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Design and Validation of Levelled Instructional Materials in Science for Multigrade Classroom

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Abstract

The study investigated the development, validation, and impacts of leveled instructional materials (LIMs) on science learning in multigrade classrooms at Mama Mary Learning Center, Inc., Pili, Camarines Sur. This research used a descriptive-evaluative design where the researchers identified the least mastered learning competencies of Grades 3 and 4 learners across Quarter 1 to Quarter 4 through teacher-made achievement tests, item analysis, and curricular validation; focus group discussions for teachers lived experiences and challenges. The respondents of this study are divided into three groups, including the first group is the (28) students enrolled in Mama Mary Learning Center, Inc, the second group is the three (3) teachers handling a multigrade set-up, and the ten (10) validators for evaluating the levelled instructional materials. To address these gaps, LIMs were developed using the RE-ACT framework (Relate, Engage, Analyze, Create, Transform), providing scaffolded, learner-centered support, and it is grounded in differentiated instruction, constructivist learning, and multimodal approaches. Curricular validation confirmed that the LIMs were Very Satisfactory in terms of content (3.82), format (3.56), presentation and organization (3.54), and accuracy/up-to-datedness (3.88), though minor refinements in values integration and grammar were recommended. Additionally, teacher interviews and focus group discussions highlighted persistent challenges in individualization, time management, classroom dynamics, and a lack of professional development. However, despite these difficulties, teachers employed coping strategies including advanced planning, differentiated instruction, peer-assisted learning, and collaborative group work. Thus, this study concludes that leveled instructional materials are effective interventions for bridging science learning gaps in multigrade classrooms, improving learner engagement and comprehension, and reducing teacher workload. Furthermore, this study underscores the importance of institutional support, continuous training, and resource provision to sustain effective multigrade teaching.

Chapter 1
THE PROBLEM
Introduction

Globally, science education is recognized as the cornerstone of national development, particularly for those students who are capable of inquiry, innovation, and problem-solving. In other developing countries, including the Philippines, schools often face varied challenges in delivering quality science instruction due to a lack of resources, teacher shortages, and the prevalence of multigrade set-ups. Even though it is frequently necessary, multigrade instruction requires pedagogical creativity, particularly in areas like science where conceptual development and experiential learning are essential. Due to geographical or financial limitations, pupils of various ages and grade levels are taught together in multigrade classrooms (UNESCO, 2015). Although this structure is frequently the result of necessity in underserved or rural areas, it poses significant pedagogical obstacles, particularly in topics like science that rely for conceptual scaffolding, diversified instruction, and hands-on activities.

The variety of students' skills, preparation levels, and past knowledge constitute the majority of the urgent problems in multi-grade classrooms. Traditional teaching resources, such textbooks and standardized

modules, were created and utilized in a single-grade setting, but they are unable to handle the vast range of competences seen in a multi-grade setting. This discrepancy causes a learning gap, especially in science, where abstract ideas need to be properly contextualized and sequenced. When content is oversimplified, learners in upper grades may lose interest, while those in lower grades may struggle with various things that are too complex. In the meantime, teachers must manage classroom dynamics, balance instructional time, and guarantee that every student master's science competencies.

Leveled instructional materials (LIMs) have become a viable solution to these problems. These educational resources are made at different levels of difficulty to correspond with the skills and readiness of the pupils. These resources give students scaffolded support in line with the DepEd K–12 Curriculum Guide and the Most Essential Learning Competencies (MELCs), allowing them to advance from basic to advanced ideas. Differentiated instruction, scaffolding, and inclusion are all embodied in these concepts, which guarantee that every student may access science information at a suitable level while progressively moving toward higher competencies. Globally, frameworks such as UNESCO's Education for All and the United Nations Sustainable Development Goal 4 (Quality Education), SDG 4, particularly call for "ensuring inclusive and equitable quality education and supporting lifelong learning opportunities for all," so that no learner is left behind, regardless of their grade level or learning pace. By guaranteeing that students of various grade levels and skill levels may access science content that is suited to their requirements, LIMs directly serve this objective in the setting of multigrade classes. It is crucial to close the educational gap between rural and urban areas by giving schools with limited resources flexible resources. Additionally, the efficacy of leveled materials is supported by empirical research. Differentiated materials have been found to increase student engagement, comprehension, and retention. By offering defined pathways for learning, tiered material lessens the cognitive strain on teachers in a multigrade classroom. Through cooperative learning techniques, students at different levels can assist one another. It emphasizes the necessity of LIMs in the local context. In these situations, a multi-grade arrangement is the standard rather than the exception in many rural Philippine classrooms. Teachers frequently don't have access to resources specifically designed for this setting or specialist training. As a result, scientific learning results in these settings frequently fall short of national requirements, and students in Grades 3 and 4 have difficulty mastering competencies. The difficulties encountered by both educators and students demonstrate the perceived need for this research. On the other hand, educators report challenges with managing a varied student body, creating suitable lesson plans, and guaranteeing fair participation. However, students frequently encounter dissatisfaction, disinterest, or inconsistent grasp of scientific ideas. This study highlights the critical need for tiered teaching resources in science classrooms with several grade levels.

Theoretical Framework

The four (4) interconnected theories of Differentiated Instruction (DI), Guided Participation Theory, Cognitive Developmental Stages, and Multidimensional Classroom Model serve as the foundation for this study.

Bunga, Olano, and Morga (2025) used Differentiated Instruction (DI), a pedagogical strategy put out by Carol Ann Tomlinson. It centers on instruction tailored to students' learning profiles, interests, and readiness. Simultaneously, DI makes science knowledge accessible to a wider spectrum of learners by providing resources that are suited to different learning levels, preventing disengagement for those who find it too easy or too challenging. Additionally, DI encourages the strategic use of scaffolded resources,

flexible grouping, and tiered tasks—all of which are crucial in multi-grade classrooms where students frequently display a wide range of ages and skill levels.

At the same time, social connection and shared learning experiences are emphasized by Barbara Rogoff's (2003–2020) Guided Participation Theory. It suggests that students learn by actively engaging with adults or peers who possess greater information. This idea encourages collaborative learning in multigrade settings, where older students can mentor younger pupils, promote reciprocal development, and strengthen the social component of science education. The use of contextualized science resources that let students experiment, explore, and deepen their understanding is supported by this research. It aligns with inquiry-based and practical science activities by offering leveled instructional materials. According to this approach, educators should take on the role of facilitators, helping pupils build their own knowledge and comprehension. Additionally, Cognitive Developmental Stages, which is based on Richard Mayer's (2004) expansion of Piaget's framework and emphasizes the development of learners' cognitive capacities through structured experiences, is the final theory relevant to this study. Science instruction should incorporate practical, manipulative tasks that improve logical reasoning, classification, and problem-solving for students in Grades 3 and 4, who are usually in the concrete operational stage. This guarantees that learning resources correspond with students' cognitive maturity and developmental readiness. Science manipulatives should be given priority in the materials for Grades 3-4. By matching activities to growing reasoning, this method improves retention, lowers frustration, and increases developr adiness.

Finally, Bradley Johnson's Multidimensional Classroom Model (2023) incorporates the concepts of motivation, variety, and social production of knowledge. It acknowledges that learning outcomes are shaped by the backgrounds, interests, and interactions of students in classrooms, which are complex ecosystems. This paradigm emphasizes the necessity of dynamic, adaptable teaching strategies that address the multifaceted character of multigrade education, such as tiered materials.

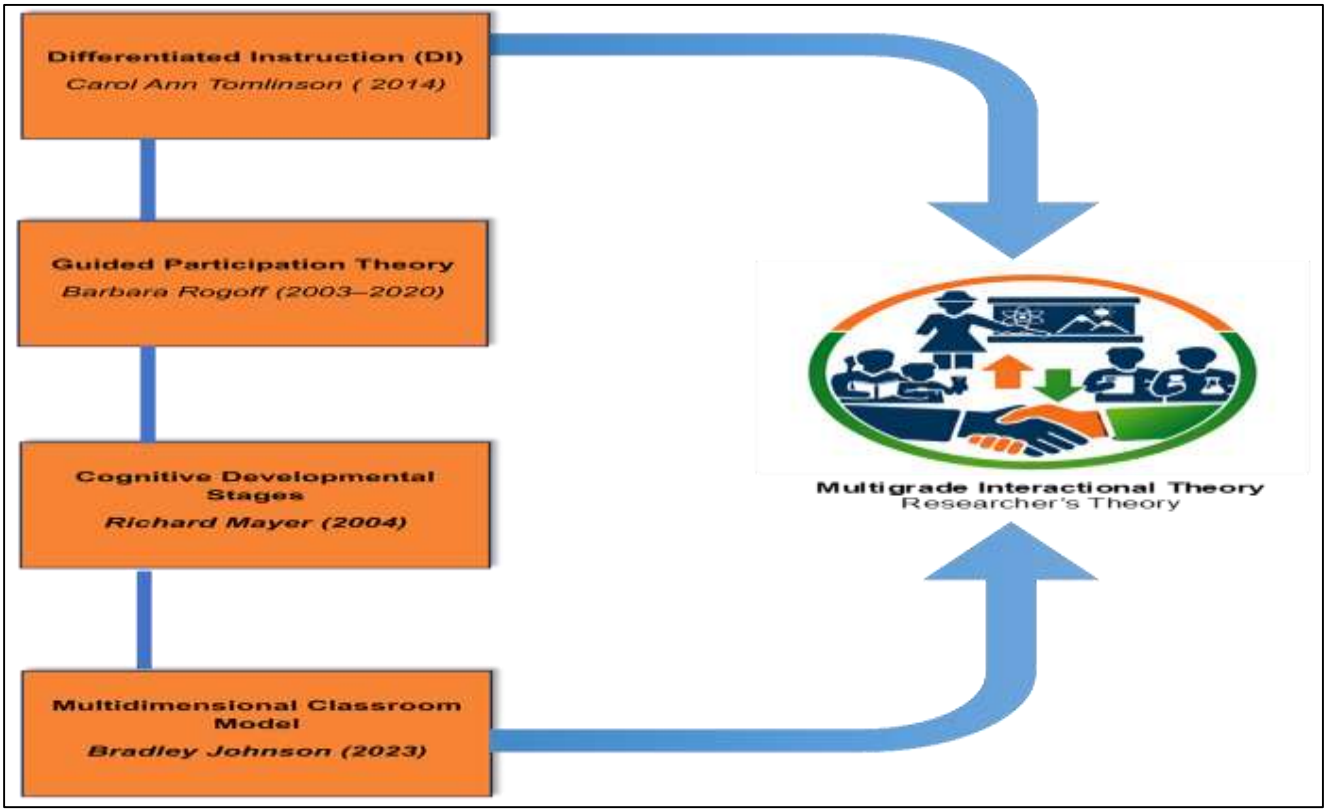

Figure 1. Theoretical Paradigm

The Multigrade Interactional Theory (MIT) (Carilo, 2025), which holds that effective multigrade science instruction results from the interaction of instructional resources, teacher adaptability, and learner engagement, is based on these four theories taken together. In this study, the researcher posits that learner engagement, instructor adaptability, and instructional resources interact to create a distinct learning dynamic in multi-grade classes.

Conceptual Framework

The conceptual paradigm of this study, illustrated in Figure 2 in Page 9, follows the systems view of research, which includes the input, process, and output. It shows the flow of influences and actions leading to the development of levelled instructional materials in Science subjects for Grades 3 and 4. The study, "Levelled Instructional Materials: Their Impacts on Science Learning in Multi-Grade Classrooms, intends to identify the frequency, severity, and correlates of instructional challenges, whereas it focuses on how teacher and classroom-related factors (inputs) interact with its instructional processes and lead to observable outcomes. The Conceptual Paradigm is shown in Figure 2 below.

Input. This study considered the DepEd Order 8, s. In 2015, the DepEd Policy Guidelines on the Grading System. It includes the least mastered learning competencies of the Grade 3 and 4 learners in science, starting from Quarter 1 to Quarter 4, using a formulated teacher-made examination by quarter, tailored with the Table of Specification. The tool will be evaluated and validated.

