Teachers' Knowledge And Readiness In Implementing The Science Theme-Based Teaching In Kindergarten

Adelfa Emba Cagula

Surigao City Pilot School, Greenhomes km 3 Brgy.
Luna Surigao City, Philippines, +63 910 015 1768
adelfa.cagula@deped.gov.ph

Abstract: Early childhood education is considered the first step to formal education and that it needs a thematic and Science Theme-Based teaching approach to develop learning independence among the kindergarten pupils. The 79 kindergarten teachers were assessed in terms of their knowledge and readiness to implement Science Theme-Based teaching in kindergarten. The gained results revealed a significant difference in the kindergarten teachers' knowledge in terms content and process when they are grouped based on their educational attainment and relevant trainings attended. Moreover, a significant difference is also shown in the teachers' readiness in implementing the Science Theme-Based teaching in terms of instructional design. The content-knowledge of the kindergarten teachers has a significant relationship with the teachers' readiness in terms of instructional design and instructional materials, while the process-knowledge of the kindergarten teachers has a significant relationship with the teachers' readiness in terms of instructional delivery and instructional materials.

Keywords: Kindergarten, Science Theme-Based Teaching, Teachers' Knowledge, Teachers' Readiness

Introduction

Early childhood is a time of rapid development and growth. Children develop faster than at any other stage in their life between the ages of birth and five. Fristiara and Rahmawati (2017) surmised that the kindergarten pupils are curious about everything that they see and hear in their environment, including their interaction with every living and non-living organism. This is the stage of rapid acquisition of knowledge and imitation from the environment in which kids love to explore, touch, feel, smell, taste, watch, and wonder about everything around them.

With the Science Theme-Based Instruction, the needs of the kindergarten pupils are given complete consideration since teachers are given a chance to render educational assistance and promote the acquisition of social and learning-related skills through innovative practices of teaching and learning as the instruction is based on the science theme.

In the kindergarten classes of Surigao City Division, the academic demand placed on the kindergarten pupils is challenging and should be managed properly. However, the kindergarten teachers have strong desire to bequeath the lessons and learning competencies completely to the kindergarten pupils, and so they want to focus more on the instruction that is thematic in nature, indicating a science theme-based instruction. The creation of an established science learning material which supports the teaching needs of the kindergarten teachers is a primary reason for conducting this study since the most essential theme for thematic learning in kindergarten would be catered to and the kindergarten pupils' learning needs would be addressed, especially since they are in the learning stage of discovery and inquisition. There is a need for the kindergarten pupils to have smooth transition to the content-based curriculum of the succeeding grade levels through setting the basic standards for an efficient and effective Kindergarten Education Program implementation as stated in DepEd Order 47, S. 2016 – The Omnibus Policy on Kindergarten Education.

For the aforementioned reasons, the kindergarten teachers, being the frontline in educating and preparing the kindergarten pupils, need to be creative enough in finding remedies and instruction that will best suit the pupils, making sure that the learning needs of every kindergarten pupil will be catered to have maximum learning. And it is for these reasons that this study will be conducted.

Review of Literature

Teachers' Knowledge in Science Theme-Based Teaching

Teachers' knowledge of Science Theme-Based teaching and its implementation has a positive and direct impact on learners' situations and outcomes in the learning environment (Veloo, Md-Ali, & Krishnasamy, 2019). In this sense, kindergarten teachers need to have ample knowledge and understanding of various science topics and lessons in order to be thematically oriented with the kindergarten curriculum that is currently being utilized in all kindergarten classes. The elicitation of young learners' thinking about natural phenomena and other science concepts must be put into practice by the kindergarten teachers through the incorporation of other learning areas/domains into the science theme as a general concept of the curriculum (Papandreou & Kalaitzidou, 2019).

Nind (2020) expressed that teachers' adjustments and difficulties coping with the new and updated teaching practices and innovations are influenced by the insufficiency of teachers' content knowledge in science. Pendergast, Lieberman-Betz, and Vail (2017) postulated that early childhood teachers are often hesitant about teaching science because they lack confidence in their conceptual knowledge and understandings. A major challenge faced by kindergarten teachers is to give total assistance to the young learners in developing their knowledge, understanding, skills, and attitudes necessary to become scientifically literate citizens (Barenthien, Lindner, Ziegler, & Steffensky, 2020).

Kindergarten teachers' domain-specific professional knowledge is assumed to play an important role in the quality of early childhood education, but due to a lack of adequate materials, little is known about the teachers' science-specific knowledge (Nilsson & Elm, 2017).

