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Instruction of Mathematics Teachers Toward Numeracy Management Program

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Abstract: Numeracy education stands as a pivotal component of the educational landscape, necessitating attention from both administrators and teachers. To facilitate the ongoing improvement of teachers' numeracy instructional skills, it becomes imperative to confront the barriers hindering students' attainment of educational objectives. The purpose of the study was to evaluate the numeracy instruction provided by mathematics teachers, with an emphasis on its impact on curriculum and pedagogy enhancement. Additionally, it identified issues in the management of numeracy instruction, forming the foundation for forthcoming numeracy management initiatives targeting elementary school teachers. This study employed a researcher-developed questionnaire to conduct a descriptive survey involving 30 elementary mathematics teachers from Marawoy Elementary School. Utilizing statistical tools, specifically the mean, responses were meticulously analyzed, while issues concerning numeracy management instruction were methodically extracted and interpreted thematically. The study affirmed the robust alignment between teachers' knowledge content and pedagogical approaches with the diverse learning needs of their students. Notably, instructional materials, classroom management, and assessment techniques exhibited variation according to students' learning capabilities. Unfortunately, suboptimal Internet connectivity and limited access to learning resources only marginally supported the integration of technology in the teaching and learning processes. Consequently, the implementation of a numeracy management program was recommended to bridge instructional gaps among teachers in the domain of numeracy.

Keywords: Numeracy; Mathematic teacher; Instruction; Management skills; Numeracy management program

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1. Introduction

Education serves as the fundamental influencing factor of an individual's personal and professional development, making it an indispensable facet of learning across various domains. Numeracy stands out as one of the crucial areas of emphasis within education. A strong foundation in numeracy is vital for the holistic development of children and young individuals, enabling them to actively participate in education, reach their full potential, and contribute meaningfully to society [1].

In the context of the 21st century, the demand for globally competitive students navigating a swiftly changing landscape necessitates the acquisition of numeracy skills. Numeracy's pervasive role in our daily lives

has long established its position as a cornerstone of lifelong learning, essential for children's success within and beyond the conventional curriculum [2]. Furthermore, it fosters the growth of critical thinking and problem-solving capabilities.

Numeracy's significance extends to active participation in both educational institutions and broader societal contexts, equipping individuals to engage responsibly in unforeseen circumstances. Its relevance spans across the school, home, community, and future career, underpinning the success of those who demonstrate proficiency in this realm, particularly in this evolving world marked by technological advancements [3].

Effective management, on the other hand, is not just an opportunity but a challenge that confronts every leader overseeing an organization. It is a social process aimed at ensuring cooperation, participation, and the engagement of others in achieving defined objectives [4]. To effectively manage the available educational resources and achieve the national educational objectives, the educational manager or administrator must possess the necessary abilities and skills [5]. In the educational setting, management is pivotal for the delivery of quality education, involving meticulous planning, decision-making, and formulation of educational policies. This facet significantly influences the realization of educational goals and involves the control, regulation, and supervision of formal education systems [6]. It encompasses functions that support the attainment of educational objectives, making it an essential component [7].

Teachers, as key players in numeracy instruction, bear the responsibility of creating a conducive learning environment that fosters numeracy skills acquisition [8]. They must recognize and cater to the diverse learning styles of students, adapting their teaching to individual needs [9]. Additionally, teachers should provide targeted support to students struggling with numeracy, conducting assessments to gauge progress and offering constructive feedback to enhance performance [10].

However, it is a matter of concern that reading and numeracy skills among Filipino students have been declining [11], as indicated by international assessments such as the Programme for International Student Assessment (PISA, 2018) and Trends in International Mathematics and Science Study (TIMSS, 2019). Despite the implementation of the K-12 curriculum by the Philippine educational system, the majority of the schools had extremely low mean percentage scores (MPS) in mathematics. This highlights the urgency of addressing the quality of basic education in the Philippines and underlines the need to evaluate and enhance numeracy instruction for mathematics teachers. The researcher's motivation to uncover these instructional gaps has led to the aspiration for a numeracy management program that can uplift the standards of education.

2. Literature

Numeracy, beyond being a fundamental aspect of mathematics, is recognized as a crucial life skill, providing students with the foundational competence necessary for success in their educational journey and broader curriculum engagement [12]. This enduring significance of numeracy underscores the need to cultivate it from early childhood, playing a pivotal role in supporting children's achievements across various curricular and extracurricular activities [2]. Furthermore, adult literacy and lifelong learning, alongside continued education, are vital components within the framework of Internet-enabled education [13].

Teachers, in their role, incorporate their knowledge bases into diverse teaching activities. Research highlights that teachers' mathematical knowledge for teaching directly correlates with improved mathematics achievement among students in both the early and later grades, underlining the significance of this pedagogical knowledge [14,15]. The adoption of deductive teaching methods offers a direct and time-efficient approach. Effective teachers leverage their understanding of students' backgrounds, interests, and abilities to plan

instruction that caters to the diverse needs of learners [16,17].

Collaborative learning fosters enhanced productivity, stronger relationships, improved psychological well-being, refined social skills, and boosted self-esteem. Experiential learning empowers students by granting them more authority and responsibility, directly involving them in the learning process within their learning environment [18,19]. Teachers must possess comprehensive knowledge to effectively teach various facets, including feedback, handling mistakes, questioning techniques, and structuring lessons. Factors like motivation, humor, and opportunities for active learning also prove important [20].

To promote student progress, educators should explore diverse techniques when creating problem sets. Teachers, with their prior knowledge and strategic skills, can significantly influence students' proficiency in mathematical problem-solving [21]. Understanding the preferred learning methods of students guides teachers in devising multiple approaches to enhance students' mathematical performance. Student-centered learning promotes an active learning style, aligning learning programs with each student's unique learning pace [22,23].

Technological tools play a crucial role in the teaching and learning of mathematics, shaping both curriculum content and student learning experiences. However, the effective use of instructional technology hinges on factors such as computer availability and Internet connectivity. These factors significantly impact the quality of education schools can provide [24,25]. In the modern classroom, incorporating technology-enhanced elements fosters student engagement, concentration, and active learning [26]. The use of Google apps, for instance, encourages critical thinking and collaborative activities, aligning with the principles of mathematical practices [27].

The quality of instructional aids, such as textbooks, holds paramount importance in the improvement of instruction. It is not the physical structures of educational institutions but the quality of processes occurring within them that shape effective teaching and learning [28,29]. Manipulatives play a crucial role in enhancing conceptual understanding in mathematics by bridging formal and informal techniques and connecting tangible and abstract concepts [30,31]. Well-equipped schools, featuring educational facilities such as libraries and laboratories consistently perform better in standardized examinations [32].

Efficient assessment techniques that contribute to enhanced learning have long been advocated. Well-developed assessment methodologies positively impact students' achievement [33]. Pilot testing proves indispensable in conducting large-scale surveys, enhancing the reliability, validity, and practicability of the questionnaire [34]. Ensuring the reliability of assessments involves making sure that different test forms within a single administration are equivalent, that retests remain consistent with the original test, and that test difficulty remains constant over time. Challenges often arise when students struggle with mathematical terminology and its related concepts [35,36].

3. Research objectives

This study focused on the management of numeracy instruction by the mathematics teacher of Marawoy Elementary School for the school year 2022–2023. Specifically, it sought answers on the following research targets:

(1) Assess the level of management of numeracy instructions in terms of:
   (a) Content knowledge;
   (b) Pedagogical approaches;
   (c) ICT-related skills;
   (d) Classroom management;
   (e) Preparation of instructional materials;

(f) Preparation of assessment tools.

(2) Identify the issues in the management of numeracy instruction.

4. Research methods and procedures

4.1. Research design

In this study, a descriptive survey methodology was employed to assess the necessity of fostering a research-oriented culture among elementary education teachers. Descriptive research entails the examination of specific attributes of a given phenomenon through observation or the exploration of potential correlations between multiple phenomena [37]. This research design facilitated a comprehensive examination of the extent to which teachers incorporate various numeracy instruction methods in their mathematics teaching.

4.2. Respondents and sampling

A total of 30 mathematics teachers of Marawoy Elementary School were recruited as the respondents as they have experience in utilizing numeracy instruction. **Table 1** shows the tabulated presentation of the number of respondents in this study.

Table 1. Participants of the study

Grade level	Teacher
Kinder	5
Grade 1	7
Grade 2	5
Grade 3	7
Grade 4	3
Grade 5	2
Grade 6	1
Total	30

4.3. Data collection instrument

The primary data-gathering tool employed by the researcher for the teacher respondents was a questionnaire created specifically for this study. This questionnaire comprised statements related to numeracy management within the context of teachers' numeracy instruction. Moreover, it aimed to uncover issues surrounding the management of numeracy instruction. The development of these questionnaire items underwent a rigorous process that involved seeking input and expertise from various professionals to ensure accuracy and clarity. Several rounds of restructuring and revisions were carried out to enhance the questionnaire's comprehensibility to the respondents. Furthermore, valuable insights and recommendations from experts were considered, leading to the refinement of the questionnaire. The final version of the questionnaire was presented to a panel of experts for their comments, suggestions, and recommendations, which were duly incorporated.

4.4. Data collection

Following the preparation and finalization of the researcher-designed questionnaire, formal approval and support were sought from the Schools Division Office of Lipa City to conduct the study among thirty mathematics teachers at Marawoy Elementary School during the 2022–2023 school year. Upon obtaining

the necessary permission, the researcher personally approached the school principal to request authorization to administer the questionnaire to the respondents. The distribution and retrieval of the questionnaire were executed at the convenience of the respondents. Subsequently, the completed questionnaires were collected, collated, and tabulated for further analysis.

4.5. Data Analysis

In this study, the researcher employed descriptive research methods, which involve the systematic identification of attributes related to a specific phenomenon through observation or the exploration of potential correlation between multiple phenomena [38]. The collected data were meticulously tallied, tabulated, analyzed, and interpreted using descriptive statistics, particularly the mean, to gauge the extent to which various numeracy instruction approaches were utilized in mathematics teaching. Additionally, in the second part of the questionnaire, a thematic approach was adopted. An open-ended question was included to elicit valuable statements, elucidate their meanings and themes, describe the phenomenon, and provide insights. The responses obtained from the respondents underwent analysis and interpretation, involving the extraction of key themes and the segmentation of ideas.

