

May Siyensya sa mga Istorya: Building Connections in Early Childhood Education through Arts Integrated Science for Kindergarten Learners

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ABSTRACT

This study aimed to develop an Arts Integrated Science Storybook in the Mother Tongue for Kindergarten Learners, utilizing a mixed-method research design following the design thinking methodology. The learning resource, comprising 40 stories, was created with the objective of aiding teachers and parents in instructing young learners about various science concepts outlined in the curriculum. By reading the stories and engaging in the activities provided in the learning material, the intention was to facilitate learning. The researcher assessed the opinions of experts, parents, Kindergarten teachers, and Kindergarten learners. The art-based integrated learning resource was found to be very satisfactory in terms of content, format, presentation, organization, accuracy, and up-to-dateness of information. Focusing on the child's critical and creative domains, the study emphasized specific curriculum outcomes for science. It was concluded that the instructional design and curriculum for science in Kindergarten should strike a balance between these two types of learning experiences.

Keywords:

Arts Integrated, early childhood education, Science Storybook, learning material

Introduction

The early formative years of child development are widely regarded as the most critical stage of their growth. During this phase, their minds are seen as flexible and open, providing an ideal environment for exploration and discovery (Center on the Developing Child at Harvard University, 2007). Recognizing this, the establishment of early childhood education

is strongly advocated by the Department of Education emphasizes kindergarten as a pivotal period transitioning from informal to formal literacy, crucial for fostering positive experiences and determining school readiness (UNESCO, 2007).

Given children's natural curiosity during this phase, introducing correct science concepts, is considered essential for holistic development (National Scientific Council on the Developing Child, 2004).

A transformative approach of integrating science concepts with mother tongue through arts-based storytelling in teaching early childhood education is deemed to be the answer to the recurring problem with low student engagement and performance (UNESCO, 2017).

Research indicates that young learners grasp advanced STEM concepts and enjoy exploring such subjects (DeJarnette, 2018). STEM education not only builds science and math knowledge but also nurtures creative, critical, and analytical thinking (Tozlu et al., 2019).

Arts integration in STEM curricula promotes the development of 21st-century skills, fostering creativity, critical thinking, collaboration, and communication (Palomaria, 2019). Embedding arts-based activities into conventional lessons enhances learning outcomes, facilitates knowledge transfer, and fosters interdisciplinary connections (Burnaford et al., 2007).

Since the introduction of the K-12 program in 2012, the Department of Education in the Philippines has integrated Mother Tongue-based Multilingual Education into the curriculum for kindergarten through Grade 3 students. Utilizing the Mother Tongue as the medium of instruction in early childhood education is vital for comprehensive development, cognitive enhancement, and cultural preservation. Republic Act No. 10157 and Republic Act No. 10533 underscore the importance of nurturing students in their native language for their comprehensive growth, as highlighted in DepEd Order No. 16, s. 2012.

Mother Tongue-Based Multilingual Education has demonstrated its ability to enhance the academic achievements of young learners in the early grades. Teaching in the mother tongue has proven beneficial in several ways: students can articulate

their thoughts more freely, leading to increased participation in classroom discussions; students develop independence in how they express themselves, and the mother tongue aids in clarifying the meanings of certain English words (Alberto et al., 2016).

On the other hand, the scarcity of educational resources in the Mother Tongue poses a significant challenge for educators aiming to deliver culturally appropriate lessons. Teachers face challenges in teaching reading, writing, speaking, and listening skills. Obstacles like the unavailability of materials tailored to the mother tongue and difficulty accessing them have impeded students' complete involvement in the learning process (Abucayon et al., 2023).

In a study conducted by Alberto et al., (2016), in terms of reading, there's a shortage of materials, and understanding complex Hiligaynon terms is difficult. For writing, teachers lack resources to improve students' skills, and spelling Hiligaynon words is challenging due to their length and complexity.

The integration of art, language, and science in early childhood education can create an enriching environment conducive to inclusive learning, sparking curiosity, nurturing creativity, and establishing the groundwork for lifelong scientific exploration and inclusive science culture. Hence, the development of "May Siyensya sa mga Istorya," an Arts-Integrated Science Storybook in the Mother Tongue, seeks to address these needs. Crafted based on the K to 12 Curriculum, this material aims to facilitate the teaching of science concepts to kindergarten learners through engaging stories and activities, fostering cognitive, affective, and psychomotor domains.

Context and Objectives of the Study

This study integrates insights from Maria Montessori's emphasis on early education, instructional material theories, Lev Vygotsky's views on learning materials, the cognitive load theory, storytelling techniques' impact on children's development, and the importance of early arts education. These perspectives collectively highlight the critical role of early childhood experiences in shaping cognitive abilities, learning outcomes, and holistic development.

It specifically sought to answer the following questions:

1. What are the insights of kindergarten teachers, parents and experts about what lessons, activities and strategies are appropriate for the developmental level of kindergarten learners?
2. What arts integrated science learning materials can be developed to facilitate effective teaching-learning process among kindergarten learners?
3. What is the assessment of the teachers and pool of experts towards the developed Arts Integrated Science Storybook for Kindergarten in terms of content, format, presentation and evaluation of the instrument?
4. What is the acceptability level of the Arts Integrated Science Storybook in Mother Tongue among Kindergarten?
5. What are the experiences of Kindergarten teachers after using the Arts Integrated Science Storybook in Mother Tongue?