The application of theme-based instruction in kindergarten is well facilitated through the application of theme-based instruction, more specifically in science (Dikici & Kunt, 2018). This kind of instruction is a combination of various learning domains that are delivered with play integration but with a general theme concept of basic science for young learners (Yamin, Permanasari, Redjeki, & Sopandi, 2017). The effectiveness of utilizing Science Theme-Based instruction has been consistently demonstrated as superior within the framework of cognitive load theory (Tussa'diah & Nurfadillah, 2018). However, the effectiveness of this instructional approach may be moderated by several factors.

Zambak, Alston, and Marshall (2017) professed that a common manner of teaching skills or concepts and providing targeted instruction using direct structured science topics/lessons for young children utilizes real objects and clear pictures; actual testing and experiments that are simple, friendly, and easy to follow by the young learners. The extension of concept teaching and procedural knowledge is done in a clearer process, especially with the intervention and guidance of the teacher from the start of the task/s until the succeeding practices.

Setiawan and Siayah (2020) revealed that Science Theme-Based Instruction is effective for both production and comprehension of refusals and equalizes learning opportunities for all learners with different learning levels. Lapsley and Chaloner (2020) believed that the Science Theme-Based Instruction aims to equip the learners with the full knowledge that with a greater sense of connections from one content area to another which helps in increasing the transfer and application of knowledge as it fosters comparison, categorizing, and pattern finding-building block of scientific method. Moreover, the tasks provided during the instruction led to more frequent learners' production, which is related to the focused performance tasks of the learners (Ellis, Li, & Zhu, 2018).

Early childhood teachers are eminent in delivering lessons thematically through igniting the learner's curiosity and enthusiasm in various domains such as gross motor, fine motor, cognitive, receptive language, self-help, expressive language, and social-emotional (Kurniah, Andreswari, & Kusumah, 2019). In this way, the link between science and other content areas is connected and follows maximum learning since it involves practical manipulation through experience. As children engage in scientific actual exercises and practices and relate them to other learning domains, their mental modes, thoughts, experiments, and visualization generate the highest understanding and promote scientific learning (Fleer, 2019).

Larimore (2020) postulated that the reforms in K-12 science education, particularly in the kindergarten department, provide a vision of a unified and holistic early childhood education that leverages the best of both early childhood and science education learning opportunities for young children.

Elm and Liljestrand (2019) suggest that science lessons are better introduced and represented in connection with the use of senses through play, outdoor activities, and experimental activities. Through this, the relevance and implications for kindergarten science education may focus on children's verbal communication and their conceptual understanding of natural phenomena towards an approach that includes their learning processes and physical experiences.

Learners gain more satisfaction towards learning as they are guided and later given chances to discover their full potential in facilitating better understanding, which results in the production of their learned concepts and making them their authentic ideas of learning (Ramanujan, Zhou, & Ramani, 2019).

Educators are endeavoring to develop critical thinking ability among the learners as an essential aspect of learning and higher academic performance, and this can be developed through giving various forms of tests (Persky, Medina, & Castleberry, 2019).

Teachers' Readiness in Implementing the Science Theme-Based Teaching

The readiness in teaching kindergarten classes with a thematic science theme-based could improve scientific literacy by noting community and societal developments (Jwaifell, 2019).

Sulaiman, Hamzah, and Rahim (2017) underscored that the ability of a teacher to get prepared before the delivery of the lesson is referred to as readiness towards implementing and applying the method of teaching. Teachers who are not prepared with lesson plans and teaching materials will undoubtedly be ineffective in the classroom.

In contrast, the beliefs of the kindergarten teachers about their readiness for teaching science would be seen through their experiences and awareness of the science concepts that would be bequeathed to the class (Park, Dimitrov, Patterson, & Park, 2017).

In order for the kindergarten teacher to be ready to teach science confidently, it is important to design a comprehensive professional development program to support knowledge in early childhood, particularly in science (Novianti, Puspitasari, Solfiah, Maria, & Garzia, 2020).

K-12 education is heavily influenced by the educational trend of improving quality curriculum integration across various learning disciplines, which promotes quality education through the use of appropriate instructional design (Yu & Li, 2019).

Teachers' knowledge of instructional design may improve to the greatest extent possible because they are constantly reminded of the various instructions (Seo, 2019). In this way, excellence in education may be achieved and a framework of intervention programs towards instructional design may be drawn and implemented.