4.6. Ethical considerations

Ethical principles were rigorously observed during the study. All necessary permits and consents were obtained from the respondents, and the researcher adhered to a strict oath of confidentiality. The data collected from the respondents were treated with the utmost confidentiality, ensuring the protection of their identities and interview responses from the public eye. The results of the interviews were used exclusively for this study, in line with the provisions of the Data Privacy Act of 2012.

5. Results and discussions

This section delves into the presentation of collected data along with the corresponding analysis and interpretation. The data is presented in an organized and sequential manner, addressing the questions posed at the outset of the study.

5.1. Numeracy instruction of teachers

5.1.1. Content knowledge

Content knowledge serves as the bedrock for understanding and effectively conveying a subject. **Table 2** exhibits the data retrieved from respondents regarding the content knowledge of numeracy instruction.

Table 2. Respondent's assessment of the numeracy instruction in terms of content knowledge

Item statement	Mean	Verbal interpretation
The school teachers...		
1. Have a deeper knowledge and understanding of the properties and relationships of numbers, as well as the different ways to represent numbers (e.g. fractions, decimals, percents).	3.67	Highly utilized
2. Have a deeper knowledge and understanding of the properties of geometric figures and their relationships to each other.	3.47	Utilized
3. Have a deeper knowledge and understanding of the concepts of probability and use them to make predictions and basics of statistics, such as mean, median, and mode.	3.27	Utilized

Table 2. (continued)

Item statement	Mean	Verbal interpretation
4. Use critical thinking and analytical skills to solve mathematical problems.	3.17	Utilized
5. Use logic and deductive reasoning to make mathematical arguments and proofs.	3.03	Utilized
Composite mean	3.32	Utilized

It is evident from the table that teachers possess a profound understanding of a variety of content knowledge aspects, tailoring their knowledge to the learners' specific grade levels. This aligns with research conducted by Duncan, which emphasized teachers' incorporation of their knowledge bases into various teaching activities [14].

This also signifies that teachers employ diverse strategies and approaches for problem-solving, utilizing tools such as diagrams, tables, or equations based on the problem at hand. This approach echoes findings by Gurat, where varied techniques in creating problem sets were deemed essential for student progress, enhancing their abilities in mathematical problem-solving due to teachers' prior knowledge and skills in strategies [21].

The composite mean indicates that teachers possess a strong grasp of the subject matter, including key concepts, skills, and inquiry methods, enabling them to identify crucial concepts and topics that each student needs to learn at their respective levels. Hill's research found a positive correlation between teachers' mathematical knowledge for teaching and student mathematics achievement during the early grades, emphasizing the importance of this pedagogical knowledge [15].

This suggests that teachers are cognizant of students' diverse needs, interests, and aptitudes, which aids in curriculum modifications to meet individual student requirements. Recognizing students' preferred learning styles, as mentioned by Cardino Jr. and Ortega-Dela Cruz, can greatly assist teachers in planning and implementing effective strategies that cater to their unique learning preferences [22].

5.1.2. Pedagogical approaches

Pedagogical approaches encompass the variety of techniques and strategies employed by teachers to facilitate learning and growth. **Table 3** showcases data collected from respondents regarding the pedagogical approaches within numeracy instruction.

Table 3. Respondent's assessment of the numeracy instruction in terms of pedagogical approaches

Item statement	Mean	Verbal interpretation
The school teachers...		
1. Directly teach the content to the students.	3.80	Highly utilized
2. Involve students working together in groups to achieve a common goal.	3.73	Highly utilized
3. Focus on learning through hands-on experiences.	3.70	Highly utilized
4. Involve the students in their own learning process by asking questions, investigating, and exploring.	3.43	Utilized
5. Focus on the student's active construction of knowledge by letting them build their own understanding through their experiences and interactions with the environment.	3.30	Utilized
Composite mean	3.59	Highly utilized

The table reveals that teachers frequently employ deductive teaching, a method that introduces themes and content at the beginning of class, followed by illustrative examples. The advantages of deductive teaching,

which emphasize its straightforward and time-efficient nature, were observed in previous research by Abdukarimova and Zubaydova [16].

Moreover, some teachers heavily favor collaborative learning, where students learn from their peers, often in group activities. This aligns with findings from Laal and Ghodsi, indicating that collaborative learning leads to enhanced productivity, better relationships, improved psychological well-being, refined social skills, and heightened self-esteem [18]. In certain learning contexts, students are encouraged to engage in self-discovery as a primary means of learning. As suggested by Kolb and Kolb in their study, experiential learning empowers students by granting them more authority and responsibility and involving them directly in the learning process within the learning environment [19].

This suggests that teachers employ a variety of pedagogical approaches to address individual differences and learning needs based on the student's grade levels. Cardino Jr. and Ortega-Dela Cruz highlighted in their study that understanding students' preferred learning methods allows teachers to develop numerous strategies to enhance students' learning, thereby boosting their performance in mathematics [22].

5.1.3. Information and communication technology skills

Information and communication technology (ICT) plays a significant role in education, enabling teachers to access and exchange information. **Table 4** presents data related to ICT skills within numeracy instruction.

Table 4. Respondent's assessment of the numeracy instruction in terms of ICT-related skills

Item statement	Mean	Verbal interpretation
The school teachers...		
1. Use online resources, such as educational videos and simulations, to reinforce mathematical concepts and provide additional practice opportunities.	3.60	Highly utilized
2. Utilize educational software and apps that allow students to engage in learning.	2.47	Slightly utilized
3. Use interactive whiteboards or projectors to display and manipulate mathematical diagrams and equations in real-time during lessons.	2.47	Slightly utilized
4. Incorporate online collaboration tools, such as Google Docs or Padlet, to facilitate group work and allow students to share their work.	2.47	Slightly utilized
5. Teach students how to use spreadsheets to analyze and visualize data, and create graphs and charts to represent mathematical concepts.	2.17	Slightly utilized
Composite mean	2.64	Utilized

The table indicates that teachers extensively utilized online platforms and other digital resources, such as educational videos and simulations, to reinforce mathematical concepts and provide additional practice opportunities, enhancing student engagement and learning in mathematics. Technology has a huge impact on teaching and learning [24]. However, the table also reveals that the use of online educational tools is limited, likely due to issues such as insufficient access to ICT materials. This echoes Johnson *et al.*'s research, which emphasized that instructional technology's effective use is contingent upon adequate computer availability and a fast Internet connection, both of which are essential for the quality of education [25].

The composite mean suggests that a significant challenge in many public schools is the lack of technologically advanced teaching materials, which deprives students of access to a wealth of knowledge and resources that could enhance engagement and promote interactive learning. In today's educational landscape,

teachers must acquire the skills to design, analyze, synthesize, and utilize technology effectively while incorporating educational technologies to facilitate learning and materials analysis [26].

This implies that teachers are adapting to modern teaching practices, embracing online educational resources that enhance the effectiveness of teaching and learning. Such resources allow for differentiation and personalized learning, encourage inquiry and exploration, and make mathematics education more engaging. On the other hand, the limited use of educational online software and tools is likely due to insufficient ICT resources, which hinders effective implementation. In this era, where students should acquire skills relevant to the rapidly developing society, ICT tools play a pivotal role in effective teaching and learning [16].

5.1.4. Classroom management

Effective classroom management demands a diverse skill set, including establishing standards, regulating student behavior, and engaging students actively.

Table 5. Respondent's assessment of the numeracy instruction in terms of classroom management

Item statement	Mean	Verbal interpretation
The school teachers...		
1. Praise students for their hard work and good behavior.	3.90	Highly utilized
2. Build positive relationships with students.	3.83	Highly utilized
3. Encourage student participation in class by asking questions, allowing for small group discussions, and creating opportunities for students to share their work.	3.73	Utilized
4. Communicate the expectations for behavior and academic performance clearly in math classes.	3.67	Highly utilized
5. Use technology tools such as online games, interactive whiteboards, and other digital resources to engage students in the learning process.	3.73	Highly utilized
Composite mean	3.63	Highly utilized

The data in **Table 5** illustrates the teacher's integration of technology, a practice that has become increasingly prevalent, as it captures students' attention and fosters engagement. This practice is substantiated by a study conducted by Mosca *et al.*, which underscores the importance of creating a technologically enhanced classroom environment to sustain student interest and concentration on the topic or concept being taught [26].

Additionally, the table indicates a high utilization of student-centered learning, where students are encouraged to take an active role in their learning through participatory teaching. Praises, rewards, and feedback are thoughtfully applied to prioritize students' emotional well-being. Addressing students' emotions is crucial as it boosts their confidence and enhances their learning. This aligns with Ciobanu's findings, which emphasized that student-centered learning involves an active learning style, integrating learning programs tailored to each student's unique learning pace [23].

The computed mean indicates that teachers prioritize student-centered teaching and learning, always placing students' welfare at the forefront. Rewards and feedback serve as vital tools that teachers employ to promote positive behavior and enhance student learning. As Ciobanu affirmed, involving the child as an active participant in their learning process requires engaged thinking and the activation of all intellectual functions [23].

This underscores that teachers employ a range of classroom management techniques to highlight strengths and areas requiring improvement. Sieberer-Nagler's research emphasized the importance of teacher knowledge in various areas, such as feedback, handling mistakes, questioning, and structured lessons. Motivation, humor,

and dedicated learning time also play significant roles in effective teaching [22].

5.1.5. Preparation of instructional materials

The preparation of instructional materials is vital in promoting active involvement, critical thinking, and alignment with learning objectives. These materials must be appropriate for the intended audience.

Table 6. Respondent's assessment of the numeracy instruction in terms of instructional materials preparation

Item statement	Mean	Verbal interpretation
The school teachers...		
1. Select materials that are appropriate for the grade level and learning objectives (textbooks, workbooks, manipulatives, or digital resources).	3.73	Highly utilized
2. Develop a lesson plan that outlines the sequence of activities, the learning objectives, and the materials that will be used.	3.70	Highly utilized
3. Use visual aids such as diagrams, graphs, and charts to help illustrate mathematical concepts, and manipulatives such as blocks, counters, and geometric shapes can help students visualize and understand mathematical concepts.	3.40	Utilized
4. Create materials in different languages, providing accommodations for students with disabilities or adapting materials for gifted students.	2.77	Utilized
5. Incorporate technology tools such as calculators, spreadsheets, or educational apps to help students engage with math concepts.	2.37	Slightly utilized
Composite mean	3.19	Utilized

The data in **Table 6** reveals that some teachers make slight use of educational mathematical apps. This limited usage is due to resource constraints in some public schools, which result in insufficient learning materials. In contrast, some teachers effectively utilize Google apps, enabling students to engage in more critical thinking, collaborative activities, and the application of mathematical practices. This approach aligns with modern math classes that leverage technology to enhance the teaching and learning process [27].