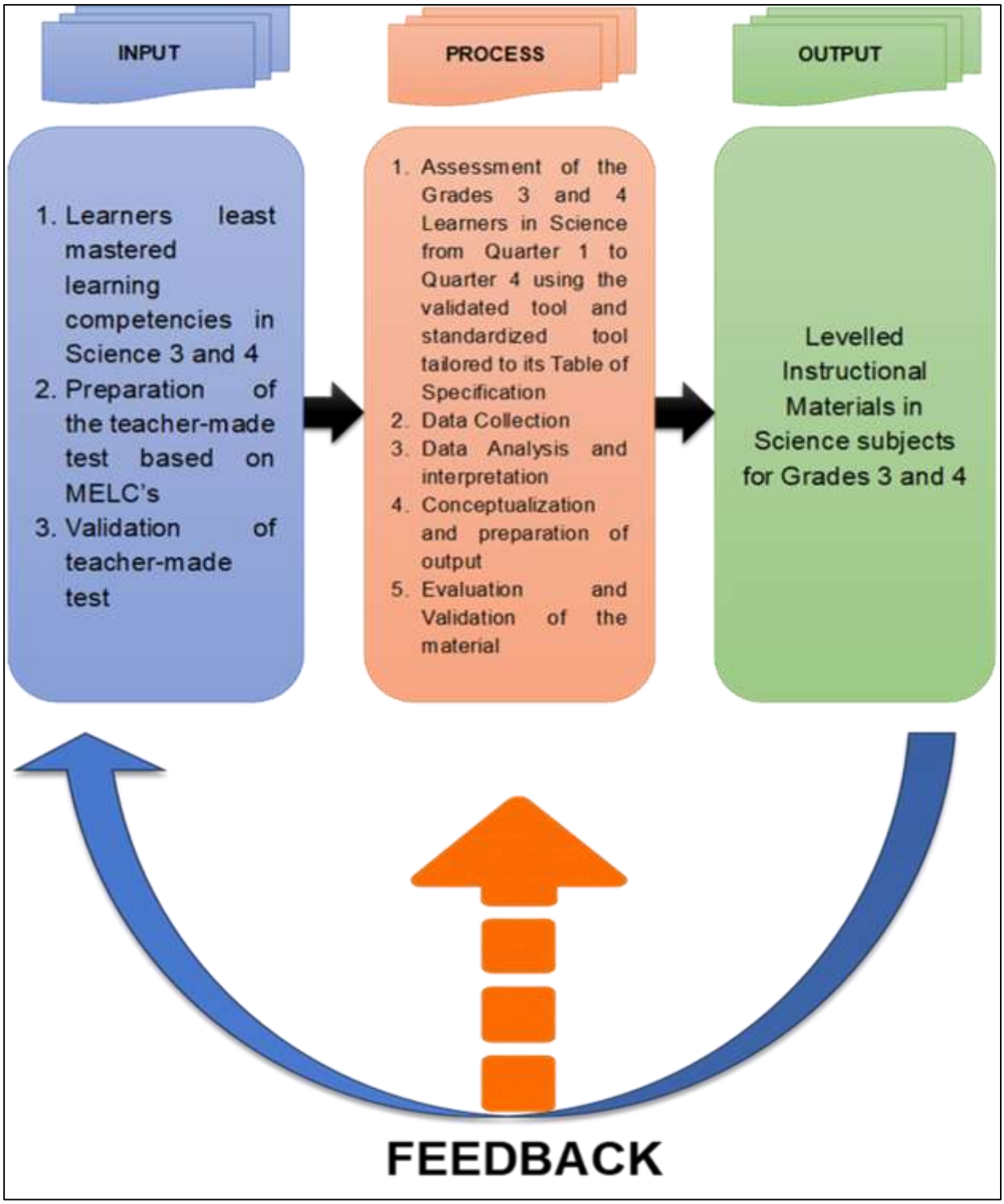

Figure 2. Conceptual Paradigm

Process. The process includes data gathering conducted through assessment of the respondents using the formulated teacher-made test. Item analysis was done to investigate the least mastered learning competencies of the learners based on the Most Essential Learning Competencies of DepEd. It was followed by data analysis and interpretation as preparation for the conceptualization of the levelled instructional materials in Science for Grades 3 and 4. Lastly, the validation of the levelled instructional

materials in teaching Science, starting from the first quarter to the fourth quarter using the DepEd LRMDS tool by the school validating team, Science Department Head, and all teachers teaching the subject.

Output. The output includes the development of leveled instructional materials specifically designed for multi-grade classrooms in Science for Grades 3 and 4, based on identifying the least-mastered competencies using a validated teacher-made test. After assessment, it needs to be item analyzed. Then, the data will be analyzed and interpreted. Next, the conceptualization and preparation of the levelled instructional materials. The final materials will undergo quality assurance through validation using DepEd LRDMS tool by the Science Department Head, the validating team, and Science teach

Statement of the Problem

The study aims to develop, validate, and evaluate levelled instructional materials in Science for Grades 3 and 4 learners in multigrade classrooms, and to determine their effectiveness in addressing the least mastered competencies of Grades 3 and 4 learners at Mama Mary Learning Center, Inc.

Specifically, it seeks to answer the following questions:

1. What are the least mastered competencies in science 3 and 4?
2. What levelled instructional materials can be developed?
3. What are the results of the curriculum validations of the materials?
4. What are the lived experiences and challenges met by teachers handling multigrade classrooms?

Assumptions

The following assumptions were considered in the conduct of the study:

1. Grade 3 and 4 learners have different least mastered learning competencies.
2. Leveled instructional materials can be developed based on the results of the least mastered learning competencies and by providing differentiated activities suited to learners' readiness levels.
3. The levelled instructional materials are curricularly valid, aligned with learning standards and appropriate for classroom use.
4. The teachers in Mama Mary Learning Center, Inc., handling multigrade classrooms face unique challenges that influence the effectiveness of instructional materials.

Scope and Delimitation of the Study

This present study is focused on identifying the least mastered learning competencies of Grades 3 and 4 in Science, starting from Quarter 1 to Quarter 4, leading to the development of levelled instructional materials. This study was conducted among learners from Grades 3 and 4 of Mama Mary Learning, Inc., located in Caroyroyan, Pili, Camarines Sur. The study is delimited to only Grade 3 and Grade 4 learners; other grade levels are excluded. The focus is solely on Science competencies. The competencies analyzed were those taught within one academic year from Quarters 1–4. Additionally, the lived experiences and challenges documented are limited to teachers handling multigrade classrooms in the said institution.

Significance of the Study

This study will be of great benefit to the following:

Learners. The findings of this study will benefit the students, as insights from the study can lead to more effective science teaching or instruction tailored to their developmental needs.

Science Teachers. This study will greatly benefit teachers by gaining understanding and strategies for navigating multi-grade science instruction challenges through potential professional development support.

School Administrators. This study aims to gather data that will help all administrators to improve resource allocation, scheduling, and teacher training programs.

Curriculum Developers. This study's findings will be helpful by informing about the gaps in instructional materials and curriculum delivery to improve relevance for multi-grade learners.

Department of Education (DepEd). This study's findings could support the Department of Education in improving its policies and standards by guiding the revision of the science curriculum to prioritize meaningful active learning experiences that better serve students.

Parents. This study will encourage parents to support their children's learning in science. Helping with experiments and active parental involvement creates a strong foundation for the child's overall development.

Present Researchers. This study is highly valuable to the researchers as its findings guide in creating a more engaging learning experience for multi-grade set-ups and an anchored lesson for learners' developmental milestones. Additionally, the results of this study offer the researcher deeper insights into the topic, refining its teaching methods and strategies.

Future researchers. The insights and knowledge gained from this study will form the basis for future research in related fields. The results offer reliable information to help enhance student learning outcomes by promoting active learning experiences.

Definition of Terms

The following significant terms were conceptually and operationally defined to clarify and better understand the study:

Curriculum Validation. This is the process of evaluating instructional materials to ensure alignment with curriculum standards and learning objectives. This study, it refers to the review and approval of the developed leveled instructional materials by curriculum experts and teachers.

Leveled Instructional Materials. It is a material or resource that is designed with varying levels of difficulty to match learners' readiness, abilities, and learning needs. In this study, it refers to Science learning modules developed for Grades 3 and 4, differentiated based on the least mastered competencies identified.

Least Mastered Competencies. This refers to learning objectives which the students find most difficult to achieve, as reflected in test results. In this study, the specific Science competencies in Grades 3 and 4 that learners scored lowest in during quarterly assessments served as the basis for the development of levelled instructional materials.

Lived Experiences. These are the personal insights and reflections of teachers based on their direct involvement in a multi-grade classroom. In this study, the term refers to the stories shared by teachers managing multigrade classrooms about their use of leveled instructional materials and the challenges they encountered.

Most Essential Learning Competencies (MELCS). MELCs were streamlined from the full K to 12 curriculum to ensure continuity of learning and it is the core skills and knowledge that learners must acquire within a grade level or subject area. In this research, it is the primary basis for identifying the least mastered skills among learners in Science for Grades 3 and 4.

Multigrade Classrooms. This is a classroom setting where a single teacher handles students from two or more grade levels simultaneously. In this study, multigrade classrooms refer to the learning environment at Mama Mary Learning Center, Inc., where learners in Grades 3 and 4 are taught together by one teacher.

Science Learning. This is the process of acquiring knowledge, skills, and attitudes related to scientific concepts, principles, and practices. In this study, which it refers to the enhancement in learners' mastery of Grade 3 and 4 Science competencies after using the developed leveled instructional materials.

Review of Related Literature and Studies

This section of the study presents a comprehensive review of literature and research studies that informed the investigation entitled "*Levelled Instructional Materials: Their Impacts on Science Learning in Multi-Grade Classrooms*." It summarizes the professional literature and studies previously undertaken, which were analytically reviewed to provide more information and insights in the pursuit of this study.

Curriculum Adaptation and Instructional Design

The study of Ainsworth, S. (2006) introduced the DeFT framework, which stands for Design, Function, and Taks, whereas it shows how using multiple representations such as diagrams, graphs, text, and models can help students learn complex ideas better. Also, teachers should think about how and when to use each type to avoid confusion so that their students can connect these representations for their learning. This study is related to the present study on science teaching in multi-grade classrooms. In such a way, in a classroom with students of different ages and learning levels, using multiple representations can help make science concepts clearer and more accessible. Additionally, this offers a solid basis for the claim that, even in multi-grade classroom settings like Mama Mary Learning Center, Inc., carefully crafted visual aids and a variety of instructional strategies can enhance science learning.

But according to Gilbert, J. K., & Justi, R. (2016), that is a teaching method called modelling-based teaching. In science, a model is a simplified way to explain something complex, like using a diagram to show how the water cycle works. Their books contend that models are central to show how science is learned and taught and that learners should be actively involved in creating and using models to understand specific ideas. Their book is related to the present study, where modelling can be a powerful tool to bridge gaps in understanding in classrooms with students of different ages and learning levels. This book also supports the researcher's ideas that flexible and interactive teaching strategies are needed to overcome challenges in multi-grade teaching of science. This would be helpful to show that modelling-based teaching is not just effective, but also aligns with best practices in science education.

Same points with the study, Cheng, M., et al. (2020), explores how using multiple modes of representation, such as diagrams, gestures, models, and digital media it can enhance students' understanding of particle models in science. In this study, teaching science with multiple modes helps students make sense of abstract ideas, which even young students like those in Grade 3 can understand complex science ideas when multimodal strategies are used effectively.

However, Nielsen, W., et al. (2020) studied how science learners and especially pre-service teachers can create digital explanations using different modalities such as visuals, narration, text, and gestures. Their study also looked at how students make choices about which modes to use when explaining science concepts digitally and how it affects the students' learning and understanding. Like in Mama Mary Learning Center, Inc., students have different learning levels and styles by using digital multi-modal explanations can help science more accessible to everyone. Additionally, this study shows that student-generated content can be a powerful tool for learning even in classrooms with limited resources.

Another, based on the study of Yeo, S. et al. (2020), which talks about the use of different types of visuals such as pictures, diagrams, videos, and models to help teach science, also known as visual ensembles. This is somehow connected to the present study in a way that it shows that using visual and multimodal tools might help make science easier to understand for students of different ages in one classroom. This also supports the idea that creative and flexible teaching strategies are needed when teachers are dealing with diverse learning needs. Also, this existing research can be used to show that improving how science is

taught, specifically with visuals, could be one way to deal with some of the challenges in a multi-grade classroom.

Lastly, the study of Hyry-Beihammer, E., & Hascher, T. (2021) focused on heterogeneity in multi-grade classrooms. According to their findings, teachers can exploit these variances as opportunities for learning through varied instruction rather than viewing them as a problem. The difficulties of teaching science in classrooms with several grade levels are examined in this study. Managing so many different learning levels at once is a significant problem. This implies that teachers can use disparities in the classroom to their advantage rather than viewing them as obstacles. Differentiated teaching techniques, such creating exercises specifically for mixed groups, can therefore aid in resolving this problem.

Science Pedagogy in Multi-Grade Settings

Mulryan-Kyne C. (2014) study, which focuses on rural Irish schools, examines how student interaction changes in multigrade classrooms. According to this study, peer connection is essential to learning, particularly in environments where students of various ages and grade levels move at the same speed. Additionally, kids frequently participate in cross-age tutoring, in which older students support younger students' social and intellectual growth. This study also discovered that, in comparison to single-grade classrooms, student autonomy and independent learning were more prominent in multigrade settings. The current study examines whether these interaction patterns translate successfully into science instruction at Mama Mary Learning Center, Inc., where teachers face unique challenges in managing content delivery across grade levels, even though these dynamics promote collaborative learning in a multi-grade setup. Additionally, the research of Tiernan, B., Casserly, A., & Maguire, C. (2018) examines collaborative learning in multigrade science classrooms, emphasizing shared inquiry, peer assistance, and group work as successful tactics. Additionally, it emphasizes how crucial teacher facilitation is to fostering teamwork. Building on this, the current study looks at how these pedagogical approaches are applied or limited in the setting of Mama Mary Learning Center, Inc., where educators deal with a variety of student needs and scarce resources.

J. M. A. De Borja et al. Al (2020) discovered that multigrade science teachers frequently encounter issues with protocol compliance and resource scarcity, necessitating the adaptation of pedagogical tactics and the creation of improvised learning resources. The quantitative evaluation of how these limitations affect scientific instruction at Mama Mary Learning Center, Inc., a rural multigrade private school in Camarines Sur, would be the foundation of this study.