Seel, Leehman, Blumschein, and Podolsky (2019) defined instructional design as a systematic procedure in which educational and training programs are developed and composed. Effective instruction is learner-centered (Wong, 2019), in which the goal of teaching is to foster learning. Learner-centered instruction begins with understanding the characteristics and needs of the learners. Teaching model development has been used in blended deliveries, which could connect every 21st century learner towards the lessons that have been delivered longitudinally (Shambaugh, 2020).

The instructional design describes the teaching-learning process that occurs in a unit of learning, with a key principle in learning design that it represents the learning activities and support activities that are performed by various people in the context of unit learning (Kurt, 2016).

Van Duijn, Crocket, and Masters (2019) described the role of instruction preference during skill learning as a useful tool for providing maximum knowledge to the learners in an effective learning environment. The creation of a learning environment that provides the learners with opportunities to learn in accordance with the categories of learning has to motivate the learners by means of provoking expectations that initiate reflective thinking about the objects to be learned (Miller, Lisanti, Witte, Elhoff, Mahle, Uzark, & Butler, 2020).

The rapid change in the educational setting has occurred as observed in the learning environment, and this is all because of the existence of advanced technology that has made it a requirement to venture and embrace the changes and innovations in education (Ko, Han, Kwon, & Sug Shin, 2019).

The rapid change in the educational setting has occurred as enhancing the learning acquisition process with the goal of engaging, encouraging, and motivating learners to gain deeper, more significant, and more meaningful levels of understanding and knowledge is the focus of instructional design (Nilsson & Karlsson, 2019). Gonzalez and Deal (2019) appraised that teachers contribute to the increase of learners' knowledge by demonstrating the content and competencies of the learning area with the support of the instructional materials and activities that totally promote learning among the learners. served in the learning environment, and this is all because of the existence of advanced technology that has made it a requirement to venture and embrace the changes and innovations in education (Ko, Han, Kwon, & Sug Shin, 2019). The creation of an instructional curriculum that is geared towards producing specific learning outcomes based on pedagogical research and current instructional practices is always involved in instructional design (Trams, Holley, & Williams, 2018). The efficacy of the instructional materials, such as learning modules, features dynamic visualization, contextualization, and interactive learning environments embedded with various learning integrations that support learners' knowledge acquisition (Oliver, Hodges, Moore, Cohen, Jang, Brown, Kwon, Jeong, Raven, Jurkiewicz, & Robertson, 2017).

Learners possess various learning styles and do not respond equally to the same instructional methods (Haynes, 2019). Learners of today have a variety of learning styles, and diverse learning styles should be addressed through various instructional techniques (Cheng & Chau, 2016). Students can contribute to success by connecting prior learning, assisting with motivation, and incorporating higher-level thinking skills into lessons (Brown, Ernst, Clark, DeLuca, & Kelly, 2017).

Alzahrani (2019) stressed that there is a need for educational instructors to continue their professional development to be upgraded about the innovations in 21st century learning, which involves instructional delivery. Mensah and Agyei (2019) evaluated that teachers are using teacher-centered teaching approaches in which they dominate classroom instruction by disseminating knowledge to their learners.

Neden, Cleak, and Thomson (2019) professed that to foster academic resilience and expand learners' learning boundaries, scaffolding, which is a primary part of explicit instruction, is very essential to create and maintain engaging learning. To support high-quality engagement of learners towards the activities, teachers need to expose and guide the learners through providing simple yet comprehensive instructions to cater to the learners' level of understanding of the tasks that they need to perform (Eason & Ramani, 2018).

Lee, Llosa, Grapin, Haas, and Goggins (2019) proposed that instructional materials demonstrate the thematic content taught and sequenced lessons linked to big ideas and other learning domains/areas that offer ample opportunities for learners to respond and practice the lesson content, which includes mastered knowledge or skills in subsequent lessons to maintain learning.

The importance of instructional materials in the teaching-learning process is essential in the development of learners' skills, knowledge, and attitudes, and the teachers' style of delivering the instruction, which could be the reason for the increasing performance of the learners and the school (Del Rey, Ortega-Ruiz, & Casas, 2019). The success of achieving the learners' expectations towards the delivery of instructions depends on the suitability of the instructional materials utilized by the teachers to motivate learning through the use of textbooks, charts, models, graphics, real objects, and improvised materials (Kuo & Wieman, 2016).