Furthermore, authentic learning materials are embraced by some teachers as readily available resources. Creative teachers provide these materials, which benefit both teachers and students. Visual representations facilitate knowledge transfer, helping students visualize and understand mathematical concepts. Manipulatives, as outlined in **Table 6**, enhance conceptual comprehension by allowing students to bridge formal and informal techniques and connect tangible and abstract ideas [30,31].

Moreover, creating lesson plans serves as a teacher's guide for daily lesson execution. Textbooks, selected in formats appropriate for lessons or activities, provide one of the key sources of knowledge. The quality of instructional aids is crucial to instructional improvement, as highlighted by Chingos and West [28]. Effective teachers, as Danielson emphasized, understand their students' backgrounds, interests, and skills, enabling them to plan instruction effectively for all learners [17].

The composite mean in **Table 6** suggests that teachers employ a variety of instructional materials. However, the limited accessibility of some learning materials is attributed to financial constraints. Najumba's research supported the idea that well-equipped schools with relevant educational facilities, including instructional materials such as textbooks, libraries, and laboratories, tend to perform better in standardized examinations [32]. This underscores the importance of considering students' needs, aligning materials with learning objectives, and ensuring accessibility and appropriateness in material selection.

5.1.6. Preparation of assessment tools

The process of creating and developing tools or techniques to assess students' knowledge, skills, and abilities is referred to as the preparation of assessment tools. **Table 7** provides an overview of the data gathered in the context of the preparation of assessment tools.

Table 7. Respondent's assessment of the numeracy instruction in terms of assessment tools preparation

Item statement	Mean	Verbal interpretation
The school teachers...		
1. Select assessment tools that are appropriate for the grade level and learning objectives (tests, quizzes, projects, or performance tasks).	4.00	Highly utilized
2. Include a variety of question types in the assessment (multiple-choice, short answer, essay, and problem-solving questions).	3.70	Highly utilized
3. Consider the accessibility of the assessment for all students.	3.70	Utilized
4. Develop guidelines for scoring the assessment.	3.10	Highly utilized
5. Conduct pilot testing before administering the assessment to students with a small group of students to identify any issues with the assessment and make necessary revisions.	2.73	Utilized
Composite mean	3.44	Utilized

The table highlights that teachers employ a variety of assessment tools, a critical aspect of effective teaching. This practice aligns with Alquraan's emphasis on utilizing efficient assessment techniques that enhance learning, as they have a positive impact on students' achievement [33].

Moreover, the table illustrates that teachers make use of pilot testing and the development of scoring guidelines. These steps are essential to ensure that assessments cater to the diverse learning abilities of students and undergo necessary revisions to enhance reliability. Pilot testing plays an indispensable role in conducting large-scale surveys, ultimately bolstering the reliability, validity, and practicability of the questionnaire, as stated in the study by Wadood *et al.* [34].

The composite mean in **Table 7** indicates the importance of conducting reliability testing and making revisions as needed to cater to students' learning abilities. Additionally, modifying test questions ensures adaptability to different students, allowing teachers to assess students' acquired knowledge. Reliability, encompassing aspects like equivalent test forms, test-retest equivalency, and maintaining consistent test difficulty from year to year, ensures the quality and consistency of assessments [35].

This underscores the technical nature of assessing assessment tools' validity and reliability, extending beyond merely aligning test questions with state standards to address the specific needs and skills of students. Using appropriate assessment methods, in line with the grade level and learning objectives, allows teachers to effectively gauge student comprehension and provide feedback to enhance learning.

5.2. Issues in numeracy instruction encountered by teachers

Effective development of students' mathematical skills and conceptual knowledge is heavily reliant on numeracy instruction. Nevertheless, teachers often encounter various challenges when utilizing numeracy instruction.

5.2.1. Lack of content knowledge

The continuous development of math content knowledge is an ongoing process that requires a growth mindset,

receptiveness to new information, and an active pursuit of improved comprehension of mathematical concepts and effective teaching methods. A deficiency in subject understanding can impede students' academic progress.

Table 8. Issues of numeracy instruction in terms of lacking content knowledge

Issues in numeracy instruction	Teacher's experience
Lack of Content Knowledge	"Mastery of basic concepts in numbers, recognizing, and analyzing the concept of addition and subtraction"
	"Readiness of the students in acquiring numeracy skills"

Table 8 underscores the issues faced by teachers concerning content knowledge. Teachers often grapple with the challenge of nurturing students' numeracy skills. This challenge stems from a myriad of factors, particularly during the early stages of education. Mulwa's research highlights the difficulties students face when using mathematical terms and understanding their related concepts [37].

5.2.2. Insufficient resources and materials

Teachers rely on a wide array of resources and materials to support their instruction and address students' gaps in content knowledge. These resources are indispensable in making learning productive and meaningful. Insufficient materials can hinder students from receiving the quality education they deserve.

Table 9. Issues in numeracy instruction in terms of insufficient resources and materials

Issues in numeracy instruction	Teacher's experience
Insufficient resources and materials	"Lack of instructional materials that are appropriate in the level of learning of the students"
	"Failed to use different mathematical processes in modeling"
	"Unavailability of teacher resource materials that will serve as guide and basis for teaching"

Table 9 demonstrates the difficulties teachers encounter due to insufficient resources and materials. Teachers may face challenges accessing adequate materials, limiting their ability to engage students in interactive learning activities and hands-on learning experiences. Najumba's studies on school achievement revealed that schools equipped with sufficient resources such as textbooks, libraries, and laboratories consistently outperform those lacking such resources in standardized tests [33].

5.2.3. Inadequate Internet connection

In today's digital age, where technology plays a pivotal role in education, the availability of adequate Internet connectivity is crucial for effective teaching and learning. Inadequate Internet connections can significantly impact the learning process.

Table 10. Issues in numeracy instruction in terms of inadequate Internet connection

Issues in numeracy instruction	Teacher's experience
Inadequate Internet connection	"Cannot use e-games because of lack of internet connection"
	"Lack of technology tools"
	"Unstable Internet connection"
	"Failed to use technology tools such as online games and other digital resources"
	"Failed to incorporate technology tools as learning materials for students"

Table 10 illustrates the problems teachers experience due to inadequate Internet connections. Respondents have expressed their inability to utilize online games and other digital learning materials due to inadequate Internet access near their schools. While temporary solutions may alleviate the challenges stemming from poor Internet connections, a long-term commitment to improved infrastructure and connectivity is essential to ensure equal access to high-quality education. It is worth noting that adult literacy, as well as other forms of lifelong learning for adults, along with continuing education, are integral components of Internet-enabled education [13].

Addressing these challenges requires a multifaceted approach, including ongoing professional development, collaborative planning and reflection, access to high-quality materials, differentiated instruction, and the creation of a positive learning environment in schools. By tackling these issues, teachers can enhance their numeracy instruction and better support their students' mathematical learning.

6. Conclusions and recommendations

6.1. Conclusion

The study's key findings have led to the following conclusions:

(1) Elementary mathematics teachers exhibit effective management skills in numeracy instruction.

(2) The teachers demonstrate a strong command of knowledge content and employ pedagogical approaches that are well-suited to the diverse learning capacities of their students.

(3) The use of instructional materials, classroom management strategies, and assessment techniques varies significantly based on students' learning abilities.

(4) Insufficient Internet connectivity and limited access to learning materials have hampered the effective integration of technology into the teaching and learning processes.

(5) A numeracy management program can serve as a valuable tool for enhancing teachers' numeracy management skills.

6.2. Recommendations

Building upon the study's conclusions, the following recommendations are put forth:

(1) The proposed numeracy management program should serve as a foundation for the continuous enhancement of teacher's numeracy management skills.

(2) Elementary schools should consider implementing additional initiatives and support for mathematics teachers, focusing on improving their proficiency in managing numeracy instruction, particularly concerning ICT-related skills, preparation of instructional materials, content knowledge, and pedagogical approaches.

(3) Educational institutions should allocate adequate funding to support the integration of technology as a highly effective teaching tool.

(4) Similar sets of variables should be utilized in further research in other educational divisions to expand the understanding of educational management.

Disclosure statement

The author declares no conflict of interest.

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Exploring the Integration of Case-Based Learning (CBL) with a Flipped Classroom Approach in Teaching Leadership in Pediatric Infectious Diseases

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Abstract: *Purpose:* This study aims to investigate the potential benefits of combining case-based learning (CBL) with a flipped classroom approach in the context of education in the infection ward. *Methods:* The study involved the selection of 50 intern students from hospital infection wards between January 2021 and December 2022. A random computer selection was employed to divide the students into two groups: the control group (n = 25) which received traditional teaching, and the research group (n = 25) which received CBL combined with a flipped classroom approach. The teaching outcomes of the two groups were subsequently compared and analyzed. *Results:* The research group demonstrated significantly higher scores in both basic theoretical knowledge and practical operation assessments compared to the control group ($P < 0.05$). Additionally, the research group reported higher levels of satisfaction with the teaching method than the control group ($P < 0.05$). *Conclusion:* The implementation of CBL combined with a flipped classroom approach for interns in the infection ward was found to be an effective method for improving interns' theoretical knowledge and practical operation scores, as well as achieving higher levels of teaching satisfaction. These findings have significant clinical value.

Keywords: Infectious diseases teaching; Case-based learning (CBL); Flipped classroom approach; Assessment results

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1. Introduction

Clinical teaching of junior doctors is an essential process that bridges the gap between theoretical knowledge and its practical application. It serves as the foundation for consolidating and enhancing the theoretical knowledge acquired during medical studies and the development of diagnostic and therapeutic skills when working with patients. High-quality clinical medical education plays a pivotal role in delivering excellence in clinical practice. Teaching interns in a clinical setting is vital for their ability to analyze and resolve issues and acquire clinical skills. Furthermore, the quality of the teaching they receive significantly influences their future

professionalism and clinical competence [1].