Teacher Competence and Professional Development

As stated by Ngubane, T., and Ramrathan, L. (2013) contends that instructional leadership in multigrade classrooms stresses teacher resilience and professional autonomy while highlighting the necessity of teacher adaptability, flexibility, and contextual sensitivity. These results lend credence to the idea that strong instructional leadership is essential for successful science education in multigrade settings, especially in classes with limited resources. The current study explores how leadership qualities affect scientific instruction at Mama Mary Learning Center, Inc., building on these insights.

Furthermore, Little, A. W. (2006) describes how "invisible multigrade teachers" operate in monograde environments. This argument also makes the case for curriculum adaptation, teacher preparation, and policy reform, arguing that multigrade teaching is frequently viewed as a second-class education even though it can provide excellent learning possibilities. Her themes of pedagogical innovation, curriculum mismatch, and teacher invisibility might serve as markers for instructional difficulties, teacher ability, and policy ramifications. The current study will evaluate local difficulties in teaching science in a multigrade

classroom in the Philippines and look at how instructors deal with curriculum, resources, and instructional demands in science across grade levels.

However, Naparan, G. B., & Castaneda, I. L. P. (2021) provide a foundational knowledge of the multifaceted challenges faced by multi-grade teachers in the Philippines. Using a transcendental phenomenological approach, this study identified three levels of challenges, including intrinsic challenges such as unpreparedness, stress, and language barriers; extrinsic challenges such as low allowances, lack of resources, and unsafe travel conditions; and lastly, system-level challenges such as absence of stakeholder support, inadequate training, and overwhelming workloads. It also found that one of the coping strategies is time management and strategic planning, and by using digital resources and self-conditioning. These findings highlight systematic and instructional barriers that may directly affect science teaching in multigrade settings, especially in resource-limited schools like Mama Mary Learning Center, Inc.

A qualitative study of Galope, L. J. (2025), which explored the lived experiences of nine multigrade teachers whereas it was found that they encounter challenges in differentiation and time allocation, managing diverse learners and behavioral issues, limited access to training and support, and use of varied teaching methods, peer learning, and collaborative planning. In spite of their limited resources and institutional assistance, this study also highlights the flexibility and inventiveness of instructors in managing multigrade classes. These results provide insights into how contextual limitations and instructor methods may influence science learning. Since science frequently calls for practical, inquiry-based methods, this emphasis on varied education and peer learning is especially pertinent. Examining scientific instructional readiness across grade levels, resource availability and its effects on science experiments and activities, and teacher agency in modifying science content for multi-grade setups should all be strengthened by this.

Classroom Management and Learning Environment

Jewitt, C. (2006) presents a multimodal paradigm for understanding how technology affects pedagogy and literacy. However, when resources are scarce, science instruction in multi-grade classes might benefit from these multimodal approaches. In order to improve conceptual understanding across age groups, our study supports the integration of digital tools, simulations, and visual aids.

The research of Pancoe, M. (2006) describes the philosophy and practices of multi-age classrooms that prioritize a holistic and child-responsive curriculum. It also highlights the significance of flexible grouping, authentic assessment, and community involvement, as well as the diversity of learners' learning styles and developmental stages, peer mentoring, and cooperative learning as key tactics. The objectives of science education, which promote inquiry, teamwork, and differentiated instruction, are in line with this paradigm. It lends credence to the notion that older students can assist younger ones in their research and experiments.

A qualitative analysis of Erden, H. (2020) in North Cyprus identifies key issues in a multi-graded system, including curriculum organization and a lack of specialized teaching materials; classroom management concerns, particularly during simultaneous instruction; and inadequate teacher support and training. These systemic problems have a direct bearing on science education, which frequently calls for organized time, resources, and supervised investigation. These results emphasize the necessity of resource adaptation and focused professional growth.

Cakir, P., et al.'s phenomenological investigation. (2022) investigated the real-life experiences of Turkish educators moving from multi-grade to single-grade classrooms. It was discovered that teachers

acknowledged the pedagogical richness and practical difficulties of teaching many grades with conflicting emotions. Along with highlighting student autonomy and peer learning as virtues, it also underlined the necessity of specialized training, curricular flexibility, and supportive policies. The significance of teacher agency and adaptive techniques in science instruction is reaffirmed by the teachers' reflections. Together, these studies highlight the necessity of multimodal and differentiated approaches in science education, the value of flexible grouping and peer learning in managing a diverse student body, and the systemic obstacles that need to be addressed, such as curriculum rigidity and a lack of training.

Assessment and Learning Outcomes

Lemke, John L. (1990) focuses on classroom speech as a means of creating scientific meaning and examines how language mediates science learning. It was discovered that science is spoken into existence through social interaction and semantic patterns rather than merely being taught. Students' engagement with scientific concepts is shaped by the language used in the classroom, which reflects attitudes, values, and control techniques. Lemke's work emphasizes the need for language scaffolding and discourse tactics to assist science learning across age groups in multi-grade classrooms, where varied instruction is crucial. But Veel, R., and Martin, J. R. (1998) use critical theory and functional linguistics to analyze scientific discourse. This demonstrates how science texts are multimodal, incorporating structured logic, technical language, and images. Additionally, it highlights the importance of critical literacy in science teaching and genre-based pedagogy to make science accessible to students at all grade levels..

A national review was made by SEAMEO INNOTECH. (2020), which analyses the multigrade education in the Philippines, covering the nine policy components and eight programmatic areas of the Multigrade Program in Philippine Education (MPPE), persistent challenges such as curriculum rigidity, limited resources and teacher training gaps and the innovations, including the Philippine Multigrade Schools Monitoring and Evaluation System (PMS-MES) and capacity-building efforts. This review provides a policy and systems-level backdrop for the present study, which it validates the need to assess science-specific challenges and supports the development of contextualized interventions.

However, DepEd Region VIII (2024), an internal report that highlights science performance trends in multi-grade schools within Region VIII. It was found that there are low achievement scores in science, particularly in inquiry-based competencies. There are also identified gaps in instructional delivery, resource availability, and teacher specialization. Thus, it is recommended that we strengthen science process skills, enhance teacher training, and improve access to materials.

Synthesis of the State-of-the-Art

All the foregoing literature and studies reviewed were of substantial benefit in amplifying and pointing out salient findings in terms of the acquisition of additional knowledge, which were valuable to the present study.

In multimodal strategies, Ainsworth (2006), Cheng et al. (2020), and Jewitt (2006, 2020) focus on the effectiveness of multimodal and visual tools in explaining abstract science concepts, which aligns well with the present study’s concern about limited instructional materials and student engagement. While in teacher adaptability and innovation, Ramrathan & Ngubane (2013) and Naparan & Castaneda (2021) highlight that teacher flexibility and strategic planning are crucial in managing the diversified learners, which the current study’s exploration of time management and instructional practices covers. Research such as that conducted by De Borja et al. (2020) and Erden (2020) concentrates on curriculum and pedagogical approaches, such as the enduring problem of curricular rigidity and resource limitations, both of which are major obstacles Mama Mary Learning Center, Inc. faces in rural multi-grade classrooms.

Conversely, Mulryan-Kyne (2014) and Tiernan et al. (2018) highlight the importance of peer tutoring and collaborative learning; yet, because of the contextual constraints examined in this study, these strategies might not be effectively implemented.

The differences between the literature and studies and the present study are that the present study investigates a semi-rural private school in the Philippines, but most prior studies focus on public multi-grade schools or international contexts. Additionally, while many studies assess general multigrade teaching, only a handful, such as Bansal & Ramnarain, 2023; De Borja et al., 2020, which focus on science instruction, and the present study, provide quantitative data on science-specific instructional challenges.

Research Gap

While there are studies that offer qualitative insights and theoretical discussions on multigrade education, several gaps remain, such as the lack of quantitative assessments of the frequency and severity of science-specific instructional challenges in multigrade classrooms. There is limited focus on science pedagogy in private in multigrade schools. Most research has centered around public-school settings, leaving private multigrade institutions like Mama Mary Learning Center underexplored in the literature. Finally, although existing literature references DepEd Orders, few studies connect these with on-the-ground realities in small Philippine schools. The present study connects national directives to practical classroom implications. Based on this, no similar study was undertaken on "*Levelled Instructional Materials: Their Impacts on Science Learning in Multi-Grade Classrooms.* This is the gap that the study aims to bridge. The research was carefully done to identify the least mastered learning competencies of Grades 3 and 4 in science from the first quarter to the fourth quarter, leading to the development of the levelled instructional materials.

Chapter 2
RESEARCH METHODOLOGY

This chapter presents the research methods and procedures used in gathering and interpreting the data needed for the present investigation. It emphasizes the description method or design, the respondents of the study, and the sampling design. This also includes the instruments used and the statistical measures employed in the interpretation of the data.

Research Design

The researcher used the descriptive-evaluative method to determine the data needed for the present investigation. Descriptive-evaluative research design is a qualitative and quantitative data collection and analysis method and is used to collect information from a preselected group without a comparison group (Gu, Y., & Warren, J., 2017). Descriptive statistics are methods which used to calculate, describe, and summarize collected research data in a logical, meaningful, and efficient way (Vetter, T. R., 2017). A data set was collected from the responses or observations of the respondent.

This method helped the researcher simplify the large set of data sensibly. This study will first examine the least mastered competencies in Science staring from the first quarter to the fourth quarter, for Grades 3 and 4 learners of Mama Mary Learning Center, Inc., Academic Year 2025-2026, using a teacher-made achievement test tailored to its Table of Specifications and an interview question for identifying the lived experiences of teachers and challenges met by teachers handling multigrade classrooms. The results shall serve as the basis for the development of levelled instructional materials in teaching Science.

Respondents

The first group of respondents in this study were students in Grades 3 and 4 who took the Science subject

from the first quarter to the fourth quarter in Mama Mary Learning Center, Inc., Caroyroyan, Pili, Camarines Sur. The respondents were identified using Slovin's formula and the stratified sampling technique.

Table 1.
Distribution of Grades 3 and 4 Learners by Grade Level

Grade Level	Population Size	Sample Size
Grade 3	11	10
Garde 4	20	18
TOTAL	**31**	28

The second group of respondents was the three (3) teachers of Mama Mary Learning Center, Inc., to identify the lived experiences and challenges met by teachers handling multigrade classrooms.
The third group of respondents will consist of ten (10) evaluators: six (6) are members of the school validating team, one (1) Science Department Head, and three (3) Science Teachers who are experts in science instruction.

Data Gathering Tools

The researcher used the following: a teacher-made achievement test based on Quarter 1 to Quarter 4 of Most Essential Learning Competencies (MELC's) of Science 3 and 4 of the Department of Education (DepEd) to identify the least mastered learning competencies of the Grade 3 and 4; and the focus group discussion to assess the lived experiences and challenges met by teachers handling multigrade classrooms. For the curricular validation, guidelines in evaluating a printed learning material provided by the LRMDS of DepEd were utilized.

Preparation of Teacher-Made Achievement Test. In the preparation of the questions for the achievement test, the researcher consulted Science books and modules, reliable cites on science journals, and the utilization of Most Essentials Learning Competencies (MELCs) of the Department of Education. A Table of Specifications was also used in the distribution of the items per competency. A 30-item test for Grade 3, which it is composed of multiple-choice questions answerable by selecting any of the four options were used in the test. However, in Grade 4, it is a 40-item test that is composed of multiple-choice and true or false questions. A sample teacher -made achievement test is shown in Appendix B, page _____. It is checked and validated by our school principal of Mama Mary Learning Center, Inc. The suggestions given by the validators for the enhancement of the test questions were reflected. After its approval, final copies were made for a dry run. The distribution of the items per learning competency is shown in Appendix E, page ___.

Pilot Testing. To determine the reliability and validity of the assessment tool, pilot testing was conducted to one (1) Grade 3 and two (2) Grade 4 learners of Mama Mary Learning Center, Inc. The difficulty index and discrimination index for each question was also assessed. The results is shown in Appendix F and G respectively on pages __ and ___.

Administration and retrieval of the Teacher-Made Achievement Test. The researchers prepared a formal request to undertake the study at Mama Mary Learning Center, Inc., Caroyroyan, Pili, Camarines Sur. The researchers used a printed teacher-made achievement test in data gathering and interview questions for teachers. The researchers personally administer the test to the respondents per class in a

limited time only. The retrieval of the teacher-made achievement test was conducted personally by the researcher.

Interview Question. The researcher prepared a set of face-to-face interview questions for teachers to assess the lived experiences and challenges they met while handling a multigrade classroom. The set of interview question was shown in Appendix H, page _____

Focus Group Discussion. A Focus Group Discussion (FGD) was conducted among the teachers handling a multigrade classroom: Grade 1 and 2 teachers, Grade 3 and 4 teachers, and Grade 5 and 6 teachers, by assessing the lived experiences and challenges met by them during handling a multigrade classroom.

This helped deepen the researcher's understanding of the researcher on the experiences and challenges the teachers might be facing.

Steps in Preparation of the Levelled Instructional Materials in Teaching Science for Grade 3 and 4 Learners

The following were the processes in the preparation of the levelled Instructional Materials in teaching Science for Grades 3 and 4.