Instructional materials are meant to improve the quality of education for effective holistic performance of learners in kindergarten classes, where the intended learning outcomes provide the validation feedback loop on the success of the interaction and instruction (Ezenwa, 2018). Morrison, Wilcox, Bird, Murdoch, Bursey, and Helvey (2020) underscored that teaching is a total package with the teacher who serves as the best instructional material and who manages and molds every mind of the learners to become competent and independent individuals when it comes to excellence. The influence of the teachers in choosing the website as the instructional material that supports the science theme-based teaching and learning is given great

consideration since the teachers' preferences are the ones that can best answer the learning needs of the learners (Na & Moon, 2020).

Theoretical and Conceptual Framework of the Study

This study is anchored on the Pragmatism Theory of John Dewey (1865), stating that the interdisciplinary curriculum of a curriculum that focuses on connecting multiple subjects where learning individuals can pursue their own interests and build their own method for acquiring and applying specific knowledge. With the set science theme for teaching the kindergarten learners, valuable knowledge is achieved as meaningful activities are provided.

The conceptual framework of this study outlines the ordered series of steps to carry out the completion and accurate result. This includes the professional profile of the kindergarten teachers in Surigao City Division with reference to their highest educational attainment, length of teaching experience, and relevant training attended, which all appear in the first box.

Moreover, the level of teachers' readiness in implementing Science Theme-Based teaching in kindergarten in terms of instructional design, instructional delivery, and instructional materials is displayed in the second box, and the level of teachers' knowledge of Science Theme-Based teaching in kindergarten with reference to content and process is displayed in the third box.

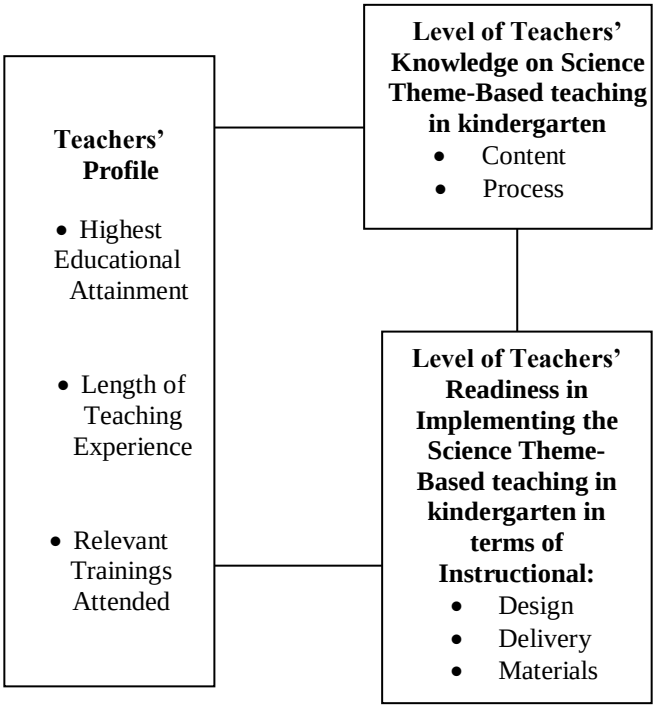

Figure 1. Research Paradigm

Statement of the Problem

The study aimed to assess the teachers' knowledge and readiness in implementing Science Theme-Based teaching in kindergarten in the Division of Surigao City. Specifically, it seeks to answer the following questions:

1. What is the professional profile of the kindergarten teachers in Surigao City Division with reference to their:
   1.1. Highest Educational Attainment;
   1.2. Length of Teaching Experience; and
   1.3. Relevant Trainings Attended?

2. What is the level of teachers' knowledge on Science Theme-Based teaching in kindergarten with reference to:
   2.1. Content; and
   2.2. Process?

3. What is the level of teachers' readiness in implementing the Science Theme-Based teaching in kindergarten in terms of Instructional:
   3.1. Design;
   3.2. Delivery; and
   3.3. Materials?

4. Is there a significant difference in the teachers' knowledge on Science Theme-Based teaching in kindergarten when grouped based on their profile?

5. Is there a significant difference in the teachers' readiness in the implementation of Science Theme-Based teaching in kindergarten when grouped based on their profile?

6. Is there a significant relationship between the teachers' knowledge and teachers' readiness on the implementation on Science Theme-Based Teaching in kindergarten?