Pediatric infections are characterized by rapid onset, quick progression, and atypical prodromal symptoms. Clinical manifestations are often nonspecific, leading to delayed diagnoses and necessitating a high level of professional competence amongst pediatric infectious disease physicians. Additionally, there is a growing demand for effective teaching due to the evolving nature of these diseases.

Case-based learning (CBL) is a learning method that emphasizes a case-centered approach, guiding students in the analysis and management of specific cases using relevant clinical and foundational knowledge. The flipped classroom model (FCM) is a student-centered teaching approach that reverses the traditional process of classroom lectures and assignments, a practice commonly used in foreign educational contexts. The combination of the two elements has the potential to enhance the quality of education and support students' learning.

This research aims to assess the practical applicability of the CBL combined with the flipped classroom approach in the context of teaching in infection wards. The integration of these two elements holds promise for raising the quality of education and facilitating students' learning.

2. General information and methods

2.1. General information

This study examined 50 interns from the Department of Nosocomial Infections selected between January 2021 and December 2022. The participants were randomly assigned to either the control group (25 participants, with 12 males and 13 females, aged 24.45 ± 2.11 years old) or the research group (25 participants, with 11 males and 14 females, aged 24.21 ± 1.89 years old). Baseline information collected before the study did not reveal any significant differences between the groups ($P > 0.05$).

2.2. Research method

The 25 participants in the control group underwent traditional instruction in which the instructors utilized multimedia to explain theoretical concepts and later accompanied the students in performing ward check-up duties at the end of the semester.

The 25 students in the study group were instructed using the CBL combined with a flipped classroom approach. (1) Before entering the ward, the instructors based their teaching materials, such as PowerPoint (PPT) and micro-videos, on the actual situation of the infection ward. They integrated this with the syllabus to cover common diseases, diagnostic methods, treatment plans, and emergency procedures, among other topics. Additionally, they established WeChat or QQ groups to distribute teaching videos, PPTs, study tasks, supplementary materials, and discussion cases. This facilitated students' comprehension of the theoretical knowledge before attending the course. With access to these materials, students had the opportunity to self-learn and refer to them as needed. Students viewed the teaching videos and PPTs independently, used supplemental materials to reinforce their understanding, completed assigned learning tasks before class, and took comprehensive study notes. (2) During practical teaching, teachers incorporated students' questions to enhance their understanding. Teachers promoted in-depth learning by providing objective explanations and addressing students' raised issues. Students then discussed these problems in small groups, focusing on essential knowledge points, and received feedback on their discussions. Information sharing and feedback took place through platforms such as QQ group or WeChat to facilitate further study and discussion. Each week, trainees were provided with representative cases from new patients and medical records. It was their responsibility to thoroughly collect medical records and perform physical examinations of patients. They then used the gathered data to make a preliminary diagnosis and develop a corresponding treatment plan, which involved referencing

designated textbooks and consulting medical literature. Any diagnoses requiring differentiation were also addressed during this process. After completing the necessary tasks, participants engaged in a group discussion led by the instructors, where they analyzed the diagnosis, differential diagnosis, and treatment methods of the clinical case. These discussions consisted of five members and lasted for 30 minutes, with a focus on the content covered in the lectures. Following the discussion, relevant questions were addressed through responses from the group or guidance from the instructors. The participants reviewed the clinical knowledge of this disease once more to ensure a connection between theory and practice.

2.3. Research indicators

This study employed a combination of teaching content, basic theory development, and practical operation assessment questionnaires, with a maximum score of 50 points [2]. In addition, a network anonymous survey method was used to collect data on teaching satisfaction, categorized as satisfactory, general, or unsatisfactory [3].

2.4. Statistical analysis

This research study utilized SPSS 21.0 statistical software as a data processing tool. Percentages were used to represent count data, while *t* calculations were used to analyze measurement data expressed as mean ± standard deviation (SD). Statistical significance was set at $P < 0.05$.

3. Results

3.1. Comparison of basic theory and practical operation assessment scores between the two groups.

Table 1 displays the basic theory and practical operation assessment scores for both the research and control groups. The research group achieved higher scores compared to the control group ($P < 0.05$).

Table 1. Comparison of the basic theory and practical operation assessment scores between the two groups (points in mean ± SD)

	Basic theory	Practical operation
Research group ($n = 25$)	46.25 ± 2.13	40.25 ± 1.25
Control group ($n = 25$)	41.22 ± 1.56	36.33 ± 2.45
t-value	6.5682	5.6487
P-value	< 0.05	< 0.05

3.2. Comparison of teaching satisfaction between the two groups

Table 2 illustrates the teaching satisfaction between the groups, with the study group reporting higher satisfaction compared to the control group ($P < 0.05$).

Table 2. Comparison of teaching satisfaction between the two groups [*n* (%)]

	Satisfactory	General	Unsatisfactory	Satisfaction
Research group ($n = 25$)	13 (52.00)	10 (40.00)	2 (8.00)	23 (92.00)
Control group ($n = 25$)	9 (36.00)	8 (32.00)	8 (32.00)	17 (68.00)
χ^2	-	-	-	4.7678
P-value	-	-	-	< 0.05

4. Discussion

Case-based learning (CBL) is an instructional method that emphasizes the use of specific cases to develop student's analytical abilities and their ability to handle real-life scenarios by applying clinical and fundamental knowledge. This approach focuses on individual case examples and promotes the use of technical language, encouraging students to think critically and make informed decisions. The flipped classroom model (FCM) is a student-centered teaching approach. Its core concept is to reverse the traditional process of in-class lectures and out-of-class assignments. This model has been extensively implemented in foreign educational contexts [4-7]. It effectively assists trainees in rapidly acquiring expertise in diagnosing and treating common infectious diseases in children, thereby enhancing their understanding of these issues, providing quality education, and improving the overall teaching standard.

Following the study, the research group achieved higher scores in both theoretical and practical assessments compared to the control group ($P < 0.05$). Additionally, the research group reported greater satisfaction with their learning experience compared to the control group ($P < 0.05$).

In clinical diagnosis and treatment, each patient is considered a unique case. CBL centers on clinical cases, encouraging students to research, discuss, and answer a series of questions. It emphasizes the cultivation of practical skills. FCM serves as the foundation for research during the teaching practice, promoting an abstract-to-concrete approach to course concepts. In CBL, students are encouraged to make judgments and decisions based on their exploration and independent analysis of cases [8]. This approach facilitates the bridging of the gap between theoretical knowledge and practical evidence, enhancing students' ability to apply textbook knowledge to resolve clinical issues.

The survey results demonstrate that incorporating CBL with FCM can benefit medical students during their internship by facilitating textbook study and referencing relevant literature. This stimulates their interest in active learning and improves their mastery of theoretical knowledge and practical skills [9-10].

In conclusion, the implementation of the CBS combined flipped classroom approach can enhance the operational performance of pediatric infectious diseases interns, both in theoretical and practical aspects. This leads to high levels of teaching satisfaction and significant clinical benefits.

Disclosure statement

The authors declare no conflict of interest.

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Exploring the Efficacy of Problem-Based Learning (PBL) in Clinical Gastroenterology Education

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Abstract: *Purpose:* To explore and analyze the effectiveness of the problem-based learning (PBL) model in clinical gastroenterology education. *Methods:* This study involved 40 postgraduate gastroenterology students from January 2020 to December 2021, who were randomly assigned to two groups using the random number table method: a control group (n = 20) receiving conventional teaching and a research group (n = 20) receiving the PBL model. The teaching outcomes of both groups were compared and analyzed. *Results:* The research group exhibited significantly high scores in both theoretical and practical examinations compared to the control group ($P < 0.05$). Moreover, the satisfaction levels of the trainees in the research group with the teaching model were significantly greater than those in the control group ($P < 0.05$). *Conclusion:* In the realm of clinical gastroenterology education, the PBL model proves to be an effective method for enhancing the theoretical and practical performance of postgraduate trainees. Furthermore, it garners high levels of satisfaction among students, underscoring its clear clinical value.

Keywords: Clinical gastroenterology education; Problem-based learning (PBL); Assessment results; Teaching satisfaction

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1. Introduction

In the era of the knowledge economy and social informatization, the demand for medical education has been steadily increasing. Gastroenterology, as a clinical specialty, encompasses a wide array of diseases, exhibits high diagnostic complexity, and serves a vast patient population, necessitating exceptional clinical expertise from healthcare practitioners. Consequently, there has been a growing emphasis on elevating the standards of clinical education in the field of gastroenterology.

Several foreign medical schools have incorporated problem-based learning (PBL) into their educational programs. In this approach, instructors present problems as the core learning content, encouraging students to collaboratively explore and resolve them. Subsequently, students seek answers through literature research, expert consultations, and other methods, followed by classroom discussions. This teaching method has the

potential to ignite students' enthusiasm for learning, and enhance their skills in expression, learning, information retrieval, and logical thinking, ultimately fostering the development of competent medical professionals [1].

This research aims to investigate the significance of employing the problem-based learning style in the context of clinical gastroenterology education.

2. General information and methods

2.1. General information

Between January 2020 and December 2021, a total of 40 postgraduate interns in the Department of Gastroenterology were randomly assigned to two groups. The control group comprised 14 females and 6 males, with an average age of 24.19 ± 2.11 years, while the research group included 16 females and 4 males, with an average age of 24.23 ± 2.13 years. Baseline information collected before the study showed no significant differences between the groups ($P > 0.05$).

2.2. Research method

In the control group, 20 participants received traditional instruction. Their instructor introduced the content, timing, plan, and objectives of the apprenticeship upon entering the ward. The instructor guided graduate students through patient assessments and immediate reviews of medical records. Students then gathered in the classroom to discuss key knowledge points related to patients' conditions, as presented by the instructor.

The 20 students in the research group adopted the PBL approach to learning. The teaching faculty used key gastroenterology diseases from the Clinical Teaching Program as a foundation for comparing with real cases. During clinical diagnosis and assessment, clinical signs, symptoms, treatment, and imaging data were summarized. Students were quizzed on crucial learning points, and integrated imaging data summarized essential knowledge for postgraduate interns. Relevant questioning emphasized critical knowledge areas to promote a deep understanding of the material.

Interns applied their acquired knowledge to analyze practical information in various teams, discussing and proposing solutions to problems. A spokesperson from each group presented their findings, with other interns supplementing answers based on their own understanding. Communication with instructors occurred through WeChat and QQ groups for in-depth discussions of problematic areas.