A. Preliminary Phase

The first part in the preparation of the Levelled Instructional Material in teaching Science for Grades 3 and 4 is the preliminary phase. It covered the selection of books, reading, and other reference materials in science for the Elementary Level. It also involved reviewing content for each learning competency stated in the Most Essential Learning Competencies (MELCs) of Science, from Quarter 1 to Quarter 4. It also covers the administration of the test and acquisition of the data from the teacher-made achievement test, focus group discussion, and interviews.

B. Developmental/ Preparation Phase

The second phase in the preparation of the Levelled Instructional Material in teaching Science for Grades 3 and 4 includes the organization of all the identified least mastered learning competencies in the Science subject, analysis of data, interpretation of the data gathered, and development of the output with a RE-ACT (Relate, Engage, Analyze, Create, and Transform) Framework.

C. Validation or Evaluation Phase

The last phase was the curricular validation, which aims to determine the validity of the Levelled Instructional Materials in Teaching Science for Grades 3 and 4 Learners using the LRMDS tool provided by the DepEd. The third group of respondents did the curricular evaluation of the teachers' guide. These consist of five (5) evaluators: one (1) is a member of the school validating team whom the School Principal, one (1) Science Department Head, and three (3) Science Teachers who are experts in science instruction.

Ethical Consideration

The researcher prepared an informed consent, which was obtained from all respondents after explaining the purpose, procedures, and voluntary nature of the study. Additionally, respondents were assured that their identities and responses would remain confidential and would be used solely for research and academic purposes.

Statistical Treatment of the Data

The research employed various statistical methods in analyzing the data collected. After the necessary data gathering was completed, the results were organized, tabulated, analyzed, and statistically treated. The statistical tools that were used are the following:

Slovin's Formula. This formula was used to identify the sample size of the respondents. The formula is: $n = \frac{N}{1+Ne^2}$ where: n = number of samples; N = Total population; and e = error tolerance level.

Stratified Random Sampling Technique. It emphasizes distributing the assorted data into multiple groups. The primary purpose of this is to ensure that the total sample is a blend of all the different kinds of items in the population. The formula is: $Stratified\ Sampling = \frac{Total\ Sample\ Size}{Population\ Size}$.

Frequency Count. This was used to tally the answers of the respondents to an item in the teacher-made test.

Percentage Technique. This was used to determine the proportionate number of respondents who find difficulty in the different learning competencies in Science starting from Quarter 1 Quarter 4. The formula is: P= $\frac{f}{N}$ x 100 , where P = Percentage, f = Frequency, and N = Total number of Respondents.

Weighted Mean. It was used to determine the curricular validation of the contextualized levelled instructional materials in Sciences 3 and 4. The formula is:

$WM = \frac{TWF}{N}$ where WM = Weighted Mean; TWF = Total Weighted Frequency; and N = Total Number of Respondents.

The five-point Likert Scale, with the corresponding verbal interpretation are shown below:

The four-point Likert Scale, with the corresponding verbal interpretation are shown below:

Scale	Interval Scale	Interpretation
5	4.20 - 5.00	Excellent
4	3.40 – 4.19	Good
3	2.60 – 3.39	Fairly Good
2	2.80 – 2.59	Poor
1	1.00 – 1.79	Very Poor

Scale	Interval Scale	Interpretation
4	3.25 – 4.00	Very Satisfactory
3	2.50 – 3.24	Satisfactory
2	1.75 – 2.49	Poor
1	1.00 – 1.74	Not Satisfactory

The 100- point scale (in percentage), with the corresponding interpretation shown below, was used to determine the Least Mastered Learning Competencies. The competencies with 59% and below were considered least mastered.

Scale	Interpretation
80 – 100%	Highly Mastered (HM)
60 – 79%	Mastered (M)
40 – 59%	Nearly Mastered (NeM)
20 – 39%	Least Mastered (LM)
0 – 19%	Not Mastered (NoM)

Chapter 3
LEVELLED INSTRUCTIONAL MATERIALS: THEIR IMPACTS ON SCIENCE LEARNING IN MULTI-GRADE CLASSROOMS

This chapter presents, analyzes, and interprets the least mastered learning competencies in the Science subject for learners in Grades 3 and 4, where the levelled instructional materials were developed, as well as the curricular validation results and focus group discussions, incorporating the lived experiences and challenges faced by teachers handling multigrade classes.

Least Mastered Learning Competencies in Science of Grade 3, Starting from Quarter 1 to Quarter 4

The first specific problem addressed in this study is the identification of the least mastered learning competencies in the Science subject, starting from Quarter 1 to Quarter 4. Based on the result of the survey conducted through a teacher-made achievement test answered by the Grade 3 learners of Mama Mary Learning Center, Inc., Zone 6, Caroyroyan, Pili, Camarines Sur, School Year 2025-2026, the least mastered learning competencies become the basis of the development of the levelled instructional materials. The learning competencies with 0-19% or not mastered (NoM) and 20-39% or least mastered (LM) become the basis for the development of levelled instructional materials.

Table 2 shows the least-mastered learning competencies among the learners in Science in Quarter 1. Based on the results, two (2) learning competencies fall under the least-mastered competencies, namely: "*Classify objects and materials as solid, liquid, and gas" with* 37.27% and "*Describe ways of the proper use and handling of solid, liquid, and gas"* with 35.00%. This indicates significant learning gaps in classification skills and the practical application of matter handling. Overall, the data reveal that the overall average mastery level of Grade 3 is 51.23%, interpreted as Nearly Mastered (NeM).

This implies that learners have not yet attained a degree of consistent and autonomous mastery, even though they have established a partial comprehension of the required competencies. Their performance shows that in order to improve conceptual understanding, they require ongoing reinforcement, organized practice, and focused instructional support. The observed challenges in categorizing matter into solid, liquid, and gas as well as in exhibiting appropriate treatment of various materials, in particular, indicate gaps in fundamental scientific knowledge that need to be methodically filled.

According to Bloom (1971), mastery learning necessitates that students thoroughly understand foundational ideas before moving on to increasingly difficult assignments. This method underlines the significance of offering corrective instruction, additional time, and various learning situations when students meet challenges. In support of this, Hussain and Suleman (2016) discovered that using Bloom's mastery learning paradigm greatly raises student achievement in science, particularly in subjects like states

of matter that call for conceptual clarity. Their results support the notion that deep learning requires frequent exposure and reinforcement. Additionally, Guskey (2005) emphasizes how important formative evaluation is to mastery learning. According to him, continuous evaluation enables educators to pinpoint certain learning deficiencies and offer prompt remedies like scaffolding and guided practice. This indicates that in order to progressively increase accuracy and confidence while classifying material, students benefit from repeated classification tasks, practical exercises, and step-by-step instruction.

These results are further supported by recent local study. According to Oseña (2024), students in Camarines Sur multigrade classes continue to struggle with the classification of matter. This is consistent with the Most Essential Learning Competencies (MELCs) of the Department of Education, which highlight this subject as a recurrent area of difficulty for science students in Grade 3. These findings demonstrate that the problem is systemic rather than isolated, highlighting the necessity of ongoing instructional interventions, contextualized teaching methods, and ongoing learner progress monitoring. All of these results point to the need for a purposeful teaching strategy that incorporates scaffolded learning experiences, formative assessment, and reinforcement in order to increase proficiency in matter classification. Teachers may help students develop a better foundation in science concepts by addressing these gaps early and regularly, which will eventually result in higher levels of comprehension and performance. Furthermore, using contextualized and interactive exercises like experiments and real-world examples can improve students' engagement and idea recall. To guarantee that students receive consistent support both within and outside of the classroom, teachers, school administrators, and parents must work together continuously.

Table 2
Least Mastered Competencies of Grade 3 in Quarter 1 of the Science Subject

Most Essential Learning Competencies (MELCS)		**ML**	**VI**	**RANK**
	Describe the different objects based on their characteristics (e.g. shape, weight, volume, ease of low)	90.00	HM	1
1	Classify objects and materials as solid, liquid, and gas based on some observable characteristic	37.27	LM	3
	Describe ways on the proper use and handling solid, liquid and gas found at home and in school;	35.00	LM	4
2	Describe changes in materials based on the effect of temperature: 1. Solid to liquid 2. Liquid to solid 3. Liquid to gas 4. Solid to gas	42.67	NeM	2
AVERAGE MASTERY LEVEL		51.23	NeM	

Verbal Interpretation: 80 – 100% Highly Mastered (HM); 60 – 79% Mastered (M); 40 – 59% Nearly Mastered (NeM); 20 – 39% Least Mastered (LM); 0 – 19% Not Mastered (NoM)

Below is Table 3 presenting the mastery level of Grade 3 in Quarter 2 across fourteen (14) MELCs (Most Essential Learning Competencies) in science. The learning competencies that were identified are the

following: "*Classify animals according to body parts and use*" with 35%; *Identify observable characteristics that are passed on from parents to offspring (e.g., humans, animals, plants)* with 35%; and "*Identify the basic needs of humans, plants and animals such as air, food, water, and shelter*" with 30%. These learning competencies highlight critical learning gaps in classification skills, heredity, and basic survival needs. Overall, the findings indicate that the average mastery level of Grade 3 learners is 63.36%, which falls under the category of Mastered (M), indicating that the learners from Grade 3 have achieved a satisfactory level of understanding of the competencies.

The results in Table 3 show significant gaps in students' knowledge of heredity, especially when it comes to recognizing the fundamental requirements of living things and distinguishing characteristics that are handed down from parents to children. These gaps imply that students would find it difficult to relate abstract biological ideas to practical observations, which would limit their comprehension of how features are inherited and how living things survive. This result is in line with Soberana's (2024) study, which found that survival needs and heredity were among the least learned competences in Cavite primary schools. This suggests that these difficulties are not exclusive to any one learning environment.

The Department of Education's Learning Resource Management and Development System (DepEd LRMDS, 2023) suggests using contextualized and experiential learning activities to fill in these gaps and help students understand topics. Learners can immediately examine patterns of inheritance and get a solid understanding of survival needs through activities including recognizing family qualities, comparing physical characteristics among classmates, and performing basic surveys of plants or animals. These exercises make learning more interesting and applicable by bridging the gap between theory and practice. Furthermore, fostering higher-order thinking abilities is crucial to assisting students in progressing from basic identification to more profound comprehension. Students should be given the chance to examine, contrast, and describe how qualities are inherited and how they relate to the survival of living things. This is consistent with Bloom's Taxonomy (1956), which highlights the progression from fundamental information to more advanced cognitive processing levels like analysis and application. Supporting this, Hussain and Suleman (2016) found that mastery learning significantly improves retention and performance in biology-related topics, particularly when learners are given sufficient time, feedback, and varied learning experiences.

More importantly, heredity as a concept requires experiential and hands-on learning, especially for Grade 3 learners who are still developing abstract thinking skills. Engaging learners in observation-based and inquiry-driven activities enables them to construct their own understanding and retain concepts more effectively. Therefore, strengthening instruction in heredity and basic needs of living things should involve continuous reinforcement, contextualization, and Incorporating visual aids, storytelling, and collaborative activities can further support learners in making connections between concepts and their everyday experiences.

Below is Table 4 presenting the mastery level of Grade 3 in Quarter 3 across MELCs (Most Essential Learning Competencies) in science.

Table 3 Least Mastered Competencies of Grade 3 in Quarter 2 of Science Subject

Most Essential Learning Competencies (MELCS)		ML	VI	RANK
	Enumerate healthful habits to protect the sense organs;	83.75	HM	3

3	Describe the parts and functions of the sense organs of the human body;	50.00	NeM	12
4	Describe animals in their immediate surroundings;	65.00	M	8.5
5	Identify the external parts and functions of animals	75.00	M	4.5
6	Classify animals according to body parts and use;	35.00	LM	14.5
	Describe ways of proper handling of animals ;	70.00	M	6.5
7	State the importance of animals to humans;	60.00	M	10.5
8	Describe the parts of different kinds of plants ;	75.00	M	4.5
	Describe ways of caring and proper handling of plants;	100.00	HM	1.5
9	State the importance of plants to humans ;	60.00	M	10.5
10	Compare living with nonliving things;	65.00	M	8.5
	Infer that living things reproduce;	100.00	HM	1.5
11	Identify observable characteristics that are passed on from parents to offspring (e.g., humans, animals, plants);	35.00	LM	14.5
12	Identify the basic needs of humans, plants and animals such as air, food, water, and shelter;	30.00	LM	16
13	Explain how living things depend on the environment to meet their basic needs;	40.00	NeM	14
14	Recognize that there is a need to protect and conserve the environment.	70.00	M	6.5
AVERAGE MASTERY LEVEL		63.36	M	

Verbal Interpretation: 80 – 100% Highly Mastered (HM); 60 – 79% Mastered (M); 40 – 59% Nearly Mastered (NeM); 20 – 39% Least Mastered (LM); 0 – 19% Not Mastered (NoM)

The following competencies fall within the least mastered ranging from 20-39%: "*Describe the movements of objects such as fast/slow, forward/backward, stretching/compressing*" with 37.50%; "*Describe the position of a person or an object in relation to a reference point such as chair, door, another person"* with 35.45%; and "*Demonstrate proper disposal of waste according to the properties of its material*" with 37.50%. These competencies reflect conceptual challenges in motion, position, energy sources, and sensory phenomena. The overall average of mastery level of Grade 3 learners in Science for Quarter 3 is 47.74%, which falls under the category of Nearly Mastered (NeM), indicating that learners have acquired a partial understanding of the competencies assessed during this quarter.