Hypotheses

At 0.05 level of significance, it will be hypothesized that:

Ho1: *There is no significant difference in the teachers' knowledge on Science Theme-Based teaching in kindergarten when grouped based on their profile.*

Ho2: *There is no significant difference in the teachers' readiness on Science Theme-Based teaching in kindergarten when grouped based on their profile*

Ho3: *There is no significant relationship between the teachers' knowledge and teachers' readiness on the implementation on Science Theme-Based Teaching in kindergarten.*

SIGNIFICANCE OF THE STUDY

The study on "Teachers' Knowledge and Readiness in Implementing Science Theme-Based Teaching in Kindergarten" would be significant and beneficial to the following:

School Administrators. The study guides every school administrator to support the kindergarten teachers in designing and delivering the kindergarten instructions, activities, and materials based on the science theme. Through this study, school administrators may better understand and support the needs of the kindergarten pupils through encouraging the kindergarten teachers to enthusiastically implement and utilize Science Theme-Based teaching.

Kindergarten Teachers. The result of the study will serve as a factual and professional verification that will professionally suggest the most appropriate theme in crafting the lesson guide for the kindergarten classes. This will help the kindergarten teachers run the kindergarten lessons in a thematic but comprehensive manner. This study will also acquaint the kindergarten teachers with the proper procedure for utilizing Science Theme-Based teaching in delivering the instruction.

Kindergarten Pupils. The results of the study will benefit the young learners since they serve as the direct beneficiaries who will enjoy the positive effect of Science Theme-Based teaching on the learning level of the kindergarten pupils. Moreover, the findings of the study will also provide the information needed in dealing with young millennial learners to increase their level of understanding and learning acquisition in a very facilitative and effective way.

Parents. The data that will be gathered through the recorded observations and outcomes will assist the parents in evaluating and monitoring their own children's ability towards their studies. This study will somehow acquaint the parents when to equip them with the knowledge to support their children's needs and support them to grow and develop into complete beings with success and achievements throughout their lives.

Researchers. The outcome and recommendations of the study enable them to gain information and insights about the problem being studied, and if they would like to do further study, it will serve as an essential reference for them.

Scope and Limitation of the Study

The scope and limitations of this study focused on the assessment of the teachers' knowledge and readiness in implementing Science Theme-Based Teaching in kindergarten in the Division of Surigao City.

Methods

Research Design

This study applied a quantitative approach and utilized two research designs, which could be mentioned as Descriptive-Comparative Research Design that was deemed to test and statistically measure the significant difference between the teachers' knowledge and readiness in implementing Science Theme-Based Teaching in kindergarten according to their profile; and the Descriptive-Correlational Research Design that was deemed to test and statistically measure the significant relationship between the teachers' knowledge and the teachers' readiness in implementing Science Theme-Based Teaching in kindergarten.

Research Respondents

The respondents of the study were directly chosen from the elementary schools in the ten districts of Surigao City Division. The kindergarten teacher-respondents were selected based on the purposive or judgmental sampling technique, in which the 79 kindergarten teachers in all elementary schools in the Division of Surigao City were officially included in the study as respondents. Moreover, the final selection and distribution of the kindergarten teacher-respondents is shown in Table 1.

Table 1. Distribution of Kindergarten Teacher-Respondents

District	Number of Teachers	Total
I	8	8
II	12	12
III	7	7
IV	8	8
V	9	9
VI	8	8
VII	7	7
VIII	8	8
IX	5	5
X	7	7
Total	79	79

Research Instrument

A researcher–made questionnaire was used as the major instrument in gathering the needed data in the study, which is in the form of a survey checklist–type. This instrument was drafted and prepared by the researcher, and the content of it was based on the readings, research, and experiences of the kindergarten teachers.

Ethics and Data Gathering Procedure

The researcher avoided certain issues that could arise at any time, especially if people are involved in the study conducted. To fully run the study with stability and continuity, the researcher addressed in advance the possibilities of having problems that would cause hindrance to the study and, even worse, the possibility of having predicaments that would make the study incomplete. The researcher also prepared and tendered letters to the people that needed to be asked for permission; information regarding the roles to take part in the study, data secrecy obtained from the respondents' answers, and confidentiality of the respondents' identities were indicated in the sent letter to respondents. Moreover, considerations were given to the respondents as to their freedom in answering and the time consumed in answering the questionnaire.

The preparation of the research questionnaire was the first step taken by the researcher, and this took ample time to assure the quality of it and guarantee the security of the required data in completing the study. The thorough process of crafting, finalizing, and reproducing the research questionnaire took enough time.

The protocol of sending information to the Office of Surigao City Division was put into writing through the Letters of Request handed to the administrators.