During the teaching period, postgraduate trainees independently addressed various gastroenterology issues, including managing rare diseases, identifying commonly misdiagnosed illnesses, and considering treatment options. This fostered a comprehensive understanding of gastroenterology treatment and provided practical experience. Instructors offered summaries for each problem, introduced relevant case studies, identified key points and challenges, and facilitated comprehension and retention through group discussions and independent thinking.

2.3. Research indicators

This study designed theoretical and practical operation assessment questionnaires, with a maximum score of 100 points [2]. Additionally, anonymous online surveys using self-made questionnaires measured satisfaction with the teaching mode, categorized as satisfactory, general, or unsatisfactory [3].

2.4. Statistical analysis

Statistical analysis was conducted using SPSS 21.0 software as the data processing tool. Count data is expressed as percentages (%), and the χ^2 test is used for calculations. Measurement data is presented as mean ± standard

deviation (SD), and the *t*-test is employed for calculations. Statistical significance is indicated by a *P*-value of less than 0.05.

3. Results

3.1. Comparison of theoretical and practical operation assessment scores between the two groups

In **Table 1**, the theoretical and practical operation assessment scores of the research group were higher than those of the control group ($P < 0.05$).

Table 1. Comparison of theoretical and practical operation assessment scores between the two groups (points in mean ± SD)

	Theoretical assessment results	Practical examination results
Research group ($n = 20$)	88.25 ± 1.02	87.31 ± 1.05
Control group ($n = 20$)	76.22 ± 1.45	75.45 ± 1.36
t-value	12.5682	10.4587
P-value	< 0.05	< 0.05

3.2. Comparison of satisfaction with teaching models between the two groups

Table 2 demonstrates that the intern doctors in the research group expressed higher satisfaction with the teaching mode compared to the control group ($P < 0.05$).

Table 2. Comparison of satisfaction with the teaching models between the two groups [*n* (%)]

	Satisfactory	General	Unsatisfactory	Satisfaction
Research group ($n = 20$)	8 (40.00)	11 (55.00)	1 (5.00)	19 (95.00)
Control group ($n = 20$)	3 (15.00)	10 (50.00)	7 (35.00)	13 (65.00)
χ^2	-	-	-	5.6682
P-value	-	-	-	< 0.05

4. Discussion

Gastroenterology is a significant field with a vast number of patients and a diverse range of complex diseases and etiologies, making clinical diagnosis and treatment intricate. Clinical teaching is this field highly practical. Therefore, it is essential to employ appropriate teaching methods during clinical internships to help postgraduate students effectively bridge the gap between theory and practice.

In clinical teaching, it is common for instructors to collaborate with graduate interns during clinical internships because the busy clinical schedule limits the instructor's guidance time. Graduate interns often follow the instructor's instructions, which can hinder their ability to effectively integrate theoretical knowledge with practical internship work, potentially leading to suboptimal teaching outcomes [4]. Problem-based learning offers an innovative educational approach in medical education that enhances interns' problem-solving skills and practical proficiency, enabling them to acquire relevant knowledge and experience more effectively [5].

The study revealed that the research group outperformed the control group in both theoretical and practical operation assessments ($P < 0.05$). Furthermore, trainees in the research group expressed higher satisfaction

with the teaching mode compared to the control group ($P < 0.05$). Problem-based learning has successfully transformed the traditional one-dimensional teaching model by placing trainee students at the core of the learning process. It prioritizes the development of practical skills and makes problem-solving the primary teaching approach. Encouraging trainee students to independently explore and address challenges ensures the achievement of set learning objectives. Problem-based learning methods are increasingly employed in contemporary clinical teaching, particularly in medical and surgical clinical practical training [6].

The problem-based learning method revolved around facilitating active learning for postgraduate students by presenting significant problem scenarios to convey the content and purpose of the study. This approach encourages students to engage proactively in the problem-solving process, fostering their ability to learn and independently address issues.

In conclusion, the problem-based learning approach to teaching has proven to be effective in enhancing the theoretical and practical competence of postgraduate students studying gastroenterology. It garners high levels of satisfaction and holds significant clinical value.

Disclosure statement

The authors declare no conflict of interest.

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Project AKAY Approach: A Reading Intervention for Non-Readers

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Abstract: The Project Adequate Knowledge Acquisition for Young Learners (AKAY) approach serves as an intervention designed to support Grade 4 students who have experienced significant cognitive challenges due to the COVID-19 pandemic. This approach places a strong emphasis on the advantages of homogenous grouping in the teaching process. Its main objective is to assist students in acquiring fundamental skills, including knowledge of the alphabet, letter sounds, reading of consonant-vowel-consonant (CVC) pattern words, numerical comprehension, handwriting of names, and following simple directions. This study delved into the implementation of the Project AKAY approach for Grade 4 students attending Marawoy Elementary School in Lipa City during the 2022–2023 academic year. The researcher aimed to assess the reading proficiency of these students using the Philippine Informal Reading Inventory (PHIL-IRI) assessment both before and after the implementation of the approach. The study also examined the extent to which the Project AKAY approach was utilized to guide students in acquiring these essential skills. Additionally, the research explored the challenges faced by teachers in implementing the Project AKAY approach and their strategies for overcoming these challenges. The study employed a descriptive quantitative research design and employed purposive sampling as the chosen sampling technique. Data collection relied on the PHIL-IRI assessment tool and interviews as research instruments. The collected data underwent thorough analysis, including statistical treatments such as frequency and percentage calculations. Ultimately, the research findings indicated that the Project AKAY approach effectively served as an intervention for non-readers.

Keywords: Reading; Homogenous group; Non-readers; Adequate knowledge

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1. Introduction

The onset of the COVID-19 pandemic in early 2020 ushered in a substantial transformation in the landscape of education. While the issue of students' reading proficiency had long been a concern in the nation, the pandemic exacerbated the situation. In many countries, including the Philippines, schools were either fully or partially closed, learning groups were reorganized, and students and teachers had to navigate extended absences from school to curb the spread of the virus [1].

Notably, data from the Programme for International Student Assessment (PISA) indicated that a large portion of Filipino students performed below the desired level in reading, with approximately 80% struggling to attain the required reading competency. This deficiency in fundamental reading and comprehension skills contributed to poor performance in subjects like English, Mathematics, and Science. To address this issue, the Department of Education (DepEd) introduced the "Hamon: Bawat Bata Bumabasa" (3Bs Initiatives) to promote read advocacy and ensure that every student achieves grade-level reading proficiency. However, the pandemic presented unexpected challenges, requiring teachers to adapt to remote teaching, students to self-regulate their learning at home, and parents to play a more active role in their children's education. Consequently, education policies, administration, and practices became keenly interested in understanding how these learning conditions impacted students' accomplishment, especially in reading – a fundamental skill essential for overall academic success and societal engagement. Furthermore, it became evident that the pandemic affected different study groups to varying degrees, even within the same educational system. Recent studies underscored the unpreparedness of schools, instructional methods, and stakeholders (including school administrators, teachers, students, and parents) for a crisis of the magnitude of the COVID-19 pandemic.

Despite these challenges, DepEd remained committed to ensuring continuity in education and the development of an intellectually empowered population. To achieve this, literacy was deemed essential, leaving no students behind. Schools were tasked with bridging the learning gap exacerbated by the pandemic. This presented unique difficulties, as physical in-person teaching was not always feasible, parents faced work-related constraints, and some lacked the literacy skills to assist their children effectively. In such trying times, the vulnerabilities of certain students were amplified, potentially leading to long-lasting repercussions for individuals and society. It became imperative for education systems to address learning disparities while nurturing student resilience to mitigate these adverse effects.

Efforts to mitigate these challenges included various interventions. Fortunately, in 2022, schools began to reopen, offering hope for bridging the pandemic-induced learning gap. The sight of students returning to school energized teachers and the education community. The initial week back in school was designed to ease students back into the learning process gently. By the second week, reading assessments were conducted using the PHIL-IRI tool. The results, while expected, were disheartening, with a significant number of Grade 4 students falling into the "frustration level" category for reading Tagalog. Out of 279 students, 173 struggled with reading, and 40 were classified as non-readers, unable to write their names or recognize letters and their corresponding sounds. Teachers notice their lack of confidence and slow progress.

In response to these challenges, Grade 4 teachers at Marawoy Elementary School initiated an intervention known as Project AKAY, which stands for "Adequate Knowledge Acquisition for Young Learners." This project was conceived after careful observation and assessment. The term "akay/akayin" in Filipino translates to "guide," signifying its mission to assist struggling students, particularly in reading, through the creation of a conducive reading environment, effective teaching strategies, and family support. Non-reader students were grouped in homogenous classes based on their reading abilities, as it was believed that tailored instruction could increase their engagement. This approach allowed teachers to create engaging lessons at the student's instructional level, maintaining their interest. In addition, Project AKAY led to increased collaboration among teachers, as Grade 4 teachers sought guidance and materials from their Grade 1 counterparts, who had experience dealing with non-readers. The necessary Grade 4 competencies were provided in printed modular form, requiring teachers to exert extra effort in managing two different types of classes daily.

Marawoy Elementary School remained committed to providing quality education despite the pandemic-induced gap. Project AKAY served as a beacon of hope in bridging this divide. The results of the Philippine

Informal Reading Inventory (PHIL-IRI) assessments at the project's inception indicated progress, with 40 non-reader students initially and eventually, two becoming independent readers, 34 achieving instructional levels, and 4 remaining in the frustration level. While these outcomes show improvement, there is room for further enhancement. Success in school is closely tied to one's ability to read, a fundamental skill that serves as a foundation for all subjects. As an educator and researcher, the author embraces the challenge set forth by DepEd's "3Bs Initiatives" and remains dedicated to bridging the pandemic-induced learning gap.

2. Literature review

Reading comprehension is a multifaceted process that draws upon various foundational skills. One model of reading comprehension suggests that there are three levels of skills – literal comprehension, inferential comprehension, and evaluative comprehension – that collectively enable us to grasp the content of what we read. These levels play a significant role in assessing a student's communication skills.