Since the mastery level of Grade 3 in Quarter 3 has found that learners have difficulties in motion, position, and waste disposal, targeted instructional interventions are necessary to address these gaps. Multi-grade learners usually struggle with abstract physics concepts like motion (Boreros et al., 2024). In such difficulties, teachers cope by using local materials for demonstrations, reinforcement cycles are needed for abstract concepts like motion, and mastery learning reduces variation in achievement in physics topics

(Naparan & Castañeda, 2021; Bloom, 1971 & Guskey, 2005). Furthermore, integrating hands-on and inquiry-based activities can help learners visualize and better understand concepts of motion and position. Strengthening environmental awareness through practical waste disposal practices can also improve both conceptual understanding and real-life application of learning.

Table 5 below presents the mastery level of Grade 3 in Quarter 4 across MELCs (Most Essential Learning Competencies) in science.

Table 4
Least Mastered Competencies of Grade 3 in Quarter 3 of Science Subject

Most Essential Learning Competencies (MELCS)		**ML**	**VI**	**RANK**
	Identify things that can make objects move such as people, water, wind, magnets;	75.00	HM	1
	Describe the movements of objects such as fast/slow, forward/backward, stretching/compressing;	37.50	LM	4,5
15	Describe the position of a person or an object in relation to a reference point such as chair, door, another person;	35.45	LM	6
	Describe sources of light and sound, heat and electricity;	37.50	LM	4.5
	Enumerate uses of light, sound, heat and electricity;	55.00	NeM	2
16	Describe the different uses of light, sound, heat and electricity in everyday life.	46.00	NeM	3
AVERAGE MASTERY LEVEL		47.74	NeM	

Verbal Interpretation: 80 – 100% Highly Mastered (HM); 60 – 79% Mastered (M); 40 – 59% Nearly Mastered (NeM); 20 – 39% Least Mastered (LM); 0 – 19% Not Mastered (NoM)

There is one learning competencies fall within the least mastered ranging from 20-39% which is "*Communicate how natural objects in the sky affect daily activities*" with 30.00%. This indicates a significant gap in astronomy-related applications and how learners connect celestial phenomena to everyday life. The overall average mastery level of Grade 3 learners in Science for Quarter 4 is 49.92%, which is interpreted as Nearly Mastered (NeM). This suggests that learners demonstrated partial understanding of the competencies assessed during this quarter.

Based on the results, it was found that in Grade 3 in Quarter 4, there is a gap in astronomy-related competencies, such as understanding the effects of natural objects in the sky. This is supported by Ares-Ferreirós et al. (2025), who found that astronomy is consistently difficult in multi-grade classrooms. Additionally, it is noted that astronomy requires inquiry-based activities and higher-order thinking skills, such as application and analysis, whereas mastery learning provides strong support for the gradual

scaffolding of abstract science concepts (DepEd Science Module Q4, 2023; Bloom's Taxonomy; & Guskey, 2005). Moreover, the use of visual models, simulations, and real-life observations can help learners better grasp complex astronomical phenomena. Continuous reinforcement and guided exploration are also essential to build deeper understanding and sustain learners' interest in space-related topics. Moreover, the use of visual models, simulations, and real-life observations can help learners better grasp complex astronomical phenomena. Continuous reinforcement and guided exploration are also essential to build deeper understanding and sustain learners' interest in space-related topics. Integrating culturally relevant examples, such as local beliefs and observations about the sky, can further make learning more meaningful to learners. In addition, consistent use of formative assessments will enable teachers to monitor progress and provide timely support to address misconceptions in astronomy concepts.

Table 5
Least Mastered Competencies of Grade 3 in Quarter 4 of Science Subject

Most Essential Learning Competencies (MELCS)		ML	VI	RANK
	Describe the things found in the surroundings;	65.00	M	2
17	Relate the importance of surroundings to people andother living things;	45.00	NeM	6
18	Communicate how different types of weather affect activities in the community;	46.67	NeM	4
	Describe sources of light and sound, heat and electricity;	70.00	M	1
19	Enumerate and practice safety and precautionary measures in dealing with different types of weather	56.67	NeM	3
	Enumerate safety measures to avoid the harmful effects of the Sun's heat and light;	40.00	NeM	7
	Communicate how the natural objects in the sky affect daily activities;	30.00	LM	8
20	Describe the natural objects that are found in the sky during daytime and nighttime	46.00	NeM	5
AVERAGE MASTERY LEVEL		49.92	NeM	

Verbal Interpretation: 80 – 100% Highly Mastered (HM); 60 – 79% Mastered (M); 40 – 59%Nearly Mastered (NeM); 20 – 39% Least Mastered (LM); 0 – 19% Not Mastered (NoM)

Least Mastered Learning Competencies in Science of Grade 4 Starting from Quarter 1 to Quarter 4

The initial problem examined in this study involves determining the least mastered learning competencies in Science from Quarter 1 to Quarter 4. Findings were drawn from a teacher-made achievement test administered to Grade 4 learners.

The competencies identified as least mastered serve as the foundation for designing leveled instructional materials, specifically, competencies with mastery levels ranging from 0–19% (Not Mastered, NoM) and

20–39% (Least Mastered, LM).

Table 6
Least Mastered Competencies of Grade 4 in Quarter 1 of Science Subject

Most Essential Learning Competencies (MELCS)		ML	VI	RANK
1	Classify materials based on the ability to absorb water, float, sink, undergo decay	48.61	NeM	4
2	Describe changes in solid materials when they are bent, pressed, hammered, or cut;	50.00	NeM	2
3	Describe changes in properties of materials when exposed to certain conditions such as temperature or when mixed with other materials.	49.44	NeM	3
	Identify the effects of decaying materials on one`s health and safety	44.44	NeM	5
	Demonstrate proper disposal of waste according to the properties of its material	27.78	LM	6
4	Identify changes in materials whether useful or harmful to one's environment.	69.44	M	1
AVERAGE MASTERY LEVEL		48.29	NeM	

Verbal Interpretation: 80 – 100% Highly Mastered (HM); 60 – 79% Mastered (M); 40 – 59% Nearly Mastered (NeM); 20 – 39% Least Mastered (LM); 0 – 19% Not Mastered (NoM)

There is only one competency, "Demonstrate proper disposal of waste according to the properties of its material" (27.78%), ranked lowest, highlighting a critical gap in applying scientific knowledge to practical and environmental responsibility. The average mastery level of Grade 4 learners in Science for Quarter 1 is 48.29%, which falls under the category of Nearly Mastered (NeM), indicating that learners have acquired a partial understanding of the competencies assessed during this quarter.

In Quarter 1 of Grade 4, it was found that waste disposal as a learning competency was least mastered. Environmental responsibility is a recurring gap in science learning (Sasan & Sacramento, 2025). Whereas it requires project-based learning and reinforcement cycles (DepEd Module, 2023; Bloom's Mastery Learning, 1971). Furthermore, Bloom's approach promotes practical science applications, and mastery learning significantly enhances responsibility-based competencies (Guskey, 2005; Hussain & Suleman, 2016). Additionally, including students in community-based projects like recycling programs and garbage segregation helps improve their sense of accountability and practical application of principles. To assist students in developing consistent environmental behaviors, ongoing assistance is required.

The results of the teacher-made test for Grade 4 are presented in Table 7 below. The average mastery level of Grade 4 students in Science for Quarter 2 is 41.86%, which falls under the category of Nearly Mastered (NeM). This indicates that students have only gained a partial understanding of the competencies assessed during this quarter. Several competencies fell into the Least Mastered (LM) category, such as practicing habits to maintain a healthy body (30.00%), surveying animals and plants in the community (25.00%),

and explaining how the environment affects the life cycle of organisms (27.50%). Surveying local plants and their habitats was one ability that received a Not Mastered (NoM) rating of only 5.00%, indicating a significant deficiency in ecological observation and application abilities.

Table 7
Least Mastered Competencies of Grade 4 in Quarter 2 of Science Subject

	Most Essential Learning Competencies (MELCS)	ML	VI	RANK
	Identify the causes and treatment of diseases of the major organs.	40.00	Ne M	11
	Practice habits to maintain a healthy body	30.00	LM	13
5	Describe the main function of the major organs	45.00	Ne M	8.5
6	Explain that the major organs work together to ensure the body functions properly.	53.33	Ne M	3.5
	Make a survey of animals found in the community and their specific habitats	25.00	LM	15.5
7	Choose which animal to raise in a particular habitat	35.00	LM	12
	Compare body movements of animals in their habitat	50.00	Ne M	6.5
	Infer that body structures help animals adapt and survive in their particular habitat.	53.33	Ne M	3.5
	Survey plants found in the community and their specific habitats;	5.00	No M	17
	Choose which plants to grow in a particular habitat	25.00	LM	15.5
	Conduct investigation on the specialized structures of plants given varying environmental conditions: light, water, temperature, and soil type	42.50	Ne M	10
8	Identify the specialized structures of terrestrial and aquatic plants.	50.00	Ne M	6.5
9	Compare the stages in the life cycle of organisms.	60.00	M	2
10	Describe the effect of the environment on the life cycle of organisms.	27.50	LM	14
11	Describe some types of beneficial interactions among living things	51.67	Ne M	5
	Describe certain types of harmful interactions among living things.	45.00	Ne M	8.5
12	Describe the effects of interactions among organism in their environment.	73.33	M	1
AVERAGE MASTERY LEVEL		41.86	Ne M	

Verbal Interpretation: 80 – 100% Highly Mastered (HM); 60 – 79% Mastered (M); 40 – 59% Nearly Mastered (NeM); 20 – 39% Least Mastered (LM); 0 – 19% Not Mastered (NoM)

In Quarter 2, it was found that plant and animal surveys and habitat classification were the least mastered, whereas multi-grade teachers face challenges in teaching ecology topics due to limited resources (Galope, 2023). These competencies require fieldwork, as well as the development of analysis and synthesis skills, for learners to achieve mastery in ecological concepts. Additionally, mastery learning greatly supports ecological competencies through repeated exposure and guided practice (DepEd LRMDS, 2023; Bloom's Taxonomy; & Guskey, 2005). More importantly, community-based plant or animal surveys are recommended to improve learning and make concepts more relevant to learners' surroundings. Furthermore, integrating simple outdoor activities and observations can help learners better connect theoretical knowledge with real-life ecosystems. Providing continuous feedback and scaffolded tasks will also support learners in gradually improving their classification and analysis skills in ecology.

Below is the data for Table 8 that presents the mastery level of Grade 4 in Quarter 3. For the third quarter, Grade 4 students' average science mastery level was 43.01%, falling into the Nearly Mastered (NeM) category. This outcome suggests that students have a rudimentary grasp of the competencies evaluated this quarter. The findings revealed that there are two learning competencies, including practicing safety measures in physical activities and handling materials (32.50%) and describing the force exerted by magnets (32.50%), as Least Mastered, which highlight significant gaps in safety awareness and basic magnetism concepts.

Table 8
Least Mastered Competencies of Grade 4 in Quarter 3 of Science Subject

Most Essential Learning Competencies (MELCS)		**ML**	**VI**	**RANK**
	Practice safety measures in physical activities and proper handling of materials;	32.50	LM	5.5
13	Explain the effects of force applied to an object.	39.38	NeM	4
	Describe the force exerted by magnets	32.50	LM	5.5
14	Characterize magnetic force.	50.00	NeM	2
15	Describe how light, sound and heat travel.	47.22	NeM	7
	Describe ways to protect oneself from exposure to excessive light, heat, and sound.	45.00	NeM	3
16	Investigate properties and characteristics of light and sound	54.50	NeM	1
AVERAGE MASTERY LEVEL		43.01	NeM	

Verbal Interpretation: 80 – 100% Highly Mastered (HM); 60 – 79% Mastered (M); 40 – 59% Nearly Mastered (NeM); 20 – 39% Least Mastered (LM); 0 – 19% Not Mastered (NoM)

The overall findings in Quarter 3 are the weaknesses of the learners in safety measures and magnetism. According to Ares-Ferreirós et al. (2025), physics concepts like magnetism are difficult in multi-grade classrooms. Moreover, Abreu & Ruedas (2024) found that Grade 4 learners in General Santos City performed poorly in diagnostic tests across science topics, especially in competence involving force and magnetism. Additionally, a durable understanding of cross-cutting concepts, noting that learners often struggle with abstract topics like energy transfer and magnetism, without contextualized, inquiry-based approaches (DepEd MATATAG Curriculum shaping paper, 2023). The learning competencies assessed, for example," characterize magnetic force", "investigate properties of light and sound", fall under application and analysis levels, which are more demanding than recall. These low mastery levels suggest learners need differentiated instruction to bridge the gaps (Bloom's Taxonomy, Anderson & Krathwohl, 2001). Also, there is studies that show inquiry and experimentation significantly improve mastery of abstract science concepts, such as Halen (2015), who emphasizes that active investigation of light and sound properties enhances conceptual retention. A study by Dela Cruz (2021) highlighted that learners often struggle with force and energy concepts due to limited laboratory exposure and reliance on rote learning.

Below is Table 9 presenting the mastery level of Grade 4 in Quarter 4, whereas the overall average mastery level of Grade 4 learners in Science for Quarter 4 is 50.28%, which falls under the category of Nearly Mastered (NeM). This indicates that learners have acquired a partial understanding of the competencies assessed during this quarter, but consistent reinforcement is needed to achieve higher mastery.