Data Analysis

Gathered data from the study conducted was treated and analyzed in a systematic manner in order to gain a correct and accurate result. The following statistical tools were used in this study:

Frequency Count and Percentage Distribution. This was used to determine the profile of the teacher-respondent.

Mean and Standard Deviation. This tool was used to determine the level of teachers' readiness to implement Science Theme-Based Teaching in Kindergarten in terms of Instructional Design, Instructional Delivery, and Instructional Materials. This tool also measured the level of teachers' knowledge of Science Theme-Based Teaching in Kindergarten in terms of content and process.

ANOVA. This was used to determine the significant difference in the teachers' knowledge of Science Theme-Based teaching in kindergarten and the teachers' readiness to implement Science Theme-Based Teaching in kindergarten when grouped based on the profile of the kindergarten teachers.

Pearson - Product Moment Correlation. This was used to determine the significant relationship between the teachers' knowledge and the teachers' readiness in implementing Science Theme-Based Teaching in Kindergarten.

Results and Discussions

On the Profile of the Respondents

It can be gleaned from Table 2 that there are more kindergarten teachers in Surigao City Division who do not have earned units in postgraduate studies and have just started to earn units in a master's degree in education. The majority of them taught for 6 to 10 years and had attended 1-2 relevant trainings. It could be assessed that the kindergarten teachers in Surigao City Division are regarded to have minimum experience in their field of teaching and that they need ample training in the succeeding years, especially in acquiring science knowledge and in cascading science concepts and ideas to the kindergarten pupils. These kindergarten teachers still need to improve their proficiency as they pursue further education, such as postgraduate courses. In the research study of Roberto and Madrigal (2019), they found that the teaching performance of kindergarten teachers is clearly influenced by the type of education they received and that registering in postgraduate studies could provide adequate knowledge to strengthen the instructions of science lessons.

Table 2. Respondents' Profile

Profile	Frequency (n-79)	Percentage
Highest Educational Attainment:		
Bachelor Degree	32	40.51
Master's with Units	32	40.51
Master's Full-Fledged	14	17.72
Doctorate with Units	1	01.26
Doctorate Full-Fledged	0	00.00
Length of Teaching Experience:		
1 – 5 years	23	29.12
6 – 10 years	37	46.84
11 – 15 years	14	17.72
16 – 20 years	4	05.06
21 – 25 years	1	01.26
Relevant Trainings:		
No Training	6	07.59
1 Training	21	64.56
2 Trainings	30	27.85
3 Trainings	19	24.05
4 Trainings	3	03.79

On the Level of Teachers' Content-Knowledge on Science Theme-Based Teaching in Kindergarten

The level of teachers' knowledge of Science Theme-Based teaching in kindergarten with reference to content is described\as "Less Knowledgeable". Teachers need to be equipped with ample concepts and knowledge on Science Theme-Based teaching across the curriculum in kindergarten, which includes the teachers' perspective towards connections across content of the learning areas/domains. Teachers' knowledge of Science Theme-Based teaching and its implementation has a positive and direct impact on learners' situations and outcomes in the learning environment (Veloo, Md-Ali, & Krishnasamy, 2019).

Table 3. Teachers' Knowledge on Science Theme-based Teaching in Kindergarten with reference to Content

Content	Mean	SD	QD
Science Theme-Based Teaching in kindergarten covered/followed the process of:			
1. extensive display of the important basic science concept related to other learning domains.	2.38	0.90	LK
2. systematic acquisition of knowledge from various learning sources.	2.29	0.46	LK
3. representing the appropriate maximum thematic learning for the kindergarten learners.	2.29	0.46	LK
4. understanding the active nature of learners' learning.	2.67	0.91	K
5. challenging the learners to learn more than what is expected towards content of the lesson/s.	2.66	1.01	K
Level of Teachers' Knowledge in terms of Content	**2.46**	**0.19**	**LK**

On the Level of Teachers' Process-Knowledge on Science Theme-Based Teaching in Kindergarten

The level of teachers' knowledge of Science Theme-Based teaching in kindergarten with reference to a process is described as "Knowledgeable" with the mean average of 2.52. Most of the teachers have little background on Science Theme-Based teaching and some of them do not have a background in it, especially those who do not have training and those who have not taken short courses that would lead them to conform with the teaching reforms and innovations. Larimore (2020) postulated that the reforms in K-12 science education, particularly in the kindergarten department, provide a vision of a unified and holistic early childhood education that leverages the best of both early childhood and science education learning opportunities for young children.