Methodology

Research Design

The study employed the Mixed Method Research Design, guided by the five-stage Design Thinking model advocated by the Hasso-Plattner Institute of Design at Stanford University (Empathize, Define, Ideation, Prototype, and Testing).

Mixed-methods research (MMR) is an approach that integrates various methods to effectively and systematically address research questions (Bryman, 2012; Creswell, 2015; Creswell & Plano Clark, 2011). This methodology includes the collection, analysis, interpretation, and reporting of both qualitative and quantitative data.

- Design Thinking (DT) is a methodology focused on developing solutions to address problems. This research methodology is accomplished by understanding the human needs involved, re-framing the problem in human-centric ways, creating multiple ideas in brainstorming sessions, and adopting a hands-on approach in prototyping and testing (Sharlip, 2019). Design thinking as a process that combines analytical and creative elements, allowing individuals to experiment, develop and prototype models, collect feedback, and make revisions (Razzouk and Shute, 2012).

Research Participants and Procedure

The study participants, primarily kindergarten teachers with a minimum of 5 years of experience, were selected based on specific criteria, including teaching tenure and involvement in early childhood education activities. These participants were divided into groups for different stages of the study. Initially, for the empathize phase, 10 kindergarten teachers, 5 parents, and 2 early childhood education experts were interviewed to gather insights on appropriate lessons and activities for kindergarten learners. Subsequently, during the prototype testing phase, 4 kindergarten teachers were chosen to assess the developed arts-integrated science storybook. Lastly, for the evaluation phase, 4 kindergarten teachers, 1 Grade Three Science Teacher, an Education Program Supervisor, and the LRMSD Division Coordinator were identified to evaluate the

learning material, while an additional 4 kindergarten teachers were interviewed about their experiences with the material.

The researcher utilized primary data sources, creating an interview guide for obtaining insights from respondents regarding suitable lessons, activities, and strategies for kindergarten learners. This guide underwent face and content validation by experts. Additionally, the researcher adapted the DepEd's Rating Sheet for Print Resources to evaluate the learning material based on content, format, presentation, organization, accuracy, and up-to-datedness. Kindergarten pupils also rated the material's acceptability using emoticons, indicating their level of enjoyment and interest. Another interview guide was used to gather data on respondents' experiences in teaching science using the arts-integrated storybook, which also underwent validation by experts.

Data Collection and Analysis

Before commencing the study, permissions and assistance were obtained from the Office of the Schools Division Superintendent and Elementary School Principals in Passi City. In the empathize stage, interviews were conducted with kindergarten teachers, parents, and experts to gather insights on suitable lessons and activities for teaching Science to kindergarten learners, informing the development of the arts-integrated science storybook in the mother tongue. The define stage involved analyzing and synthesizing gathered data through thematic analysis, leading to the identification of appropriate learning material and included lessons for kindergarten science instruction. The ideation stage focused on conceptualizing an Arts Integrated Science Storybook in the Mother Tongue based on the results of the previous stages. During the prototype stage, the researcher crafted the storybook, ensuring alignment with the DepEd Curriculum Guide for Kindergarten and considering feedback from teachers and learners.

Grammar editing was conducted to ensure accuracy and suitability for the students' level of understanding. The instructional material underwent initial drafts, advisor feedback, and revisions, followed by face and content validation by experts. The testing and evaluation stage involved prototype testing in a selected public elementary school, coordination with the Passi City administration, and submission for content and face validation by curriculum and early childhood education experts. Final revisions were made before finalization.

In the initial phase of the study, kindergarten teachers, parents, and experts were interviewed to gather insights. The data analysis involved narrative analysis, including transcribing, coding, and identifying common themes to capture the informants' voices and experiences. The researcher immersed herself in the data by carefully studying videos and notes before transcribing the interviews. The transcripts included pseudonyms to protect identities and were analyzed to determine initial codes and themes. Matrices were created to group data sharing similar themes, and these themes were reviewed to align with the study's objective.

The developed Arts Integrated Science Storybook underwent content and face validation by jurors, along with evaluation using the DepEd's Rating Sheet for Print Resources. Comments and suggestions from jurors were considered for incorporation into the final instructional material. Evaluation was conducted using a four-point rating scale, assessing content, format, presentation, organization, and accuracy of information. Results were analyzed using mean and standard deviation, presented in tabular form, including a separate table indicating the acceptability level among kindergarten learners using emoticons.