There are competencies such as comparing and contrasting soil types (39.00%), explaining the use of water from different sources (37.00%), and using weather instruments to measure components (36.00%), which were rated as Least Mastered, indicating significant gaps in soil science, water resource applications, and practical weather measurement skills.

Table 9
Least Mastered Competencies of Grade 4 in Quarter 4 of Science Subject

Most Essential Learning Competencies (MELCS)		**ML**	**VI**	**RANK**
17	Compare and contrast the characteristics of different types of soil.	39.00	LM	11
18	Explain the use of water from different sources in the context of daily activities.	37.00	LM	12
	Describe the importance of the water cycle	60.00	M	3
	Infer the importance of water in daily activities	40.00	NeM	10
19	Trace and describe the importance of water cycle.	48.33	NeM	6
	Record in a chart the weather conditions.	70.00	M	2
	Make simple interpretations about the weather as recorded in the weather chart.	45.00	NeM	8
20	Use weather instruments to measure the different weather components in a weather chart	36.00	LM	13

21	Identify safety precautions during different weather conditions.	45.00	NeM	8
22	Describe the changes in the position and length of shadows in the surroundings as the position of the Sun changes.	55.00	NeM	4.5
	Describe the role of the Sun in the water cycle;	45.00	NeM	8
	Describe the role of the Sun to living things	55.00	NeM	4.5
23	Describe the effects of the Sun to living things.	78.33	M	1
AVERAGE MASTERY LEVEL		50.28	NeM	

Verbal Interpretation: 80 – 100% Highly Mastered (HM); 60 – 79% Mastered (M); 40 – 59% Nearly Mastered (NeM); 20 – 39% Least Mastered (LM); 0 – 19% Not Mastered (NoM)

Based on Piaget's theory, it emphasizes that learners struggle with abstract concepts like the water cycle or soil properties, consistent with Piaget's notion that abstraction develops gradually (Piaget, 1972). In the DepEd MATATAG Curriculum, it highlighted the need for recalibrated science instruction to strengthen durable understanding and contextual application concepts. From the 2019-2020 curriculum review, it was found that similar gaps in mastery of tool-based and abstract competencies exist, urging integration of inquiry-based learning (Department of Education, 2023). Additionally, Cruz & Oducado (2021) found that Filipino learners often show higher mastery in competencies linked to everyday experiences but lower performance in tasks requiring scientific instruments or abstract reasoning. And studies in Southeast Asia, confirmed that science achievement correlates with experiential learning opportunities, whereas learners exposed to real-life applications, such as observing shadows and recording weather, outperform those taught abstractly (Nguyen, 2020; Tan, 2021). This supports the recent findings and mirrors the LM scores in weather instruments and soil comparison. Moreover, there are empirical studies found that mastery gaps in science are linked to limited access to laboratory tools and contextualized materials, especially in rural schools (Garcia & Villanueva, 2020).

Development of Levelled Instructional Materials

The second specific problem in this study is the development of levelled instructional materials based on the least-mastery learning competencies in Science 3 and 4 from Quarter 1 to Quarter 4 at Mama Mary Learning Center, Inc. These instructional materials will serve as an intervention tool to increase learners' scientific literacy across the learning competencies. This levelled instructional material is a teacher's guide meant to facilitate teaching on the least mastered learning competencies during the conduct of the intervention to help the scientific literacy of the learners in the subject. Supporting this design of LIM's, Smale-Jacobse, Meijer, Helms-Lorenz, & Maulana (2019) conducted a review showing that DI improves student outcomes when materials are leveled and contextualized. Moreover, in a multi-grade setting, cross-age tutoring fosters both academic and social development, and collaborative inquiry in science improves engagement and mastery. (Mulryan-Kyne, 2014; Tiernan, Casserly, & Maguire, 2018). Additionally, Yeo et al. (2020) demonstrated that visual ensembles (pictures, diagrams, videos) enhance comprehension of abstract science concepts.

This learner-centered tool uses a RE-ACT framework, which stands for Relate, Engage, Analyze, Create, and Transform. This framework accommodates the needs, challenges, and difficulties encountered by learners in their studies. The part of RELATE intends to recall and bridge the previous competency with

the current competency. The part ENGAGE intends to introduce the topic in a motivational activity. The part ANALYZE is simplified and comprehensive content of the lesson. The part of the CREATE offers hands-on activities for the learners as a formative assessment. And the part of TRANSFORM explains the importance of studying the lesson in everyday life. This tool also includes vocabulary building to help learners overcome difficulty understanding the subject due to unfamiliar terminology.

The topics prepared in these resource materials are based on data gathered on the least mastered learning competencies in sciences 3 and 4 from Quarter 1 and Quarter 4. These levelled instructional materials are intended for intervention activities and programs of the school and should not be used by the teachers as the main strategy for teaching, and they should only be used for learners or classes who failed to meet the expected mastered learning competencies. The main goal is to build the mastery level of the learners in scientific literacy or academic performance.

Curricular Validation of Levelled Instructional Materials

This is the third specific problem identified in this study, resulting from curricular validation. This process involved a thorough evaluation of the instructional materials' alignment with existing curriculum standards and their potential through LRDMS Tools to enhance learner understanding of specific concepts. This shows that content, adequacy, appropriateness, and usefulness should be considered in assessing learning materials.

Table 10
Result of the Curricular Validation along Content as Factor 1

Content	WM	VI
1. Content is suitable to the student's level of development.	4.0	VS
2. Material contributes to the achievement of specific objectives of the subject area and grade/year level for which it is intended.	4.0	VS
3. Material provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing, inquiry, problem solving, etc.	4.0	VS
4.Material is free of ideological, cultural, religious, racial, and gender biases and prejudices.	4.0	VS
5. Material enhances the development of desirable values and traits such as:	2.77	S/NA
5.1 Pride in being a Filipino	2.4	P
5.2 Scientific attitude and reasoning	3.2	S/NA
5.3 Desire for excellence	2.4	P
5.4 Love for country	2.8	S/NA
5.5 Helpfulness/Teamwork/Cooperation	2.8	S/NA
5.6 Unity	2.8	S/NA
5.7 Desire to learn new things	3.6	VS
5.8 Honesty and trustworthiness	2.8	S/NA
5.9 Ability to know right from wrong	3.2	S/NA
5.10 Respect	2.8	S/NA
5.11 Critical and creative thinking	2.8	S/NA

5.12 Productive work	2.8	S/NA
5.13 Other: (Please specify)	1.6	P
6. Material has the potential to arouse the interest of the target reader	4.0	VS
7. Adequate warning/cautionary notes are provided in topics and activities where safety and health are of concern.	4.0	VS
TOTAL POINTS:	26.77	PASSED
AVM	3.82	VS

Legend: *Very Satisfactory (VS) (4.00 – 3.50); Satisfactory / Needs Adjustment (S/NA) (3.49 – 2.50); Poor (2.49 – 1.50); Not Satisfactory (1.49 – 1.00)*

Based on Table 10 on Page 61-62, the curricular validation results show that the levelled instructional materials are generally *Very Satisfactory* (VS), with 3.82 as the average mean, in terms of content suitability, objectives alignment, cognitive skills development, bias-free presentation, and reader interest, but require improvement in the area of values formation. In the first indicator, "*Content is suitable to the student's level of development"* is very satisfactory, with a weighted mean of 4.0, indicating strong curricular alignment and high acceptability. It shows that the levelled instructional material is highly appropriate for the learners' developmental stage. It is neither too advanced nor too simplistic, as Piaget's theory of cognitive development suggests; instructional materials must align with learners' developmental stage to maximize comprehension and engagement. Also, in Indicator 2, "*Material contributes to the achievement of specific objectives of the subject area and grade/year level for which it is intended"* indicating that the instructional material is highly aligned with the curriculum standards and learning competencies prescribed for the grade/ year level, which ensures that lessons are not only appropriate but also purposeful, directly supporting the intended outcomes of Science as subject. Then, in Indicator 3 "*Material provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing, inquiry, problem solving, etc*.", with 4.0 as the weighted mean, and this Very Satisfactory rating shows that the instructional material is highly effective in fostering higher-order cognitive skills. Instead than being restricted to rote memory, learners are encouraged to participate in activities that foster evaluation, synthesis, and analysis. With 4.0 as the weighted mean for Indicator 4, "Material is free of ideological, cultural, religious, racial, and gender biases and prejudices," this Very Satisfactory indicates that this levelled instructional material exhibits neutrality, inclusivity, and fairness, avoiding discriminatory language, stereotypes, or any biased perspectives, ensuring that it respects. Indicator 5, "Material enhances the development of desirable values and traits," received the lowest overall rating (2.77) when compared to the other indicators. This indicates that although the material is academically sound, its integration of values and affective learning outcomes is inconsistent and underdeveloped. Furthermore, Indicator 6, "Material has the potential to arouse the interest of the target reader," has a very satisfactory score of 4.0, indicating that the levelled instructional material is highly motivating and engaging for students. It also shows that the content is presented in a way that draws students in, piques their curiosity, and promotes active participation. Last but not least, Indicator 7, "Adequate warning/cautionary notes are provided in topics and activities where safety and health are of concern," has a rating of 4.0, which is extremely satisfactory. This indicates that the instructional material exhibits responsible and ethical design, ensuring that the learners are guided in both safe practice and knowledge acquisition. However, Aguelo (2024) found that contextualized materials in the mother tongue (Bikol Central) significantly improved learner engagement and values awareness. Additionally, Anzures (2022) reported that validated instructional materials were rated "Highly

Acceptable" in format and activities, but emphasized the need for continuous revision to strengthen affective and values-based outcomes. In support of Ornstein & Hunkins (2018) argue that curriculum effectiveness depends on alignment between objectives, content, and assessment. The material's contribution to objectives strengthens its validity as a teaching resource.

Table 11
Result of the Curricular Validation along Format as Factor 2

Format	WM	VI
1. Prints:		
1.1 Size of letters is appropriate to the intended user.	3.3	S/NA
1.2 Spaces between letters and words facilitate reading.	4.0	VS
1.3 Font is easy to read.	4.0	VS
1.4 Printing is of good quality (i.e., no broken letters, even density, correct alignment, properly placed screen registration).	3.3	S/NA
2. Illustrations		
2.1 Simple and easily recognizable.	3.3	S/NA
2.2 Clarify and supplement the text.	4.0	VS
2.3 Properly labelled or captioned (if applicable).	3.3	S/NA
2.4 Realistic / appropriate colors.	3.3	S/NA
2.5 Attractive and appealing.	3.3	S/NA
2.6 Culturally relevant.	4.0	VS
3. Design and Layout		
3.1 Attractive and pleasing to look at.	4.0	VS
3.2 Simple (i.e., does not distract the attention of the reader).	3.3	S/NA
3.3 Adequate illustration in relation to text.	4.0	VS
3.4 Harmonious blending of elements (e.g., illustrations and text).	3.1	S/NA
4. Paper and Binding		
4.1 Paper used contributes to easy reading.	3.3	S/NA
4.2 Durable binding to withstand frequent use.	4.0	VS
5. Size and Weight of Resource		
5.1 Easy to handle.	3.3	S/NA
5.2 Relatively light.	3.3	S/NA
TOTAL POINTS:	64.1	PASSED
AVM	3.56	VS

Legend: *Very Satisfactory (VS) (4.00 – 3.50); Satisfactory / Needs Adjustment (S/NA) (3.49 – 2.50); Poor (2.49 – 1.50); Not Satisfactory (1.49 – 1.00)*

Table 11 on Page 65 shows the results of the validation of the levelled instructional materials in Factor 2: Format. The overall format of the levelled instructional materials was rated *Very Satisfactory overall (AVM = 3.56).* Under Prints, the first indicator, "*Size of letters is appropriate to the intended user*." As Satisfactory/ Need Adjustment with a 3.3 weighted mean, it shows that the material is appropriate for learners, though slightly below the highest rating, which suggests a minor adjustment for readabilityIt

scores highly for space/font with a weighted mean of 4.0. This tells us that great spacing allows for better fluency when reading and less eye strain as well as fonts that are very readable allowing for accessibility and understanding. Scoring decent for print quality with a weighted mean of 3.3 tells us that it is acceptable but can be improved upon to help reach consistency with alignment and density.

When it comes to simplicity/recognition, labeling/captioning, and colors of the illustrations, 3.3 is its weighted average which is satisfactory. Satisfactory meaning that the illustrations show adequacy however lacks some detail and needs more work to be clear. Furthermore, the images can be considered moderately effective but can have more effort to catch the attention of learners. However, when talking about clarity of illustrations, supplemental text, and cultural relevance of the illustrations, it has a score of 4.0. With 4.0 being very satisfactory showing that the illustrations have a strong connection and understanding with the students. With regards to the design and layout of the material, attractiveness and pleasing design of materials, and adequate illustrations to support text it has a 4.0 as a weighted average. Which is very satisfactory meaning that the overall LEveled INstructional MATERIAL(Picture) is pleasing to the eye and meshes well together. Although, simplicity/harmony of elements got scores of 3.3 and 3.1 respectively showing that some materials may cause distractions to learners and could use improvement to blend well with text.