Table 4. Teachers' Knowledge on Science Theme-based Teaching in Kindergarten with reference to Process

Process	Mean	SD	QD
Science Theme-Based Teaching in kindergarten covered/followed the process of:			
1. grouping the learners based on their learning pace.	2.70	1.05	K
2. providing relevant teaching resource materials for inter-active learning.	2.44	1.06	LK
3. offering the optimal kind of instruction suitable for the kindergarten learning needs.	2.67	1.17	K
4. helping the learners to practice perform simple experiments at their own level.	2.38	0.90	LK
5. utilizing the appropriate rubrics in all exercises and experiments. content of the lesson/s.	2.42	1.02	LK
Level of Teachers' Knowledge in terms of Process	**2.52**	**1.11**	**K**

On the Level of Teachers' Readiness in Implementing the Science Theme-Based Teaching in Kindergarten in terms of Instructional Design

The mean average of 2.14, described as "Less Ready," is the level of teachers' readiness in terms of instructional design. This gives an implication that teachers need more time to get ready to embrace the innovations in education, particularly in implementing Science Theme-based Teaching in terms of instructional design. They need more time to look at the positive contribution of the design of the teaching approach in order to provide ample instruction for the pupils. The instructional design describes the teaching-learning process that occurs in a unit of learning, with a key principle in learning design that it represents the learning activities and support activities that are performed by various people in the context of unit learning (Kurt, 2016).

Table 5. Teachers' Readiness in Implementing the Science Theme-based Teaching in Kindergarten in terms of Instructional Design

Instructional Design	Mean	SD	QD
As a *kindergarten teacher, I am ready to:*			
1. utilize the daily lesson logs with science theme-based format.	2.13	0.63	LR
2. apply the knowledge of science content within and across curriculum teaching areas.	2.56	0.92	R
3. develop a creative thematic aspect of scientific teaching. kindergarten learning needs.	2.09	0.99	LR
4. create detailed specifications for the enhancement of science learning materials.	1.81	0.81	LR
5. present learning experiences that promote better acquisition of knowledge.	2.11	0.90	LR
Level of Teachers' Readiness in terms of Instructional Design	**2.14**	**0.27**	**LR**

On the Level of Teachers' Readiness in Implementing the Science Theme-Based Teaching in Kindergarten in terms of Instructional Delivery

The level of teachers' readiness in Implementing the Science Theme-Based teaching in kindergarten in terms of instructional delivery is described as "Less Ready" with the mean average of 2.14. Teachers need more time to get ready to embrace the innovations in education, particularly in implementing Science Theme-based Teaching in terms of instructional design. They need more time to look at the positive contribution of the design of the teaching approach in order to provide ample instruction for the pupils. The instructional design describes the teaching-learning process that occurs in a unit of learning, with a key principle in learning design that it represents the learning activities and support activities that are performed by various people in the context of unit learning (Kurt, 2016).

Table 6. Teachers' Readiness in Implementing the Science Theme-based Teaching in Kindergarten in terms of Instructional Delivery

Instructional Delivery	Mean	SD	QD
As a *kindergarten teacher, I am ready to:*			
1. share a pace-leveled science theme-based teaching to the class.	1.75	0.82	NR
2. used to contextualized science teaching strategies in presenting the lessons.	2.44	1.06	LR
3. taught scaffold way to support the learners' wholistic proficiency.	2.61	1.06	R
4. engaged learners to explore things in their surroundings.	2.34	0.86	LR
5. gave constructive feedbacks to the learners during the class activities.	2.42	1.02	LR
Level of Teachers' Readiness in terms of Instructional Delivery	**2.31**	**0.33**	**LR**

On the Level of Teachers' Readiness in Implementing the Science Theme-Based Teaching in Kindergarten in terms of Instructional Materials

The mean average of 2.22, described as "Less Ready," is the level of teachers' readiness in implementing Science Theme-Based teaching in kindergarten in terms of instructional material. This gives an implication that the lack of science kindergarten instructional materials affects the readiness of the kindergarten teachers to implement Science Theme-Based teaching in the kindergarten classes. Teachers need concrete science instructional materials that suit the level of the kindergarten pupils in order to have better changes with greater innovations in kindergarten education. By means of this, quality education would be achieved regardless of the educational predicaments of this recent time. Gonzalez and Deal (2019) found that teachers contribute to the increase of learners' knowledge by demonstrating the content and competencies of the learning area with the support of the instructional materials and activities that totally promote learning among the learners.