Results and Discussion

A descriptive analysis of transcripts during the interviews revealed that three major themes characterized the informants' responses as regards the appropriateness of learning materials for kindergarten pupils. Video recordings were utilized to capture the informants' perspectives. To gain familiarity with the content of the recorded audio and video, these were repeatedly listened to and were transcribed verbatim. Matrices were prepared for the content analysis of the verbal narrative. Significant statements were extracted and categorized into related cluster to be able to cull out themes. The themes, however, were not to be interpreted as independent from each other but as

complementary aspects of a unified pattern. The questions in the interviews were asked in English but informants were encouraged to respond in the vernacular if they find it easier to freely share their thoughts about the issue. Most of them, however, tried to respond in English, though it seemed that it was found to be a barrier for them to convey ideas more openly and freely. The goal was to turn data into a story to capture the informants' voices, emotions and experiences.

The two themes from the transcripts of the informants were: (1) The Need for Arts Integration in the Curriculum and (2) The Need for a Localized Context and Medium of Instruction.

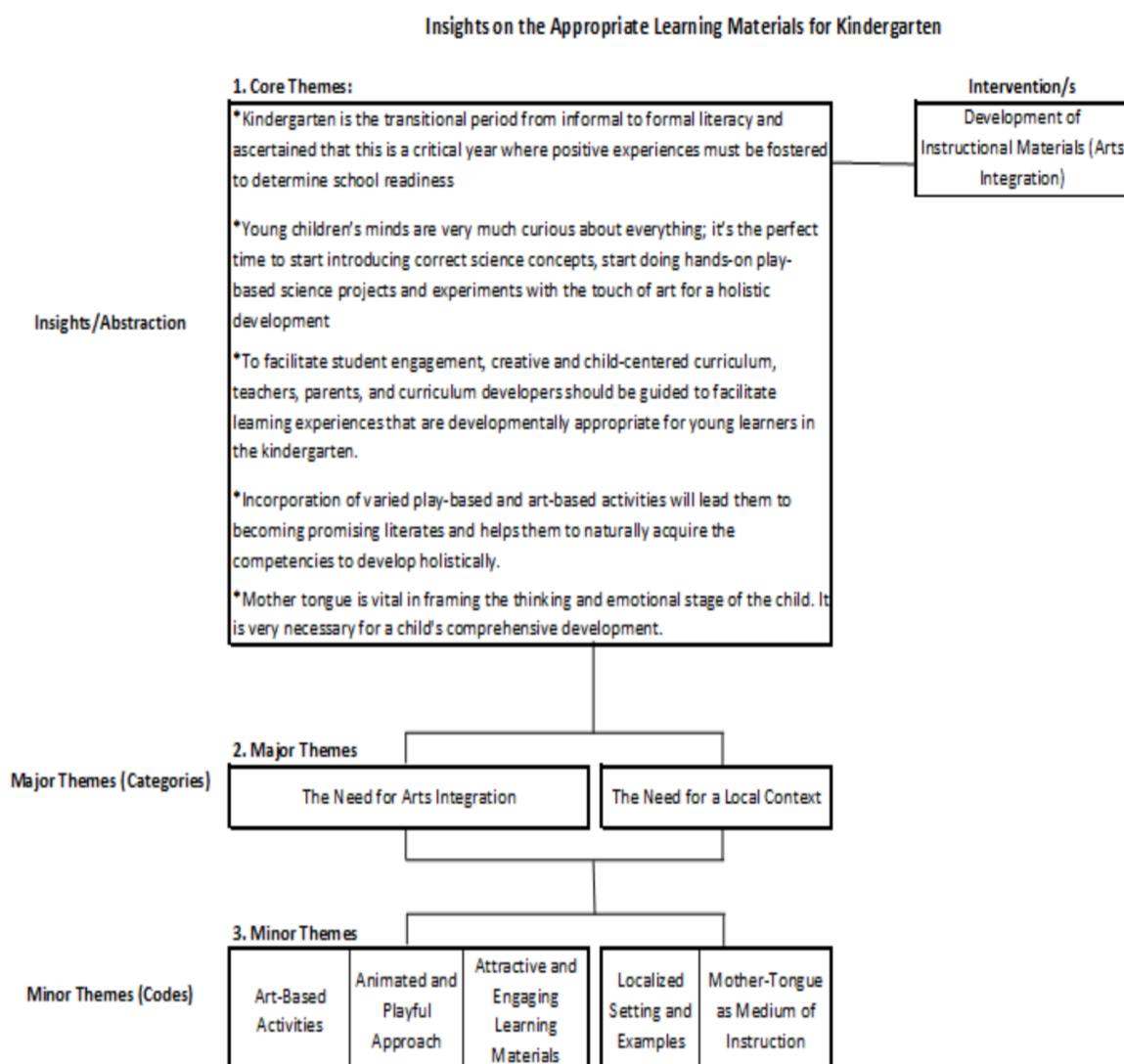


Figure 1. Thematic Framework showing Results of the Study

The Need for Arts Integration in the Curriculum

Experts' Evaluation. Experts emphasize the crucial role of arts integration in education, providing students with opportunities to explore materials and their own identities. Teachers stress the importance of colorful illustrations and interactive activities to enhance engagement and creativity. Arts integration fosters critical thinking and communication skills, making learning more meaningful. This approach is supported by research, which highlights how combining arts with core subjects' helps children express themselves and retain information effectively. For instance, children may remember concepts better through singing, drawing, or dancing, making learning enjoyable and memorable.