As noted by Eyorcadas [2], reading encompasses a substantial part of human activities, estimated at around 85%. The process involves sensation, perception, comprehension, application, and integration, all working together to construct meaning from written symbols and words. Reading serves as a means of communication and a source of knowledge and ideas, with applications ranging from reading signs and advertisements to restaurant menus, cookbook recipes, medication instructions, and much more. Furthermore, reading holds a pivotal position in both academic and lifelong learning. However, there is a prevalent challenge in the Philippines, where a substantial number of children lack the inclination or ability to read, as reported in a 2010 article from The Philippine Star [3].

Tomas *et al.* highlighted that readers who struggle often attribute their difficulties to factors such as limited phonological awareness, inadequate alphabet knowledge, insufficient phonics proficiency, a deficient vocabulary, poor word recognition, limited fluency, and low comprehension levels [4]. These challenges are typical reasons behind students' reading deficiencies, prompting ongoing debates among educators about the effectiveness of reading intervention programs. Additionally, the existence of learners-at-risk and the absence of a reading culture pose additional challenges [4].

Akyol's study in 2014 underscored that students with severely deficient reading skills face significant academic hurdles that may escalate to social difficulties in middle and high school. Over time, these students may build emotional barriers to reading due to a history of academic setbacks and labeling. To compensate, they may rely on their hearing and perceptive abilities, attempting to remain inconspicuous. They may be more prone to antisocial behavior if they have feelings of isolation and helplessness [5].

Aquino and De Vera discussed the negative spiral that children experiencing difficulties with letter coding and word recognition can enter. As they encounter obstacles, their enjoyment of reading diminishes, leading to reduced practice and more negative reading experiences. This, in turn, may result in a reluctance to read or a passive approach to reading, where individuals merely go through the motions without actively engaging with the material. Such emotional side effects can have adverse effects on the overall school experience [6].

One strategy to address these challenges is to group students with similar abilities in one classroom, a practice known as homogeneous grouping. Bayot and Galutan argued that grouping students based on their academic level and skills can enhance engagement, as instructions can be tailored to their abilities [7]. This approach may foster higher engagement than if students were grouped to work on skills they have already mastered, potentially leading to boredom. Homogenous grouping allows teachers to design lessons that are engaging and suitable for the student's instructional levels.

Creating a positive learning environment that instills confidence in students' abilities is crucial in breaking the cycle of reading difficulties. Effective reading programs provide students with access to reading material suited to their reading levels, opportunities for discussion, and choices in reading activities, interspersed with more structured lessons, all delivered by teachers who believe in their students' potential for success.

Moreover, teachers need to adapt their instruction to match students' educational backgrounds and individual reading skills. Parents also play a pivotal role in reinforcing their children's reading skills through home mentoring and follow-up evaluations.

Strategic Marketing and Research, Inc. emphasized that reading failure is a significant national concern that cannot be solely attributed to factors like immigration, poverty, or learning English as a second language. Teaching reading is considered one of the most critical subjects, as it forms the foundation for successful teaching and learning at all educational levels. Reading proficiency is indispensable for effective learning, as reading encompasses numerous sub-skills, with comprehension being just one of them. Challenges in reading can have far-reaching consequences across various subjects [8].

Recognizing the importance of reading and aligned with the K-12 Basic Education Program, DepEd introduced the "Every Child A Reader Program" (ECARP) through DepEd Memorandum No. 402s.2004 and Administrative Order No. 324. This program aims to provide structured reading and writing instruction to public school primary students, equipping them to become independent readers and writers. ECARP is an integral component of President Benigno Aquino III's ten-point education strategy, striving to produce graduates equipped to face life's challenges [9].

Numerous readers often mistakenly believe they comprehend the text because they rely on superficial analysis as their benchmark for adequate comprehension [10]. Additionally, engaging in uninterrupted daily reading for a minimum of 30 to 60 minutes can result in enhanced vocabulary and comprehension [11]. Reading independently at one's appropriate level, in conjunction with guidance from a parent, teacher, or tutor, can expedite skill development, consequently boosting understanding and reading speed.

3. Research objectives

This study will assess the effectiveness of the Project AKAY approach as a reading intervention for non-readers by addressing the following objectives:

(1) To assess the initial reading proficiency of Grade 4 students through the pre-reading assessment conducted using PHIL-IRI.

(2) To track the ongoing progress of students' reading abilities as they engage with the Project AKAY approach.

(3) To examine how the Project AKAY approach contributes to the enhancement of reading skills among non-readers.

(4) To identify the challenges faced by teachers in the context of reading instruction.

4. Action research methodology and procedures

4.1. Research design

The selection of respondents involved the purposive sampling technique, which targeted Grade 4 students. Questionnaires were distributed to Grade 4 teachers at Marawoy Elementary School, as well as to forty Grade 4 students identified as non-readers. This study employed a quantitative research approach within a quasi-experimental design. Quasi-experimental design, as defined by Creswell [12], aims to establish a cause-and-

effect relationship between variables. The total enumeration method was used, wherein all Grade 4 students underwent individual assessments of their reading skills across the three essential components contributing to successful reading. This approach was deemed suitable for this action research, as it sought to investigate the effectiveness of the identified enrichment activity.

4.2. Participants and sampling

This study focused on forty identified Grade 4 non-readers at Marawoy Elementary School for the school year 2022–2023. These students underwent pre-test and post-test assessments using the PHIL-IRI (Philippine Informal Reading Inventory) assessment tool. Purposive sampling was employed to select respondents exclusively from among students identified as non-readers. The choice of purposive sampling was deliberate, considering the specific qualities possessed by the selected informants.

4.3. Data collection

Quantitative data for this proposed action research were collected from the respondents through the results of the pre-test and post-test assessments using the PHIL-IRI assessment tool. The data will be analyzed using descriptive interpretation. Additionally, two key questions were utilized by the researcher for the interviews conducted with the participants:

(1) What difficulties did you encounter during the project intervention?

(2) How did you overcome the challenges you faced?

Upon the completion of the intervention, the researcher collected the necessary data, with the intervention spanning an entire academic quarter. To conduct the study, the researcher obtained the necessary approvals from relevant authorities to administer the evaluation tool to the student respondents. The pre-test and post-test assessments were personally administered to the student respondents by the researcher. Subsequently, the researcher collected, checked, and retrieved the assessment tools. Interviews were conducted with Grade 4 teachers who participated in the program.

4.4. Data analysis

The collected data underwent analysis, interpretation, and evaluation by the researcher, employing appropriate statistical tools. The pre-test and post-test assessments were used to determine the reading levels of non-readers and struggling readers before and after the intervention. The data analysis utilized rating scales, as listed in **Table 1**.

Table 1. Phil-IRI oral reading rating scale

Oral reading level	Word reading score-fluency (%)	Comprehension score
Independent	97–100	14–20
Instructional	90–96	9–13
Frustration	89 and below	0–8

4.5. Ethical considerations

The researcher asked for parental approval from all the students who participated in the study. This study also complied with the Data Privacy Act of 2012, with the data and information collected being used only for this research study. The researcher kept these to validate and verify the respondents' identities.

5. Results and discussions

5.1. Reading performance before project implementation

Table 2 presents the outcomes of the pre-test conducted on the respondents to assess the reading comprehension skills of Grade 4 students.

Table 2. Reading performance of Grade 4 students

Comprehension score (%)	Interpretation	Pre-test	
		Frequency	Percentage
80–100	Independent	0	0
59–79	Instructional	0	0
58 and below	Frustration	40	100
n		40	100
Mean		0	Frustration

Table 2 displays the pre-test results regarding the reading comprehension skills of Grade 4 students. The pre-test findings reveal that all 40 students fall into the frustration level category, as indicated by the PHIL-IRI Oral Reading Profile. Furthermore, these students were categorized as non-readers.

Project AKAY was conceived with the primary goal of imparting fundamental knowledge to learners, particularly in the realm of reading. It aimed to support educational systems in addressing learning gaps and mitigating disruptions to students' educational journeys. These 40 students constituted the project's respondents.

Evidently, in the Philippines, achieving a high level of literacy and the ability to read and write are top priorities, with the government actively promoting proficient reading skills. Reading is a skill that demands consistent practice to be retained and improved. Consequently, even individuals who possess literacy skills may not necessarily consider themselves readers. Therefore, those who do not engage in reading are often referred to as having a reading disability. A non-reader is typically defined as an individual with a reading disability who experiences reading challenges that are unexpected given their age, cognitive abilities, the quality of instruction they have received, and the interventions they have undergone.

5.2. Reading performance following project implementation

Table 3 shows the results of both the pre-test and post-test assessments conducted to evaluate the effectiveness of Project AKAY.

Table 3. Reading performance of the Grade 4 participants before and after the implementation of Project AKAY

Comprehension score (%)	Interpretation	Pre-test		Post-test	
		Frequency	Percentage	Frequency	Percentage
80–100	Independent	0	0	2	5
59–79	Instructional	0	0	34	85
58 and below	Frustration	40	100	4	10
n		40	100	40	100
Mean		0	Frustration	34	Instructional

Table 3 illustrates the results of the pre-test and post-test assessments focusing on the reading skills of Grade 4 students. Comparing the pre-test and post-test scores, it is evident that post-test scores were notably higher. The pre-test results initially categorized all 40 learners as frustration level/non-readers, according to the PHIL-IRI Oral Reading Profile. However, the post-test results revealed a positive impact on their reading comprehension levels. While some students remained in the frustration level category, there was an increase in the overall percentage. Additionally, two learners achieved independent reading status, and 34 were classified as instructional readers.

A study by Repaso underscored the effectiveness of the PHIL-IRI and homogenous class grouping, as it resulted in an increased number of learners categorized under the instructional level. Homogeneous classes motivated the students to start their reading journey and provided them with fundamental guidance [13]. The two students categorized as independent readers showed an increased fondness for reading during their free time, active participation in discussions, and heightened enthusiasm following their placement in homogenous groups. This shift signifies a boost in their confidence levels, subsequently fueling their eagerness to learn more. The instructional approach incorporated realia, colored visuals, games, and songs to enhance engagement.

The post-test results affirm that the project was an effective intervention in bridging the learning gaps created by the pandemic, particularly in terms of reading proficiency. Non-readers typically struggle to recognize words efficiently, exhibit weak word recognition skills, and lack fluency. According to Combalicer, non-readers often read without proper expression, intonation, pitch, and phrasing. Furthermore, non-readers may struggle to recognize letters or words, including their names, classroom labels, signs, and other printed materials [14]. Repaso also emphasized the importance of teachers understanding the critical components of reading instruction. Students with reading disabilities required intensive direct instruction, encompassing strategies for reading comprehension, phonological awareness, phonemic awareness, phonics, vocabulary development, sentence and text structure awareness, text organization, and reading fluency [13].

