) from all twelve validators. The sole exception

was Item 3, which pertains to the accuracy of content, where one validator assigned a rating of 3, yielding a mean of 3.92 (Very Satisfactory). All twelve validators surpassed the passing threshold. The weighted mean for Factor A is 3.99 (Very Satisfactory).

Table 8: Validation Ratings of the Video Lesson by Factor

No.	Criterion	Mean	Description
Factor A — Content Quality			
1	Content is consistent with topics/skills found in the DepEd Learning Competencies for the subject and grade level it was intended.	4.00	VS
2	Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives.	4.00	VS
3	Content is accurate.	3.92	VS
4	Content is up-to-date.	4.00	VS
5	Content is logically developed and organized.	4.00	VS
6	Content is free from cultural, gender, racial, or ethnic bias.	4.00	VS
7	Content stimulates and promotes critical thinking.	4.00	VS
8	Content is relevant to real-life situations.	4.00	VS
9	Language (including vocabulary) is appropriate for the target user.	4.00	VS
10	Content promotes positive values that support formative growth.	4.00	VS
Weighted Mean for Factor A		**3.99**	**VS**
Total Points		**39.92**	**PASSED**
Factor B — Instructional Quality			
1	Purpose of the material is well defined.	4.00	VS
2	Material achieves its defined purpose.	4.00	VS
3	Learning objectives are clearly stated and measurable.	4.00	VS
4	Level of difficulty is appropriate for the intended target user.	4.00	VS
5	Graphics/colors/sounds are used for appropriate instructional reasons.	4.00	VS
6	Material is enjoyable, stimulating, challenging, and engaging.	4.00	VS
7	Material effectively stimulates creativity of target user.	4.00	VS
8	Feedback on target user's responses is effectively employed.	4.00	VS
9	Target user can control the rate and sequence of presentation and review.	4.00	VS
10	Instruction is integrated with target user's previous experience.	4.00	VS
Weighted Mean for Factor B		**4.00**	**VS**
Total Points		**40**	**PASSED**
Factor C — Technical Quality			
1	Audio enhances understanding of the concept.	4.00	VS
2	Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.	4.00	VS
3	There is complete synchronization of audio with the visuals, if any.	4.00	VS
4	Music and sound effects are appropriate and effective for instructional purposes.	4.00	VS
5	Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.	4.00	VS
6	Visual presentations (non-text) are clear and easy to interpret.	4.00	VS
7	Visuals sustain interest and do not distract user's attention.	4.00	VS
8	Visuals provide accurate representation of the concept discussed.	4.00	VS
9	The user support materials (if any) are effective.	4.00	VS
10	The design allows the target user to navigate freely through the material.	4.00	VS
11	The material can easily and independently be used.	4.00	VS
Weighted Mean for Factor C		**4.00**	**VS**
Total Points		**40**	**PASSED**
Factor D — Other Findings			
1	Conceptual errors.	4.00	VS
2	Factual errors.	4.00	VS
3	Grammatical and/or typographical errors.	4.00	VS
4	Other errors (i.e., computational errors, obsolete information, errors in the visuals, etc.).	4.00	VS
Weighted Mean for Factor D		**4.00**	**VS**
Total Points		**16**	**PASSED**
Overall Weighted Mean		**4.00**	**VS**

Legend: VS = Very Satisfactory; S = Satisfactory; P = Poor; NS = Not Satisfactory

Instructional Quality. Factor B assessed ten criteria related to the instructional design of the material, with a maximum possible score of 40 and a passing threshold of 30. All ten criteria received perfect mean scores of 4.00 (Very Satisfactory) from all twelve validators. All twelve validators surpassed the passing threshold. The weighted mean for Factor B is 4.00 (Very Satisfactory).

Technical Quality. Factor C assessed eleven criteria related to the technical dimensions of the material, with a maximum possible score of 44 and a passing threshold of 33. All eleven criteria received perfect mean scores of 4.00 (Very Satisfactory) from all twelve validators. All twelve validators surpassed the passing threshold. The weighted mean for Factor C is 4.00 (Very Satisfactory).

Other Findings. Factor D examined the material for the presence of conceptual, factual, grammatical/typographical, and other errors, with both the maximum and required passing score set at 16. All twelve validators rated all four error-detection criteria at 4.00 (Very Satisfactory), indicating that no errors of any kind were detected in the material. The weighted mean for Factor D was 4.00 (Very Satisfactory). The overall weighted mean across all four factors is 4.00 (Very Satisfactory).

4. Conclusions and Recommendation

This study was conducted to develop and validate instructional materials for teaching mathematics to learners with disabilities (LWDs) in mainstream secondary classrooms. Based on the findings, the following conclusions were deduced.

With respect to the experiences of mathematics teachers in handling learners with disabilities, the findings reveal that teaching LWDs in inclusive classrooms is largely shaped by the mismatch between traditional modes of mathematical representation and the sensory access needs of learners. For visually impaired learners, the inherently visual nature of mathematics presents significant barriers, particularly in topics involving spatial and graphical representations. For deaf or hearing-impaired learners, instruction becomes more effective when anchored in visual, structured, and multi-sensory approaches. Across both groups, teachers demonstrated adaptability and resourcefulness despite the absence of formal training and institutional support. However, their reliance on improvised strategies and peer-mediated assistance indicates systemic gaps in inclusive education implementation.

The validation results confirm that all developed instructional materials meet the quality standards set by the DepEd LRMDS evaluation framework. All four materials obtained "Very Satisfactory" ratings during initial validation and achieved a uniform mean rating of 4.00 after enhancement. This indicates that the materials are accurate, instructionally sound, technically appropriate, and free from conceptual or structural errors. The findings affirm that disability-responsive instructional materials can achieve high levels of quality without compromising curricular alignment or instructional rigor.

Given the documented challenges experienced by teachers in handling learners with disabilities, it is recommended that educational institutions and the Department of Education strengthen capacity-building programs for teachers in inclusive education. Training should focus on disability-specific instructional strategies, basic sign language skills, and the use of multi-sensory teaching approaches in mathematics. Additionally, schools should ensure the provision of necessary support personnel, such as sign language interpreters and shadow teachers, to reduce overreliance on peer-mediated assistance.

Considering the strong validation results of the developed instructional materials, it is recommended that the Department of Education formally review, endorse, and disseminate these materials for use in public secondary schools. Their alignment with DepEd standards and their demonstrated effectiveness position them as viable resources for supporting inclusive mathematics education. Schools may also consider reproducing and contextualizing these materials based on available resources and learner needs.

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