Empathizing Kinder Teachers. In the classroom, art plays a crucial role in enhancing creativity, imagination, and attention span among students. Teachers emphasize the importance of integrating arts not only in science but across all subjects, as it fosters enjoyment and critical thinking. Kindergarten educators highlight the benefits of interactive classes and mother tongue-based materials in facilitating learning. They stress that arts integration supports educators and enhances student engagement and understanding. The use of tools like the Arts Integrated Science Story Book effectively combines art with traditional subjects, resulting in hands-on learning experiences that align with Gardner's Theory of Multiple Intelligences. Overall, integrating art into education enhances learning outcomes and reduces teacher workload.

Empathizing Kinders, Parents. Learning can be engaging and dynamic when parents employ various methods to capture their children's attention. Parent 1 advocates for using songs and colorful illustrations to teach the ABCs, emphasizing the importance of engaging activities. Parent 2 supports integrating arts into science subjects, noting

that interactive learning aids in identifying body parts. Dissatisfaction with dull instructional materials is echoed by Parent 3, underscoring the need for vibrant and engaging resources. Parent 4 endorses integrating arts across subjects to enhance student engagement. Parent 5 appreciates innovative approaches that make teaching enjoyable for both children and educators. These observations are reinforced by research from Celebree School, highlighting the multifaceted benefits of art in childhood education.

Defining the Need for Local Context

Kindergarten serves as a critical developmental stage, where all instructional materials and activities are advocated to be in the child's mother tongue, aligning with the Mother Tongue-Based Multilingual Education (MTB-MLE) mandated by relevant educational acts. This approach promotes inclusivity, faster understanding, and cognitive development. Teachers and parents unanimously stress the importance of mother tongue instruction, citing its effectiveness in captivating learners' attention and facilitating comprehension through engaging stories and illustrations. Research underscores the cognitive benefits of MTB-MLE, particularly in enhancing literacy and cognitive development. The Philippines stands out in Southeast Asia for its national policy mandating MTB-MLE in primary education, serving as a model for the region. Despite widespread satisfaction with increased student understanding, further research is needed to explore the long-term implications of this policy in localized educational contexts.

Ideation of the Learning Material

The findings underscore the necessity for intervention, prompting the development of a learning material tailored for Kindergarten Teachers and Pupils.

This material, aligned with the Kindergarten Curriculum Guide, focuses on the "Understanding the Physical and Natural Environment" domain, specifically addressing three sub-domains: Body and the Senses, Animals, and Plants. Each sub-topic is structured into weekly content focuses, further delineated into daily learning objectives. The researcher has created 40 distinct stories based on this framework, covering the three sub-domains and organized according to the Department of Education's Kindergarten Teacher's Guide recommendations.

Table 1 outlines the sub-domains within the Understanding the Physical and Natural Environment domain. These materials were crafted based on insights gleaned from interviews with kindergarten teachers, parents, and experts during the empathize stage. Following this, the researcher refined the initial draft in collaboration with the research adviser, incorporating feedback received. Subsequently, the revised instructional materials were evaluated by a panel of experts, teachers, and kindergarten pupils to gather ratings, comments, and suggestions for further enhancement (Table 2).

Table 1

Sub-domains within the Understanding the Physical and Natural Environment domain (from Kindergarten Curriculum Guide)

SUB-DOMAIN	STANDARDS		LEARNING COMPETENCIES	CODE
	CONTENT	PERFORMANCE		
	<i>The child demonstrates an understanding of...</i>	<i>The child shall be able to...</i>		
Life Science: Body and the Senses (BS)	body parts and their uses	take care of oneself and the environment and able to solve problems encountered within the context of everyday living	1. Identify one's basic body parts	PNEKBS-Id-1
			2. Tell the function of each basic body part	PNEKBS-Id-2
			3. Demonstrate movements using different body parts	PNEKBS-Ic-3
			4. Name the five senses and their corresponding body parts	PNEKBS-Ic-4
			5. Use the senses to observe the environment	PNEKBS-Ic-5
			6. Use the senses to observe and perform simple experiments in classifying objects (e.g., texture – soft/hard, smooth/rough; taste – salty, sweet, sour)	PNEKBS-Id-6
			7. Identify one's basic needs and ways to care for one's body	PNEKBS-II-8
			8. Practice ways to care for one's body	PNEKBS-II-9
Life Science: Animals (A)	characteristics and needs of animals and how they grow	communicate the usefulness of animals and practice ways to care for them	9. Describe how one grows and changes	PNEKBS-IJ-7
			1. Name common animals	PNEKA-Ie-1
			2. Observe, describe, and examine common animals using their senses	PNEKA-IIIh-2
			3. Group animals according to certain characteristics (how they look/ body, coverings/parts, how they move, sounds they make, what they eat, where they live)	PNEKA-IIIi-4
			4. Identify the needs of animals	PNEKA-III g-5
Life Science: Plants (P)	characteristics and growth of common plants	communicate the usefulness of plants and practice ways to care for them	5. Identify ways to care for animals	PNEKA-III g-6
			6. Identify and describe how animals can be useful	PNEKA-III g-7
			7. Name common plants	PNEKP-IIa-7
			8. Observe, describe, and examine common plants using their senses	PNEKP-IIb-1
			9. Group plants according to certain characteristics, e.g., parts, kind, habitat	PNEKP-IIb-8
			10. Identify needs of plants and ways to care for plants	PNEKP-IIb-2
11. Identify and describe how plants can be useful	PNEKP-IIIf-4			