5.3. Challenges encountered by teachers

Teachers encountered various challenges when guiding learners in the initial stages of reading, encompassing issues related to time, student focus/interest, and parental support (**Table 4**).

Table 4. Challenges of teachers in line with reading

Challenges of teachers	Teachers' experience
Time-consuming	"The preparation doubled, for regular face-to-face class, printing of modules for Project AKAY learners so they can also answer task given to regular students…"
Lack of learners' focus	"It is hard to teach them letters or the basics at their age because of their attention…"
Lack of remediation at home	"It is difficult to do it alone when parents/guardians are not cooperative in terms of their children's progress…"

Table 4 illustrates the challenges faced by teachers. The teachers responsible for Project AKAY were subject instructors who dedicated substantial time to preparing materials for the program, which required them to start from the very basics. As a result, these beginning readers needed to establish connections between written words and their known spoken vocabulary, understand the composition of words from letters, and grasp the concept that each letter represents distinct sounds within words. Research by McCoach suggested that children progress through developmental stages in their reading skills, with their focus shifting as they age. Consequently, letter recognition may not necessarily align with the interests of older students [15].

Another strategy involves collaborating with parents to identify issues and formulate classroom

intervention strategies. In many cases, these interventions prove effective, negating the need for additional assistance. However, this approach may pose a challenge if parental support is lacking [4]. **Table 5** outlines the strategies employed by teachers when confronting challenges.

Table 5. Strategies of teachers for those challenges

Challenges of teachers	Teachers' strategies
Time-consuming	"Division of labor is the most effective way since there are 8 dedicated teachers…"
Lack of learners' focus	"Different motivation was used and also the integration of technology helps…"
Lack of remediation at home	"Continuous communication with the student's parents/guardians…"

Teachers utilized a variety of strategies, including the division of labor, which involves task specialization within a production process – an essential concept in boosting productivity. The study results also highlight the importance of devising alternative plans for various situations to address teaching-related challenges. One respondent emphasized the need to remain prepared and flexible, always having a contingency plan or intervention in place to tackle challenges. This proactive approach included instances where teachers invested personal resources in purchasing materials and spending extra time at school. Teachers are renowned for their creativity and adaptability, consistently devising innovative approaches to capture students' attention, particularly through the use of various strategies, including games. These strategies are effective in engaging students and maintaining their interest. The challenges faced by teachers were ultimately offset by the positive progress observed in their students.

6. Conclusions and recommendations

Based on the findings of the study, the following conclusions have been drawn:

(1) The COVID-19 pandemic has had a significant impact on education and has resulted in a lack of confidence among students.
(2) Teachers employed a variety of strategies and methodologies in implementing the project intervention.
(3) The challenges faced by the respondents during the implementation of the project intervention were effectively addressed, thanks to their passion and determination.
(4) The Project AKAY approach proved to be an effective reading intervention in bridging the educational gaps caused by the pandemic.
(5) The formation of homogenous groups created a conducive learning environment.

Based on these conclusions, the following recommendations are suggested for consideration:

(1) The Department of Education should continue to study the feasibility of implementing homogenous classes in larger schools.
(2) Similar studies should be conducted to explore students' perceptions of being in homogenous classes.
(3) Project AKAY should be encouraged for adoption in all schools, especially those with a high number of non-reader students.
(4) Schools should provide support to teachers in developing beginner-level reading materials to facilitate the implementation of the project.
(5) Schools should involve key stakeholders in strategic planning for the integration of 21st-century skills into the school curriculum.
(6) Teachers should be empowered to take the lead and embrace the project as part of their teaching

practices.

(7) Schools should prepare to embrace new ideas, shift mindsets, and adopt a paradigm that promotes various interventions to address educational gaps.

Disclosure statement

The author declares no conflict of interest.

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From Compliance to Play: Enhancement of Phonemic Awareness Through Play-Based Learning Activities in Kindergarten

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Abstract: Phonemic awareness is a skill that begins developing from birth and continues to develop throughout a child's early years. In the context of 21st-century learning, there is a growing demand for students to establish a solid foundation in this skill during their early developmental stages. Despite the recognized importance of phonemic awareness, there have been instances of low achievement in this area. This study aimed to assess the impact of incorporating play-based activities on improving phonemic awareness in kindergarten learners. The variables examined within phonemic awareness include letter sound fluency, blending, and segmenting. The study employed a quasi-experimental research design and utilized purposive sampling. A total of 20 kindergarten learners from Tangway Loob Elementary School participated in the study. The primary instruments for data collection were pre-tests and post-tests. The findings revealed that, before the implementation of play-based activities, kindergarten learners had a mean phonemic awareness score of 42.58, interpreting a moderate level of awareness. After the intervention, the learners attained a mean of 56.53, also interpreted as a moderate level of awareness. The analysis revealed a significant improvement in letter sound fluency and blending skills between the pre-test and post-test assessments. However, no significant difference was observed in terms of segmenting. In conclusion, this study demonstrated the effectiveness of incorporating play-based activities in enhancing the phonemic awareness of kindergarten learners. It is recommended that these activities be integrated into instructional practices to further develop phonemic skills, which serve as a crucial foundation for more advanced literacy skills.

Keywords: Phonemic awareness; Play-based activities; Sound fluency; Blending; Segmenting

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1. Introduction

Phonemic awareness is a fundamental skill that precedes the acquisition of phonics and reading abilities and is typically nurtured through interactive games, books, and various activities. Experiences related to phonemic awareness begin to develop from a child's earliest days and continue to evolve throughout their early years. Early childhood education places a strong emphasis on achieving essential developmental milestones, competencies, and concepts that children should master as they progress from basic to more intricate skills. In

the context of 21st-century learning, there is a growing imperative for students to establish a robust foundation during their formative years.

The significance of phonemic awareness cannot be overstated, yet it has been observed that many students struggle in this critical area, which is concerning given that it serves as the cornerstone for more advanced literacy skills. Recognizing this challenge, teachers feel compelled to guide kindergarten learners in enhancing their phonemic awareness, recognizing that it will ultimately benefit them in their academic journey. Proficiency in phonemic awareness is instrumental in fostering stronger literacy skills [1].

However, a significant hurdle arises in engaging kindergarten learners, who are predominantly dawn to play as their primary mode of exploration and learning. Play is integral to the development of foundational skills, prompting consideration of incorporating play into the learning processes [2]. A theoretical perspective, as articulated by Alam (2022) through Vygotsky's sociocultural approach, underscores the importance of play-based learning for the optimal development of children [3]. Furthermore, the United Nations Educational, Scientific and Cultural Organization (UNESCO) underscores the significance of high-quality early childhood education as a key component of sustainable development goals. The "Completely Kindergarten: Kindergarten Curriculum Guide (2010)", the "Service Delivery Model for Students with Exceptionalities" (SDM-SE), and the integration of play-based learning all contribute to fostering healthy child development.

Balancing the instruction of literacy skills by providing children with unstructured playtime is a critical consideration in kindergarten classrooms. According to Pyle *et al.* [4], play has been demonstrated to enhance children's development and learning, with various play contexts, including free play and guided play, proving effective in facilitating growth and learning. Additionally, children benefit from free playtime in the classroom, allowing them to explore and engage their imagination. Numerous studies have emphasized the importance of free play in kindergarten classrooms and explored effective methods for teaching literacy within this context. Approaching teaching from a child-centered perspective, rather than a teacher-driven approach, has proven highly beneficial to young children [5]. It is worth noting that phonemic awareness skill instruction is particularly relevant for kindergarten students.

In light of these circumstances, the researcher, who is also a kindergarten teacher, observed a noticeable deficiency in the phonemic awareness skills of her students, motivating her to embark on this study. She contemplated the potential of integrating play-based activities as a means to enhance phonemic awareness, to ultimately improve literacy skills for her learners. As a kindergarten teacher entrusted with the responsibility of laying a solid educational foundation, the researcher was driven to pursue this study.

2. Literature review

Kenner *et al.* emphasized that phonemic awareness begins to take root in most young learners from the very day they are born as they interact with their environment [6]. Educators are challenged with the task of identifying the optimal timing for phonemic awareness instruction, where children can make the most progress in developing this skill. Once it was established that young children do acquire phonemic awareness skills, the next question revolved around whether a child's age or grade level had any bearing on the development of these skills.

A study examined a sample of kindergarten students who were considered at risk for reading difficulties, focusing on their initial status and growth in phoneme segmentation fluency (PSF), letter naming fluency (LNF), and letter sound fluency (LSF). These assessments were administered on an ongoing basis during the fall of kindergarten. The findings revealed that these learners demonstrated varying degrees of predictiveness in terms of their word reading fluency skills and their progress throughout the latter half of the school year [7].

In an action research endeavor, 16 kindergarten students from a public pre-primary elementary school in the north-central United States participated in daily whole-group lessons featuring explicit phonemic awareness instruction and guided practice. The assessment tools included pre- and post-assessments in letter-sound fluency, phoneme isolating tests, and guided practice tests [8].

Assessments of phonemic awareness conducted at the outset of kindergarten have proven to be valuable in predicting students' reading abilities at the end of the first and second grades. Tests assessing phoneme blending, phoneme segmenting, phoneme elision, rapid automatized naming (RAN), and letter knowledge have all shown significant predictive power regarding future reading achievement when employed with kindergarten students [9].

Furthermore, Utami *et al.* focused on identifying methods to engage students in developing reading skills through a play-based approach [10]. The conventional approach, which often relies on boxed curricula with activities like drills and worksheets, does not fully cater to the diverse learning styles of students, recognizing that they have unique developmental needs. As the formative years of early literacy, a child's skills and development play a pivotal role in shaping their abilities and awareness. Kindergarten classrooms are thoughtfully designed as child-centered programs, fostering playful environments that support children's growth and development.

3. Research objectives

This study aimed to determine the effectiveness of the utilization of play-based learning as a means to enhance the phonemic awareness of kindergarten learners of Tangway Loob Elementary School.

More specifically, it aimed to address the following objectives:

(1) To determine the enhancement of phonemic awareness through play-based activities using the pre-test and post-test on the localized materials from the Division of Lipa City.