However, this substance has a great resilience that guarantees endurance when it comes to paper and binding, earning a score of 4.0, which is extremely satisfactory. Higher-quality paper could increase usability; its paper readability score of 3.3 indicates that it is somewhat supportive. The leveled instructional materials, on the other hand, are lightweight and easy to handle; their Need Adjustment score of 3.3 indicates that they are manageable but ideal for portability. The contents must be useful in order to guarantee the module's comfort and ease of use, but they should also be enhanced with more lucid graphics and ergonomic modifications. This is consistent with Care et al. (2015), who highlighted the use of clear typefaces and spacing in the content to enhance comprehension. Effective images also improve learning when they make text easier to understand, but bad labeling lessens their effectiveness (Clark & Mayer, 2016). Additionally, learners' involvement and values formation are enhanced by materials that are contextualized to their culture (Aguelo, 2024). Additionally, Anzures (2022) notes that educational materials must not only endure regular use but also remain manageable. Valiente and Andeng (2021) emphasize that keeping student focus requires a harmonic blending of text and graphics. When considered collectively, these results indicate that in order to complement the materials' durability and guarantee comprehensive usability, changes should give priority to visual clarity and cultural significance.

Table 12

Result of the Curricular Validation, along with Presentation and Organization as Factor 3

Presentation and Organization	WM	VI
1. Presentation is engaging, interesting, and understandable.	4.0	VS
2. There is logical and smooth flow of ideas.	4.0	VS
3. Vocabulary level is adapted to target reader's likely experience and level of understanding.	3.3	S/NA
4. Length of sentences is suited to the comprehension level of the target reader.	3.1	S/NA
5. Sentences and paragraph structures are varied and interesting to the target reader.	3.3	S/NA

TOTAL POINTS:	17.7	PASSED
AVM	3.54	VS

Legend: *Very Satisfactory (VS) (4.00 – 3.50); Satisfactory / Needs Adjustment (S/NA) (3.49 – 2.50); Poor (2.49 – 1.50); Not Satisfactory (1.49 – 1.00)*

The organization and presentation of the instructional content were scored as Very Satisfactory overall (AVM = 3.54), as shown in Table 12 on pages 67–68. This indicates that while the materials are usually understandable, interesting, and logically organized, they still need to be improved in terms of sentence design and language adaption to better meet the comprehension levels of learners. According to Francis (2012), who highlights that effective presenting techniques boost student performance in big classrooms, the presentation is captivating, fascinating, and comprehensible (WM = 4.0, VS), while the students find the content appealing and simple to follow and participate. Similarly, the content is well-sequenced, avoiding abrupt transitions, which guarantees coherence and comprehension, as indicated by the logical and smooth flow of ideas (WM = 4.0, VS). According to Barroga & Matanguihan (2021), coherence and clarity in academic writing depend on logical flow. It is tailored to the intended reader in terms of vocabulary level (WM = 3.3, S/NA). This indicates that while the language used in the text is somewhat adequate, it may contain terms that are unfamiliar to learners. This is in line with Nation's (2001) contention that vocabulary control is essential to reading comprehension and needs to be carefully tailored to students' competence levels. More importantly, to make the tiered instructional material accessible, it should be adjusted to the learner's level.

It is consistent with Zeng et al. (2025), who emphasize that effective comprehension requires vocabulary training to be adapted to learners' developmental stage. Additionally, the sentence length is appropriate for the comprehension level (WM = 3.1, S/NA), which indicates that sentences are occasionally overly complicated and impede learners' comprehension. Shorter sentences make it easier to read. Sentence complexity has a direct impact on reading comprehension, particularly for younger students, according to Shanahan (2025). Additionally, the sentence and paragraph structures were fascinating and varied (WM = 3.3, S/NA), indicating that the leveled educational materials' structures are somewhat diverse but might be more dynamic. While McCombes (2022) emphasizes that coherent and varied paragraph forms improve academic writing and reader engagement, this variation avoids monotony and maintains interest.

Table 13
Result of the Curricular Validation along with the Accuracy and Up-to-datedness of Information as a Factor 4

Accuracy and Up-to-datedness of Information	WM	VI
1. Conceptual errors.	4.0	Not Present
2. Factual errors.	4.0	Not Present
3. Grammatical errors.	3.3	Present but very minor & must be fixed
4. Computational errors.	4.0	Not Present
5. Obsolete information.	4.0	Not Present

6. Typographical and other minor errors (e.g., inappropriate or unclear illustrations, missing labels, wrong captions, etc.).	4.0	Not Present
TOTAL POINTS:	23.3	PASSED
AVM	3.88	*Not Present*

Legend: Not Present (4.00 – 3.50); Present but very minor & must be fixed(3.49 – 2.50); Present & requires major redevelopment (2.49 – 1.50) Poor – Do not evaluate further(1.49 – 1.00)

The findings of the curricular validation are displayed in Table 13 on page 70, along with the information's accuracy and timeliness as evaluation criteria. Conceptual Errors (WM = 4.0, Not Present): The absence of conceptual errors indicates that ideas and principles are accurately represented in the content. Cosido et al. (2025), who stress that contextualized instructional materials must avoid conceptual errors to maintain alignment with curriculum standards, provide support for it. Furthermore, Factual Errors (WM = 4.0, Not Present), indicating that no factual errors were discovered, guaranteeing that students receive reliable knowledge. It is consistent with Narciss & Alemdag (2025), who emphasize the importance of factual correctness in fostering learner confidence and avoiding misunderstandings. Grammatical Errors (WM = 3.3, Present but Minor), on the other hand, indicate that there were a few minor grammatical errors that could have an impact on readability but are readily fixed.According to Fitrawati & Safitri (2021), verb tenses and subject-verb agreement are prevalent problems in student writing, demonstrating the prevalence of grammatical faults in instructional texts. Additionally, grammatical and vocabulary mistakes were noted by Isma et al. (2023) as obstacles to the clarity of educational materials. Additionally, computational errors (WM = 4.0, Not Present) indicate that there are no computational errors in the materials, guaranteeing mathematical accuracy in line with Nelson & Powell's (2017) observation that while computational errors frequently occur in student work, their absence in validated materials indicates strong quality control.

Similarly, In a similar vein, the indicator for obsolete information (WM = 4.0, Not Present) is supported by Ferma (2024), who cautions that out-of-date curricula impede learners' readiness for contemporary challenges, highlighting the significance of current content. However, typographical and minor errors (WM = 4.0, Not Present) indicate that there are no labeling or typographical errors, guaranteeing that the captions and drawings are clear. According to Anzures (2022), verified papers with a "Highly Acceptable" rating frequently exhibit few typographical errors, indicating meticulous editing.

Lived Experiences and Challenges Met by Teachers Handling a Multigrade

Table 14 below shows the thematic analysis of the lived experiences and challenges encountered in handling multigrade classrooms. This is the third specific problem in this study, which is the lived experiences and challenges met by teachers handling a multigrade setup.

Individualization and Differentiation

According to Recla & Potane (2023), these strategies provide a unique way to cater to the students' individual needs and abilities while simultaneously doing activities. Since teachers are handling a multigrade set-up, differentiation and individualization are the most crucial strategies in a multigrade teaching, as they address the diverse learning needs and paces of students towards different grade levels in a single room. However, these two are seen as challenges for multigrade teachers due to the complexities of catering to the diversity of students simultaneously.

Based on the law, Republic Act, 2013, the Department of Education (DepEd) has responded to the diversity of learners by institutionalizing differentiated instruction (DI) as a core pedagogical strategy

through K to 12 Basic Education. According to the study of Tomlinson, DI involves tailoring content, process, and assessment to learners' readiness levels, interests, and learning profiles (Tomlinson, 2014; Tomlinson & Imbeau, 2023). In the underexplored context of Philippine multigrade classrooms, effective DI rests on three interconnected pillars: instructional planning, instructional delivery, and classroom management. (Bunga, J. B., etc., 2025). As shared by the participants:

Table 14
Thematic Analysis of Lived Experiences and Challenges in terms of Individualization and Differentiation

Themes	Responses
Individualization and Differentiation	"Grade 1 and Grade 2 are still developing foundation skills, especially Grade 1 pupils, who are just beginning to read, while Grade 2 pupils are already expected to comprehend short texts and stories. The biggest challenge I encountered is the wide gap in readiness. Since it's a new setup for me, I have hardly adjusted to this kind of teaching. It is supposed to be a constant one-on-one support, but with limited time, it's really difficult to give equal attention. Every day I need to prepare differentiated activities for both Grade 1 and 2, but sometimes it is not usually followed." (Teacher 1) "One of the challenges that I have experienced as a Grade 3 and 4 teacher, "sobrang puyat," I mean, in preparing differentiated activities, which is so demanding, multiple versions of the same lesson, which is really time-consuming. Individualization is hindered by the pressure to cover up curriculum requirements while still addressing slower learners. Sometimes, I had encountered non-readers, and I really need to adjust so he can keep up with the lesson". (Teacher 2) *"Andaming challenges, hahaha, so first is the maturity differences. My Grade 5 learners depend heavily on teacher guidance, while Grade 6 learners are preparing for independence. It becomes difficult when some students finish early, and others lag. Some students are too lazy to do activities and are always absent, so many activities are not done. Second, I had used printed books, but it is limited. Third, large class sizes make individualized attention harder." (Teacher 3)*

Additionally, Shareefa, Mariyam. (2020) examined teachers with differentiated instruction in a small multigrade school in the Maldives. It found that DI was widely practiced and yielded significant benefits for students' academic progress and psychosocial development. According to the study of Goodnough (2018), requiring personalized attention and tailored learning plans for each student as a way to compound the challenges they've met in individualization, which is particularly challenging in larger classes where the teacher-to-student ratio is high. Therefore, continuously assessing and providing feedback to students at different levels can be overwhelming, further complicating the teaching process (Gaitas & Alves, 2017).

Time Management

Table 15 below shows the thematic analysis of the lived experiences and challenges encountered in handling multigrade classrooms in terms of time management.

Defined by Galope, L.J (2024), this involves the process of planning and organizing how much time you allocate to specific activities in order to maximize efficiency and productivity. Lack of time management is one of the main issues teachers have when teaching multigrade classes (Naparan and Alinsug, 2021). In setting priorities, multigrade teachers face difficulties in class instruction due to time limits and curriculum demands. According to Naparan, G. & Alinsug, M. (2021), they've identified that lack of time management is a major issue in multigrade teaching in Philippine schools, where teachers struggle to set priorities due to curriculum demands. As shared by the participants:

Table 15
Thematic Analysis of Lived Experiences and Challenges in terms of Time Management

Themes	Responses
Time Management	"Since I live in Ocampo, I need to wake up very early to travel, and there are days when I arrive at school by 9, even though I am expected to be at the center by 7:30. It's hard to maximize time, especially when there are topics that aren't discussed in Grades 1 and 2. I sometimes have to send activities to another teacher to cover for me when I am not present, but this requires extra effort to ensure that instructions are clear and that learning objectives are met. " (Teacher 1). "As a Grades 3 and 4 teacher, I face constant challenges in managing time while meeting the Most Essential Learning Competencies (MELCs). Balancing the reinforcement needed in Grade 3 with more advanced lessons in Grade 4 often leads to uneven pacing and lost instructional minutes. Mostly, I write the lesson on the board, so it's very time-consuming because technological advancement is still lacking." (Teacher 2) "Balancing Grade 5 and 6 within a limited time makes it difficult to sustain mastery across both grade levels. It is so challenging to handle overlapping responsibilities without rushing." (Teacher 3)

Additionally, Lawat, D. G. C. (2025) found that teachers face difficulties in time management, classroom organization, and workload in Calanasan, Apayao, but they also employ strategies like peer-assisted learning and structured routines. In Lanao del Norte, it was reported that multigrade teachers face time constraints, curricular alignment, and a lack of instructional materials. (Ruelan, M. C., & Ebisa, E., 2025). Globally, time management is a recurring issue, whereas teachers need to be adaptable and flexible to handle diverse learners (Ares-Ferreirós, M.,etc 2025). In a systematic review of the ASEAN Journal of Open and Distance Learning, it was highlighted that teachers face difficulties in balancing instructional time, preparing differentiated lessons, and managing workload (Potane, J. D., 2024). Thus, opportunities and coping mechanisms are important. In an in-depth exploration of teachers' strategies and challenges, it

was found that teachers employ planning, collaboration, and adaptability but still struggle with resource constraints and logistical difficulties (IMCC Journal of Science, 2024).

Classroom Dynamics

Understanding classroom management begins with an understanding of classroom dynamics. It is more on the students as the core of the classroom, the teacher's role, physical environment, and different external influences such as family, community, and cultural contexts (Llego, J. H., 2024). In a multigrade classroom, managing classroom dynamics can be challenging, particularly with the wide range of ages and abilities of learners in a single room. As shared by the participants in the interview that shows in Table 16:

Table 16
Thematic Analysis of Lived Experiences and Challenges of Multigrade Teachers in terms of Classroom Dynamics

Themes	Responses
Classroom Dynamics	"*I sometimes have to simplify lessons for Grade 1 while simultaneously extending activities for Grade 2, which really demands extra preparation and quick adjustments." (Teacher 1)* *"Grade 3 and 4 are quite emotional, I think I struggle a lot with their behaviour. If I don't notice them, my student will just cry. There's another student you just reprimanded, but still, he's already been reprimanded." (Teacher 2)* *"One common problem is the difference in maturity and learning pace of Grade 5 and Grade 6. (Teacher 3)*

According to Dy, K. G. (2024), in a multigrade classroom, the difficulty of managing classroom dynamics in multigrade settings suggested that differentiated instruction, collaborative learning, and flexible groupings were found to be effective but time-consuming. In addition, teachers reported challenges in managing classroom dynamics, particularly with behaviour management and balancing instructional strategies. Also, Iballa, J. R., etc. (2025) reported challenges in behavior management, balancing instructional strategies, and coping with diverse learner needs in one setting. It was revealed that teachers were overwhelmed in teaching students at different levels simultaneously, which led to burnout and exhaustion. It was supported by Naparan, G., & Alinsug, M. (2021), who identified time management and classroom dynamics as recurring issues in multigrade teaching. Furthermore, teachers struggle with balancing instructional strategies and behavior management in diverse classrooms, and one of the foundational global studies shows how multigrade classrooms demand flexible management of dynamics. (Little, A. W. (2006), Subban, P., & Sharma, U. (2020).