Table 2*Content focus of the materials*

Week	Content Focus	Monday	Tuesday	Wednesday	Thursday	Friday
6	I have a body and I can do many things with my body.	I have a body. My body has different parts.	I have two hands and each hand has five fingers. My hands are connected to my arms and shoulders. I can clap, write, paint, draw with my hands.	I have two feet and each foot has five toes. My feet are connected to my legs. I can walk, run, hop, jump with my legs and feet.	My heart, lungs, and stomach are inside my body. My heart beats so it can pump blood into the body. My lungs help me to breathe. My stomach stores the food I eat.	The different parts of my body work together.
7	I can see and hear.	I have a face. My face has different parts. Each part has its use.	I have two eyes. I see with my eyes. I can see different colors and shapes with my eyes.	I can take care of my eyes.	I have two ears. I can hear with my ears. I can hear different sounds with my ears.	I can take care of my ears.
8	I can smell, taste and touch.	I have a nose. I can smell with my nose.	I can feel soft and hard objects with my hands.	I can feel smooth and rough objects with my hands.	I have a mouth, teeth, lips and tongue. These help me speak and eat.	I can taste with my tongue. I can identify different tastes.
9	I can take care of my body.	I keep my body clean by taking a bath. I use soap for my body and shampoo for my hair.	I wash my hands before and after eating. I brush my teeth after I eat.	I exercise every day to make my body strong. I play different sports to strengthen my muscles.	I take vitamins for added nutrients. (include good and bad drugs/ medicines)	I get enough sleep so that my body can rest.
33	We have plants in the environment.	We have plants in the environment.	Plants have different parts.	The parts of the plants have functions.	Plants help us in many ways. Plants provide food.	Plants help us in many ways. Plants are used as medicine and provide material for making objects.
34	We care for plants in the environment.	Plants need water and sunlight.	Plants need soil or something to live on.	Plants need air.	We care for plants in the environment.	
35	We have animals in the environment.	We have animals in the environment.	Animals live in different places.	Animals have different body parts.	Animals move in different ways.	Animals help us in different ways.
36	We care for animals in the environment.	We take care of animals. We call these animals pets.	Pets live in humans' homes.	Animals need a home. Some live in the zoo and other places where humans care for them.	Animals need food to live.	Animals need love and care.

Development of the Learning Material

The Design Thinking Process was employed to create the learning materials, specifically the Arts Integrated Science Storybook in Mother Tongue for Kindergarten Learners. Developed based on insights from interviews with teachers and key informants, the materials align with the Kindergarten Curriculum Guide. Each lesson was carefully structured to suit the students' level of understanding and interest. Grammar editing ensured accuracy and sequential discussions. Feedback from

a research adviser and experts guided revisions. The resulting learner's material, titled "May Siyensya sa mga Istorya – An Arts Integrated Science Storybook in Hiligaynon," integrates science concepts into stories using an art-based approach. It focuses on developmental domains such as Understanding of the Physical and Natural Environment and Language, Literacy, and Communication. The material aims to strengthen the Science culture among young learners and facilitate the teaching of science concepts related to the human body, plants, and animals. Preparation involved extensive

story development, translation, proofreading, and illustration. The final material comprises forty stories structured with preliminaries, content, and learning

activities to enhance comprehension and engagement while promoting hands-on science activities and arts integration (Figure 2).



Figure 2. The developed material

Prototype Testing: May Siyensa sa Mga Istorya

Prototype testing is a crucial step in the design thinking process, aimed at validating the effectiveness of learning content. The process involves obtaining insightful feedback from actual users to determine if improvements are needed. In this study, a mock-up version of the Arts Integrated Science Storybook in Mother Tongue was developed and tested with kindergarten pupils at Passi I Central School. Approval was obtained from the school principal and division superintendent prior to the trial. During the pilot testing, conducted with seventeen kindergarten pupils, stories were read and art-based activities were incorporated into the lesson. Pupils rated the material and activities, while an expert observed the class to assess learning facilitation.

The copies were furnished to 3 jurors who acted as pool of experts for content and face validation following the adapted Evaluation Rating Sheet for Print Resources of the Department of Education for evaluation using the following scoring and description

such as (4) Very Satisfactory, (3) Satisfactory, (2) Poor, and (1) Not Satisfactory, in the specific areas evaluated which are Content, Format, Presentation and Organization, and Accuracy and Up-to-Datedness of Information.

The results showed that in terms of the Content, the pool of experts found the materials Very Satisfactory ($M=3.71$, $SD=0.00$). This implies that the material is suitable to the student's level of development, contributes to the achievement of specific objectives of the subject area and grade level, and provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing, inquiry, problem solving, etc.