(2) To ascertain the difference in the pre-test and post-results.

4. Methods

4.1. Design

The study used a quasi-experimental design. Papadakis and Kalogiannakis defined quasi-experimental design as an empirical interventional study that does not use randomization to determine the causal effects of an intervention on the target population [11]. In this study, the researcher used the result of the pre-test and post-test as an indicator of the effectiveness of play-based learning activities in kindergarten in enhancing phonemic awareness. The quasi-experimental design enabled the researcher to make careful analysis and interpretation of the data as well as make inferences and generalizations out of the data gathered.

4.2. Sampling

A total of 20 kindergarten learners were chosen from Tangway Loob Elementary School. This constituted the participants of the study in as much as the objectives of the study revolved around the learners and the factors surrounding their behavior and performance. They were chosen using purposive sampling.

As defined, purposive sampling is a method of choosing a group of individuals based on a specific objective [12]. This type of sampling is appropriate to the present study since phonemic awareness which is the topic of this study is naturally honed during kindergarten age. This also targeted the specific participants which is related to what this study is looking for.

4.3. Instrument

The main instrument that was utilized in this study was the localized pre-test and post-test as indicated in the 3B'S (Bawat Bata Bumabasa) Program crafted from the Division of Lipa City and the Standardized ECCD checklist as a form of assessment. This instrument was already validated by experts and is appropriate to be used in this study.

4.4. Data collection

To fulfill the aims and objective of this study and explore previous research, the quantitative method of data collection was the most suitable using a quasi-experimental design. The main goal of quantitative research is to collect numerically objective data through statistics of the volume of data collected from large sample sizes [13]. From this information, this method of data collection was suitable for this study which focused on the enhancement of phonemic awareness through play-based learning activities in kindergarten using the pre-test and post-test on the localized materials from the Division of Lipa City.

The researcher asked for the permission of the school principal to conduct the study. Once approved, the researcher distributed the pre-test. The data was recorded to determine the baseline data. The play-based activities were implemented. After implementation, a post-test was conducted. The result was recorded to compare the two sets of data. From this, the researcher was able to conclude the effectiveness of play-based activities to improve phonemic awareness.

4.5. Data analysis

The following statistical procedures were used to interpret the data gathered from the respondents of the study – mean and paired *t*-test. Mean was used to interpret the level of phonemic awareness of the kindergarten learners based on their pre-test and post-test scores. To score the responses, the researcher used the scale below:

Range	Verbal interpretation
0 – 20	Not at all aware
21 – 40	Slightly aware
41 – 60	Somewhat aware
61 – 80	Moderately aware
81 – 100	Extremely aware

To compare the pre-test and post-test scores, a paired *t*-test was used. This tool identified significant differences in terms of letter sound fluency, blending, and segmenting. The effectiveness of play-based activities in improving phonemic awareness was validated by this statistical tool.

4.6. Ethical considerations

Researchers must uphold the highest standard of ethics when doing research. First and foremost, the researcher asked for the consent of the respondents of the study to participate in this academic endeavor. No one has been forced to participate. They were reminded that their decline to participate would be accepted professionally.

The researcher explained the objectives of this study so that the respondents would be informed about what they were about to do. The researcher ensured that the data would be treated with utmost confidentiality. Reproduction of the result was not permitted. The researcher immediately disposes of the data so that it will not be used for other purposes. The identity of the participants was hidden, and the data remained confidential.

5. Results and discussion

This part presents the analysis and interpretation of data presented in tables and supported with corresponding implications and theoretical bases on the effect play play-based learning activities on the enhancement of phonemic awareness.

5.1. Pre-test result on phonemical awareness

Phonemic awareness is the starting skill that must be honed to progress toward better reading skills. The level of awareness on this aspect will guide kindergarten learners into more complex skills. In this study, the researcher assessed the level of phonemic awareness of kindergarten pupils before the application of play-based learning activities. **Table 1** shows the pre-test scores on phonemic awareness.

Table 1. Pre-test results

Area	Mean	Interpretation
Letter sound fluency	37.14	Slightly aware
Blending	47.60	Somewhat aware
Segmenting	43.00	Somewhat aware
Grand mean	42.58	Somewhat aware

Based on the table, it can be gleaned that the kindergarten pupils are somewhat aware of phonemics. This means that the level of phonemic awareness of learners did not meet the average level. In terms of letter sound fluency, a slightly higher level was observed. However, in terms of blending and segmenting, there is a below-average awareness of phonemics. This means that the phonemic awareness of the pupils is lagging.

The result signifies a poor performance level in terms of phonemic awareness of pupils. This means that the pupils are lagging in this aspect as the intended expectations are not met. The result implies that the pupils have insufficient phonemic awareness. This may be attributed to the mismatch of strategies used in teaching phonemic awareness. Teaching pupils may need to be better strategized, which aligns with the preferences of learners.

Concerning this, Kenner *et al.* pointed out that phonemic awareness in most young children is developed earlier as they engage in their environment from the day they are born [6]. It is also determined that educators need to find the best time for instruction where children can improve their phonemic awareness. Once it was identified that young children learned phonemic awareness skills, the focus was to determine if the age, or grade level, of the child made an impact on phonemic awareness skills.

5.2. Post-test result on phonemical awareness

Play-based learning activities are the utilization of interesting tasks in which learning may also take place. In these activities, pupils become more engaged and at the same time get a grasp of the skills they intend to learn. In this study, the researcher conducted play-based activities to address the low level of phonemic awareness of kindergarten pupils. **Table 2** manifests the post-test results of the learners in terms of phonemic awareness.

Based on the table, it can be gleaned that the pupils are somewhat aware of phonemic awareness. However, it can be noted that the other indicators signify a good level of phonemic awareness. In terms of letter sound fluency, there is moderate awareness among pupils as well as in terms of blending. The learners still have a long way to go in terms of segmenting but show an improvement as compared to previous results.

Table 2. Post-test results

Area	Mean	Interpretation
Letter sound fluency	61.79	Moderately aware
Blending	64.80	Moderately aware
Segmenting	43.00	Somewhat aware
Grand mean	56.53	Somewhat aware

The result implies that the play-based activities helped the pupils to gain phonemic awareness. This result may be attributed to the inclusion of highly interesting tasks for learners that stimulate their attention and fuel their learning. Kindergarten learners need an element of play to gain their attention. It entails the creativity of teachers to supply engaging activities among learners.

According to Pyle *et al.* [4], play has been shown to benefit children's development and learning, different play contexts, such as free play and guided play, were effective tools in facilitating the development and learning of children. Children also need to have free play time in the classroom to explore and use their imagination. There have been many studies on the importance of free play in kindergarten classrooms and how to teach literacy in the classroom. Teaching with a child-centered approach instead of a teacher-driven approach can be very beneficial to young children.

5.3. Significant difference in pre-test and post-test results

To further determine whether the play-based activities have been effective, a significant difference was identified. In this study, the researcher conducted pre-tests and post-tests to compare the results. Differences in the pre-test and post-test scores prove the effectiveness of the activity to improve phonemic awareness. **Table 3** mirrors the comparison of the pre-test and post-test results of the learners.

Table 3. Comparison of pre-test and post-test results

Area	Computed value	*P* value	Decision on H_0	Interpretation
Letter sound fluency	-8.797	0.000	Reject	Significant
Blending	-12.608	0.000	Reject	Significant
Segmenting	0.000	1.000	Fail to reject	Not significant

Table 3 shows the comparison of pre-test and post-test scores. The result revealed that there is a significant difference in phonemic awareness in terms of letter sound fluency with a *P* value of 0.000. In terms of blending, there is a significant difference in the pre-test and post-test scores as revealed by the *P* value of 0.000. On the other hand, the phonemic awareness of kindergarten pupils in terms of segmenting was revealed to be not significant as shown by the *P* value of 1.000.

The result implies that the play-based activities are effective in increasing the phonemic awareness of the kindergarten pupils in terms of letter sound fluency and blending. This means that the pupils benefited from the utilization of play-based activities. On the other hand, play-based activities have no significant impact in terms of segmenting. This means that there is a need to focus on this area and refine the activities.

Moreover, Utami *et al.* focused on finding ways to help students get inclined to reading skills while using a play-based approach [11]. The traditional way of teaching which uses the boxed curricula on different skills

like drills and worksheets does not solely help learners to engage in their developmental needs as learners have different learning styles covering their differences. As the foundation years of early literacy, children's skills and development are crucial in how to build their skills and awareness. Kindergarten classrooms are designed as child-centered programs with playful contexts for children to grow and develop.

6. Conclusions and recommendations

6.1. Conclusions

This study focused on determining the effectiveness of the utilization of play-based learning in enhancing literacy in kindergarten as the basis for reading innovation among the learners of Tangway Loob Elementary School. This section presents the conclusions made based on the objectives of this study.

(1) There is a low level of phonemic awareness among kindergarten pupils.
(2) Most of the learners have poor letter sound fluency.
(3) The utilization of play-based activities helps in the improvement of phonemic awareness.
(4) Play-based activities did not affect segmenting skills.
(5) Letter sound fluency and blending can be improved through play-based activities.

6.2. Recommendations

This section presents a recommendation that can help address the issue of low phonemic awareness of kindergarten learners.

(1) School leaders and managers may include play-based activities in the curriculum focusing on reading skills.
(2) Teachers handling kindergarten may utilize a series of play-based activities to improve phonemic awareness.
(3) Parents may introduce play-based activities at home to hone the phonemic awareness of learners.
(4) Similar studies may be conducted on a wider scale to verify the effectiveness of play-based activities.

Disclosure Statement

The author declares no conflict of interest.

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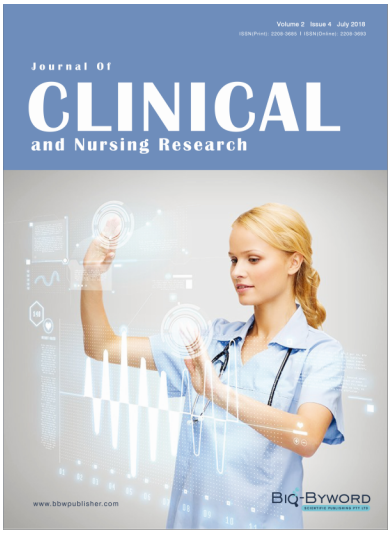

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