Professional Development and Support

Professional development and support involve acquiring new skills, knowledge, and credentials to advance careers through workshops, mentoring, and certifications, enhancing job performance. Different professional development activities, both inside and outside of the schools, directly improve classroom management, instructional planning, and teaching competencies (Padillo, G. G., Manguilimotan, R. P., Capuno, R. G., & Espina, R. C., 2021). The importance of continuous training and mentoring for

multigrade teachers to cope with diverse classroom dynamics (Lawat, D. G. C., 2025). However, multigrade classrooms often experience and highlight the issue of lacking professional development and training, as teachers often enter multigrade set-ups without adequate and efficient training and support. As participants shared in the following interview in Table 17:

Table 17
Thematic Analysis of Lived Experiences and Challenges in terms of Professional Development and Support

Themes	Responses
Professional Development and Support	*"In Mama Mary Learning Center, Inc, it lacks of training and seminars. There has been no notice from DepEd regarding professional development, which makes it difficult for us to update our skills and knowledge." (Teacher 1)* *"Our principal told us that there is a training for us, but it seems to be seasonal. We are told to wait a little longer before such opportunities become available." (Teacher 2)* *"Another struggle is that there is no adequate training designed for multigrade teachers. Since I'm new in this field, I often find myself needing to make significant adjustments to cope with the demands of handling multiple grade levels at once." (Teacher 3)*

In the results of the Teaching and Learning International Survey (TALIS) 2018, many teachers worldwide report insufficient access to professional development, especially in rural and disadvantaged schools (OECD, 2019**).** *T*). Supporting this, Naparan, G., & Alinsug, M. (2021) reported that teachers often enter multigrade classrooms without adequate training, which makes professional development crucial for effective teaching. And many countries struggle with inadequate professional development opportunities, especially in rural and multigrade contexts, leading to teacher burnout, reduced effectiveness, and leading to gaps in instructional quality. Because of teachers without adequate training, they struggle with lesson differentiation and classroom management (Crisostomo, M. A. (2019); Bacani, J. C. (2020); Villegas-Reimers, E. 2003). Furthermore, Schleicher, A. (2016) emphasized that countries with weak PD systems face challenges in teacher retention and instructional quality. In Mama Mary Learning Center, teachers have also experienced handling multi-grade class as their first time. In Calanasan, Apayao, many teachers in multigrade schools are first-time handlers of such classes and face difficulties in classroom management and instructional planning (Lawat, D. G. C., 2025). Globally, teachers are frequently assigned to multigrade classrooms without preparation and lack of structured professional development, making it one of the most challenging teaching contexts, forcing them to rely on self-adjustment when first exposed to multigrade teaching, leading to professional stress and reduced instructional effectiveness. (Little, A. W. (2006); Komba, W. L. M., & Nkumbi, E. (2008); Villegas-Reimers, E. (2003).

Strategic Planning and Preparation

It is important to address these different challenges for strengthening multi-grade teaching. Strategic planning and preparation are a systematic process of setting long-term goals, determining the activities

needed to achieve the set goals, and allocating the necessary resources to execute the actions effectively (Galope, L. J., 2024). All participants have shared the same coping strategies in teaching a multigrade classroom. The following are the participants' views, which are shown in Table 18:

Table 18
Thematic Analysis of Coping Strategies in Teaching a Multigrade Classroom

Themes	Responses
Strategic Planning and Preparation	*" I coped by planning ahead of time. Specifically, preparing lesson instructional materials and Individualized Learning Plans, which really helps me to monitor their progress, portray personalized goals, and give aimed support where needed." (T1)* *" I had to prepare using differentiated instruction to tailor my lessons and activities to meet the learning needs of Grades 3 and 4. I use collaboration and peer learning, whereas it encourage learners to help and mentor younger students by older ones. (T2)* *"In Grades 5 and 6, I will give an activity that aligns competencies across both levels, and I will design group work where mixed-grade collaboration fosters peer learning. (T3)*

The study of Castro, M. J. S. (2024) emphasized that effective preparation and tailored teaching techniques, such as whole-class teaching, group teaching, and differentiated instruction, are necessary for success in a multigrade set-up. Establishing clear routines, planning, and preparation, using differentiated instruction and collaborative learning to manage diverse groups effectively. Also, coherence and preparation in instructional planning are key to effective teaching outcomes (Gaberza, J. (2023); DELED Institute (2024); Desimone, L. M. (2009). Furthermore, Darling-Hammond, L., et al. (2017) found that strategic planning, collaboration, and active learning lead to improved classroom practices. In selected schools in Palawan, it was found that multigrade teachers rely heavily on planning and curriculum delivery strategies, including parental involvement, to manage diverse learners (Dulana, A., Dacanay, R. T., & Perez, D. R. ,2023). Moreover, Guskey, T. R. (2002) stressed that strategic preparation and planning are necessary for teachers to translate professional development.

Chapter 4
SUMMARY, FINDINGS. CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary of the preceding chapters and their findings. The investigation of the least mastered learning competencies in Science for Grades 3 and 4 learners at Mama Mary Learning Center, Inc. (SY 2025–2026), leading to the development and validation of leveled instructional materials (LIMs). The researcher formulated the recommendation drawn from the conclusions.

Summary

This study aimed to investigate the least mastered learning competencies in Science for Grades 3 and 4 learners at Mama Mary Learning Center, Inc. (SY 2025–2026), leading to the development and validation of leveled instructional materials (LIMs) by using a descriptive-evaluative design. Specifically, this

research sought to answer the following questions:1.) What are the least mastered competencies in science 3 and 4?; 2.) What levelled instructional materials can be developed? 3. What are the results of the curriculum validations of the materials? 4. What are the lived experiences and challenges met by teachers handling multigrade classrooms? The data were gathered through teacher-made achievement tests, focus group discussions, and curricular validation using the DepEd LRMDS tool. Respondents included 28 learners, 3 teachers, and 10 evaluators. The study also followed three phases: *Preliminary Phase* – identification of the least mastered competencies through teacher-made tests; *Developmental Phase* – preparation of LIMs using the RE-ACT framework (Relate, Engage, Analyze, Create, Transform); and *Validation Phase* – curricular validation by experts and teachers. The results showed that learners struggled with competencies in classification of matter, heredity, motion, astronomy, ecology, magnetism, and environmental responsibility. Curricular validation confirmed that the LIMs were Very Satisfactory overall, excelling in content suitability, format, presentation, organization, and accuracy, but requiring improvement in values integration and minor grammatical refinements.

Findings

The study yielded the following salient findings:

1. There are eight (9) identified least mastered learning competencies of Grade 3 from Quarter 1 to Quarter 4, based on the item analysis and computed performance level of the respondents, were the following: *Classify objects and materials as solid, liquid, and gas* (37.27%, LM); *Describe ways on the proper use and handling of solid, liquid, and gas* (35.00%, LM); *Classify animals according to body parts and use* (35%, LM); *Identify observable characteristics passed on from parents to offspring* (35%, LM); *Identify basic needs of humans, plants, and animals* (30%, LM); *Describe movements of objects* (37.50%, LM); *Describe position of objects in relation to reference points* (35.45%, LM); *Describe sources of light, sound, heat, and electricity* (37.50%, LM) and *Communicate how natural objects in the sky affect daily activities* (30%, LM). While in Grade 4, there are eleven (11) identified least mastered learning competencies, including the following: *Demonstrate proper disposal of waste according to properties of its material* (27.78%, LM); *Practice habits to maintain a healthy body* (30%, LM); *Survey animals in the community and habitats* (25%, LM); *Choose plants to grow in a habitat* (25%, LM); *Describe effect of environment on life cycle of organisms* (27.50%, LM); *Survey plants in the community and habitats* (5%, NoM); *Practice safety measures in physical activities and handling materials* (32.50%, LM); *Describe force exerted by magnets* (32.50%, LM); *Compare and contrast soil types* (39%, LM); *Explain use of water from different sources* (37%, LM); and *Use weather instruments to measure components* (36%, LM). There are the least mastered learning competencies in every quarter for both Grade 3 and Grade 4, showing recurring gaps in abstract science concepts and practical applications.
2. Based on the identified least learned competencies, the leveled instructional materials (LIMs) were developed as targeted intervention tools to address the least mastered science competencies of Grades 3 and 4 learners. As a teacher's guide, LIMs were organized according to the RE-ACT framework (Relate, Engage, Analyze, Create, and Transform). Instead of acting as the primary teaching method, the LIMs offer scaffolded support, guaranteeing that students who have difficulty mastering the material receive more reinforcement. Differentiated instruction, collaborative inquiry, and multimodal methodologies served as the foundation for these leveled teaching resources. Smale-Jacobse et al. (2019), Mulryan-Kyne (2014), Tiernan et al. (2018), and Yeo et al. (2020) provide evidence that

balanced, contextualized, and visually enriched resources enhance comprehension and engagement. The levelled instructional materials for Grades 3 and 4 received the following results from the curricular validation: Factor 1 is the Content, which scored 3.82 or Very Satisfactory with a total score of 26.77 (PASSED); Factor 2 is the Format, which scored 3.56 or Very Satisfactory with a total score of 64.1 (PASSED); Factor 3 is the Presentation and Organization, which scored 3.54 or Very Satisfactory with a total score of 17.7 (PASSED); and Factor 4 is the Accuracy and Up-to-date, which scored 3.88 or Not Present with a total score of 23.3 (PASSED).

3. Individualization, time management, classroom dynamics, professional development, and strategic planning are among the real-world experiences and difficulties faced by educators working in multigrade classes. Teachers highlighted how challenging it is to differentiate instruction for a wide range of students across grade levels, frequently creating several iterations of the same task while finding it impossible to fulfill curriculum requirements. Another significant problem was time management, as teachers had to juggle conflicting duties, a shortage of instructional time, and practical limitations like travel and a lack of technology. Additionally, handling different age levels, behaviors, and learning speeds was difficult due to classroom dynamics, which frequently resulted in fatigue and burnout. Then, it was discovered that there were insufficient possibilities for professional development, which left teachers dependent on self-adjustment and ill-prepared for multigrade settings. In order to manage varied learners, teachers at Mama Mary Learning Center, Inc. used coping mechanisms like advanced planning, differentiated instruction, peer-assisted learning, and cooperative group work.

Conclusions

Based on the findings, the following conclusions were drawn:

1. Grades 3 and 4 learners consistently demonstrated the least mastered competencies across all quarters, particularly in abstract concepts such as classification of matter, heredity, motion, astronomy, and practical, tool-based applications such as waste disposal, ecology surveys, magnetism, soil science, and weather instruments.
2. The development of levelled instructional materials (LIMs) using the RE-ACT framework provided a structured, learner-centered intervention that addressed identified weaknesses. This is based on the identified least learned competencies of Grades 3 and 4 from Quarter 1 to Quarter 4.
3. The validation results confirmed that the levelled instructional materials (LIMs) were Very Satisfactory in terms of content, format, presentation, organization, and accuracy and up-to-datedness. While the materials passed all validation factors, minor refinements are needed in values integration and grammar to further enhance usability and alignment with holistic learning goals.
4. Mama Mary Learning Center, Inc', teachers' lived experiences revealed persistent challenges in individualization, time management, classroom dynamics, and lack of professional development. Then, it was discovered that there were insufficient possibilities for professional development, which left teachers dependent on self-adjustment and ill-prepared for multigrade settings. In order to manage varied learners, teachers at Mama Mary Learning Center, Inc. used coping mechanisms like advanced planning, differentiated instruction, peer-assisted learning, and cooperative group work.

Recommendations

In light of the findings and conclusions of the study, the following recommendations were drawn:

1. To reinforce the least learned competencies, especially in abstract and tool-based science ideas, teachers are advised to employ the leveled instructional materials (LIMs) as supplemental resources.
2. To integrate abstract ideas with practical applications, it is crucial that students participate in experiential and community-based science activities, such as ecology surveys and weather observations.
3. To maximize usability, curriculum creators must match instructional materials with developmental stages and multigrade contexts.
4. With an emphasis on differentiated instruction, classroom management, and contextualized science pedagogy, School Administrators and Policy Makers (DepEd) should offer ongoing professional development programs specifically designed for multigrade teaching. Replicate the study in different topic areas and grade levels for future researchers to confirm thethe efficacy of LIMs across disciplines as well as to repeat the study in different subject areas and grade levels to confirm the efficacy of LIMs across disciplines.