In terms of Format, the pool of experts rated the materials as Very Satisfactory ($M=3.68$, $SD=0.68$). This implies that the printing is of good quality, the illustrations are attractive and easily recognizable, the design and layout has harmonious bending of elements, the paper and binding is durable and the size and weight is relatively light and easy to handle.

Presentation and Organization of the Materials of the materials was generally rated as Very Satisfactory ($M=3.80$, $SD=0.35$). This implies that the presentation is engaging, interesting and understandable. There is also a logical and smooth flow of ideas and the length of the sentences is suited to the comprehension level of the target reader.

With regard to Accuracy and Up-to-Datedness of Information, the pool of experts rated the materials as Very Satisfactory ($M=3.67$, $SD=0.00$).

This implies that the materials have no conceptual, factual, grammatical, computational, typographical and other minor errors. The information is not obsolete.

The pool of experts also indicated in their suggestions to further improve the material. These suggestions were considered in the further refinement of the developed learning materials. Since the experts found the materials to substantially Very Satisfactory in all factors, it is therefore imperative to follow their recommendations to utilize the material for kindergarten classes. The data are shown in table 3.

Table 3

Pool of Experts' Ratings of the Developed Learning Materials

Criteria	Mean	SD	Description
Content	3.71	0.00	Very Satisfactory
Format	3.68	0.13	Very Satisfactory
Presentation and Organization	3.80	0.35	Very Satisfactory
Accuracy and Up-to-Datedness of Information	3.67	0.00	Very Satisfactory

Scale: 3.25-4.00 "Very Satisfactory", 2.51-3.25 "Satisfactory", 1.76-2.50 "Poor", 1.00-1.75 "Not Satisfactory"

Learning Materials as Evaluated by the Teachers

Copies of the instructional materials were also given to five teachers who were purposively selected by the researcher. These teachers are public and private kindergarten teachers who are actually teaching Kindergarten and are considered as experts on the curriculum and the subject matter. Since these teachers conduct classes every day, they have first-hand knowledge on the experiences of a kindergarten instructor on what difficulties they have encountered, what activities can be engaging, what strategies can elicit engagement among learners. They were purposively chosen according to the criteria and the need set at the start of the study. They were considered based on the length

of service rendered or the teaching experience and participation in early childhood seminars and trainings. Teacher respondents have a minimum of 5 year teaching experience in handling the kindergarten learners.

These experiences matter most especially in the development of a learning material that will be primarily used by the pupils as these will serve as bases and baseline of on how the lessons will be crafted and delivered. The experiences of the purposively selected kindergarten learners are very valuable because they are one of the clientele of the developed learning materials. Also they are the ones interacting with the kindergarten learners on the daily basis thus they are the best persons who know what learning materials are suited to

the developmental level of the students. Their insights are very much needed to improve the developed learning materials as they can make suggestions and recommendations on how to improve the stories and activities in the book.

The developed learning material was evaluated following the adapted Evaluation Rating Sheet for Print Resources of the Department of Education for evaluation using the following scoring and description such as (4) Very Satisfactory, (3) Satisfactory, (2) Poor, and (1) Not Satisfactory, in the specific areas evaluated which are Content, Format, Presentation and Organization, and Accuracy and Up-to-Datedness of Information.

The results showed that in terms of the Content, the pool of experts found the materials Very Satisfactory ($M=3.83$, $SD=0.12$). This implies that the material is suitable to the student's level of development, contributes to the achievement of specific objectives of the subject area and grade level, and provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing, inquiry, problem solving, etc.

In terms of format, the pool of experts rated the materials as Very Satisfactory ($M=3.70$, $SD=0.15$). This implies that the printing is of good quality, the illustrations are attractive and easily recognizable, the design and layout has harmonious bending of elements, the paper and binding is

durable and the size and weight is relatively light and easy to handle.

Presentation and Organization of the Materials of the materials was generally rated as Very Satisfactory ($M=3.64$, $SD=0.26$). This implies that the presentation is engaging, interesting and understandable. There is also a logical and smooth flow of ideas and the length of the sentences is suited to the comprehension level of the target reader.

With regard to Accuracy and Up-to-Datedness of Information, the pool of experts rated the materials as Very Satisfactory ($M=3.93$, $SD=0.15$). This implies that the materials have no conceptual, factual, grammatical, computational, typographical and other minor errors. The information is not obsolete.

The highly positive teacher evaluation result shows that the created learning content is developmentally suitable for the students. It is engaging, comprehensible, and interesting. It is "entertaining" and arouses interest, encouraging more in-depth analysis of the subject. Through the usage of the created learning materials, the students are more involved in the class. The designed learning materials are written in a friendly and conversational tone and are prepared at an appropriate reading level for the students, which increases student engagement and increases learning. The data are shown in table 4.

Table 4
Teachers' Ratings of the Developed Learning Materials

Criteria	Mean	SD	Description
Content	3.83	0.12	Very Satisfactory
Format	3.70	0.15	Very Satisfactory
Presentation and Organization	3.64	0.26	Very Satisfactory
Accuracy and Up-to-Datedness of Information	3.93	0.15	Very Satisfactory

Scale: 3.25-4.00 "Very Satisfactory", 2.51-3.25 "Satisfactory", 1.76-2.50 "Poor", 1.00-1.75 "Not Satisfactory"

Learning Materials as Evaluated by the Learners

The developed instructional materials were then pilot-tested to seventeen (17) selected kindergarten pupils. Prior to the conduct of the study, permission to conduct the study and other forms of assistance was secured from the Office of the Schools Division Superintendent, Schools Division of Passi City as well as from the Elementary School Principals and Elementary School Heads. Also the researcher sends out the Parental or Guardian Permission Form for Research Involving a Minor. The researcher explained in the consent form purpose of the research, procedure to be followed, and statement of confidentiality and ensured Voluntary learner participation in the prototype testing. The researcher ensured that the kindergarten learners during the

conduct of the prototype testing activity will not be harmed in anyway.

The developed learning material was evaluated by the pupils using face emoticons and followed the following scoring and description such as (3) Excited Face Emoticon – Very Satisfactory, (2) Smiling Face Emoticon – Satisfactory, and (1) Angry Face Emoticon – Not Satisfactory.

Based on the evaluation, all seventeen (17) pupils raised excited face emoticons when asked to rate the materials based on content, format, presentation and organization and accuracy and up-to-datedness of information. This implies that the pupils found the developed material as engaging and very satisfactory.

Table 5
Learners' Ratings of the Developed Learning Materials

Criteria	Mean	SD	Description
Content	3	0.00	Very Satisfactory
Format	3	0.00	Very Satisfactory
Presentation and Organization	3	0.00	Very Satisfactory
Accuracy and Up-to-Datedness of Information	3	0.00	Very Satisfactory

Scale: 1-1.66 “Not Satisfactory”, 1.67-2.33 “Satisfactory”, 2.34-3.00 “Very Satisfactory”

Experiences of Kindergarten Teachers in Using the Developed Learning Material

The use of Arts Integrated Science Story Books not only enhances science education but also extends to various subjects, school activities, and instructional materials. Kindergarten teachers and parents have noted the positive impact of these books on students' engagement and learning outcomes. Teachers find it easier to deliver instruction with the help of these storybooks, which make learning fun and exciting for students. Parents also appreciate the joy their children experience

while learning with colorful illustrations and engaging activities.

The positive response from both teachers and parents validates the effectiveness of Arts Integrated Science Story Books in early education. Studies support the notion that integrating art into the curriculum enhances student engagement and fosters deeper learning. Early childhood is seen as a crucial time for sowing the seeds of critical thinking and innovation, with STEM activities playing a vital role in developing scientific and problem-solving skills from a young age.

Conclusions and Recommendations

Language is fundamental for thinking, communication, and exchanging ideas (Saeed, Iqbal, & Azam, 2012). Vygotsky highlighted its role in mediating higher-order thinking (Jones & Araje, 2002). Kindergarten is recognized by the Department of Education as a crucial transitional period for literacy development, emphasizing the need for positive experiences to ensure school readiness (K to 12 Kindergarten Curriculum Guide, 2016).

The K to 12 science curriculum aims to cultivate scientific literacy among students, enabling them to make informed decisions about scientific applications with societal, health, or environmental implications. It integrates science and technology across various life domains, focusing on understanding scientific knowledge, applying inquiry skills, and fostering scientific attitudes and values (K to 12 Kindergarten Curriculum Guide, 2016). The study yielded several key findings:

Emphasize Stage Results: The study identified a clear need to incorporate art-based activities and approaches into the Kindergarten Curriculum. Additionally, localization of lesson contexts and the use of Mother-Tongue as the medium of instruction and in learning materials emerged as important considerations.

Ideation Stage: Drawing insights from the narratives collected, the researchers developed an art-based integrated learning material comprising 40 stories, with Mother-Tongue serving as the medium of instruction.

Prototype Testing and Evaluation: Following prototype testing and evaluation, both a pool of experts and teachers rated the developed learning materials as Very Satisfactory across various dimensions, including Content, Format, Presentation and Organization, and Accuracy and Up-to-datedness of Information.

Pupil Feedback: Kindergarten pupils overwhelmingly responded positively to the developed reading material, with 100% of them expressing excitement through Excited-Face Emoticons, indicating their high level of satisfaction.

Teacher Feedback: Teachers provided positive feedback, expressing enjoyment in using the prototype learning material. They suggested producing more similar materials due to their perceived creativity, interactivity, and ease of understanding compared to other instructional materials. This feedback underscores the effectiveness and potential of the developed learning materials in enhancing the learning experience for both teachers and students.

The study identified persistent issues hindering effective science teaching, notably the lack of arts integration and localization in curriculum. To address these, an Art-Based Integrated Storybook was developed to ease teaching burdens and enhance learning experiences. The study's implications draw upon Empowerment Theory by Ledwith (2005), advocating for empowering teachers to shape critical thinking and consciousness. Gagne's Instructional Design Theory (1998) underscores the need for tailored instructional materials, suggesting proactive initiatives by educational institutions.

Teachers play a crucial role in material development, supplementing existing resources and fostering student empowerment. The study emphasizes the importance of adapting teaching materials to students' needs and interests, highlighting the role of teachers as agents of change. The output, an Arts integrated science Storybook, reflects the Design Thinking Process framework, offering 40 stories with art-based activities for each learning competency.

The study underscores the importance of integrating science and arts in learning materials to foster young learners' engagement and interest. Teachers, parents, and curriculum creators should prioritize developmentally appropriate, interactive, and colorful materials to stimulate student creativity and engagement. These materials can serve as valuable resources for lesson planning and instructional delivery, allowing teachers to focus on effective teaching strategies rather than searching for resources. School administrators can utilize the study's findings to enhance teacher training seminars and choose relevant topics. LRMSD Coordinators can incorporate the developed materials into their repository and guide educators in efficient instructional delivery.

The study recommends supplementing existing Department of Education resources with newly developed materials, considering missed lessons and alternative pedagogical strategies. Curriculum developers can align these materials with educational goals, providing authentic learning experiences for students. Textbook authors can use the study's findings to enrich their materials and ensure mastery of required competencies. Finally, the study suggests replicating similar research on a broader scale to validate and reinforce its findings.

References

- Abucayon, R. L., Dinoro, A. P., Fajardo, L. L., Parmisana, V. R., Semilla, J.-R. B., & Tabudlong, J. M. (2023). Innovation in early reading instruction: The development of e-learning materials in mother tongue. *International Journal of Learning, Teaching and Educational Research*, 22(7), 411–433. <https://doi.org/10.26803/ijlter.22.7.22>
- Alberto, Rosario and Gabinete, Sunny and Rañola, Vanessa, Issues and Challenges in Teaching Mother Tongue-Based Multilingual Education in Grades II and III: The Philippine Experience (April 22, 2016). Available at SSRN: <https://ssrn.com/abstract=2768558> or <http://dx.doi.org/10.2139/ssrn.2768558>
- Burnafor, G., Brown, S., Doherty, J., & McLaughlin, H. J. (2007). Arts integration frameworks research and practice: A literature review. Washington, DC: Arts Education Partnership.
- Bryman, A. (2012). Social research methods (4th ed.). Oxford university press.
- Creswell, J. W. (2015). A concise Introduction to Mixed Methods Research. Sage Publications Ltd. Center on the Developing Child at Harvard University. (2007). The science of early childhood development: Closing the gap between what we know and what we do. Retrieved from <http://developingchild.harvard.edu>
- Creswell, J. W., & Plano Clark, V. L. (2011). Designing and Conducting Mixed Methods Research. Sage Publications
- DeJarnette, N. K. (2018). Implementing STEAM in the early childhood classroom. *European Journal of STEM Education*, 3(3), 1-9. <https://doi.org/10.20897/ejsteme/3878>
- Department of Education (DepEd), Republic of the Philippines. (2012). Republic Act No. 10157: Kindergarten Education Act. Retrieved from <https://www.officialgazette.gov.ph>

- Gagne', R. M., Wager, W. W., Golas, K. C. & Keller, J. L. (2005). Principles of Instructional Design. Belmont, CA: Thompson.
- Jones, M., & Araje, L. (2002). The impact of constructivism on education: Language discourse, and meaning. *American Communication Journal*, 5(3).
- K to 12 Science Curriculum Guide. (2016). <http://lrmds.deped.gov.ph>
- National Scientific Council on the Developing Child. (2004). The Science of Early Childhood Development. Center on the Developing Child, Harvard University. Retrieved from <https://developingchild.harvard.edu>
- Saeed, A., Iqbal, T., & Azam, R. (2012, December). Perceptions of teachers regarding Englishmedium instruction at secondary education in Punjab province in Pakistan. *Secondary Education Journal*, 1(1), 41-53.
- Sharlip, J. (2019, January 10). Applying the Design Thinking Process in Qualitative Research. *QRCA Connecting, Educating, Advancing*. June 12, 2022, [https://www.qrca.org/blogpost/1488356/315846/Applying-the-Design-Thinking-](https://www.qrca.org/blogpost/1488356/315846/Applying-the-Design-Thinking-Process-in-Qualitative-Research)
- Process-in-Qualitative-Research Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). From Neurons to Neighborhoods: The Science of Early Childhood Development. National Academies Press.
- Tozlu, İ., Gülseven, E., & Tüysüz, M. (2019). Activity Application for STEM Education: Sample of Force and Energy. *Yüzüncü Yıl University Journal of Education Faculty*, 16(1), 869-896. <http://dx.doi.org/10.23891/efdyu.2019.145>
- UNESCO. (2007). Strong Foundations: Early Childhood Care and Education. Retrieved from: <https://unesdoc.unesco.org/ark:/48223/pf0000147776>
- UNESCO. (2017). Learning to Live Together: Using Arts-Based Approaches for Early Childhood Development. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000247878>