Table 7. Teachers' Readiness in Implementing the Science Theme-based Teaching in Kindergarten in terms of Instructional Material

Instructional Material	Mean	SD	QD
As a *kindergarten teacher, I am ready to:*			
1. utilize the science theme-based learning resource materials to my kindergarten class.	2.34	0.86	LR
2. prepare the needed learning resource materials for the science theme-based activities.	2.13	0.63	LR
3. create more science theme- based activities.	2.44	1.06	LR
4. gather indigenous materials available in the locality for better contextualized learning resource material.	2.11	0.91	LR
5. share learning resource material to the the other kindergarten teachers in other division.	2.09	0.99	LR
Level of Teachers' Readiness in terms of Instructional Material	**2.22**	**0.16**	**LR**

On the Significant Difference in the teachers' Knowledge on Science Theme-Based teaching in Kindergarten

There is a significant difference in the teachers' knowledge on Science Theme-Based teaching in kindergarten in terms of content when the kindergarten teachers are grouped based on their profile. The null hypothesis is rejected since the gained f-values are greater than the critical value of 3.06 and the projected p-values are less than the alpha level of 0.05. This implies that the teachers' profile with reference to highest educational attainment, length of teaching experience, and relevant training attended could affect the teachers' knowledge of Science Theme Based teaching in kindergarten in terms of content. The level of education that they have attained, the training that they have, and the years that they intend to teach could contribute to the knowledge that they possess. With the projected result, it could be said that there is a need for them to embrace the changes and innovations in education to provide ample science learning among the kindergarten pupils. They need to be parallel and have one goal, which is to increase the learning opportunities for young learners through effective teaching in science. According to Lapsley and Chaloner (2020), Science Theme-Based Instruction aims to provide learners with complete knowledge and a greater sense of connections from one content area to another, which aids in knowledge transfer and application by encouraging comparison, categorizing, and pattern finding—building blocks of scientific method.

In terms of process, the highest level of education and relevant training obtained f-values greater than the critical values and projected p-values greater than the alpha level of 0.05, implying rejection of the null hypothesis. Among the three profile factors, only the length of teaching experience has an f-value of 2.97, which is less than the critical value of 3.06, together with the p-value of 0.054, which is at the alpha level of 0.05, implying that do not reject the null hypothesis and an interpretation of there is no significant difference in the teachers' knowledge of Science Theme-Based teaching in kindergarten. This gives an implication that the number of years served by the teachers is not a concrete factor nor a guarantee that the teachers are competent in the process of Science Theme Based teaching in kindergarten. Teachers who have been teaching for a long time but have not received extensive training in Science Theme-Based teaching must learn more and practice conceptualizing science as a general theme in order to be confident in teaching science lessons to kindergarten students. Pendergast, Lieberman-Betz, and Vail (2017) postulated that early childhood teachers are often hesitant about teaching science because they lack confidence in their conceptual knowledge and understanding.

Table 8. Difference in the Teachers' Knowledge on Science Theme-based Teaching in Kindergarten in terms of Content and Process when Grouped based on their Profile

Profile	f-value	p-value	decision	sig
Content				
Highest Educational Attainment	5.77	0.005	reject H_o	significant
Length of Teaching Experience	5.40	0.006	reject H_o	significant
Relevant Trainings Attended	3.38	0.037	reject H_o	significant
Process				
Highest Educational Attainment	39.43	0.00001	reject H_o	significant
Length of Teaching Experience	2.97	0.054	do not reject H_o	significant
Relevant Trainings Attended	23.10	0.0001	reject H_o	significant

On the Significant Difference in the Teachers' Readiness in the Implementation of Science Theme-Based teaching in Kindergarten

All the categories of the teachers' profile projected the f-values that are greater than the f critical value of 3.06 and the projected p-values that are less than the alpha level of 0.05 implied a rejection of the null hypothesis and an interpretation that there is a significant difference in the teachers' readiness for Science Theme-Based teaching in kindergarten in terms of instructional design when the kindergarten teachers are grouped based on their profile.

The proficiency background of the teachers could set themselves to be prepared to accept whatever educational transformations may occur. This could train them to be open-minded in applying the Science Theme-Based teaching in kindergarten as this would provide teaching assistance to them in elevating the performance of the kindergarten pupils. The readiness in teaching kindergarten classes with a thematic science theme-based could improve scientific literacy by noting community and societal developments (Jwaifell, 2019).

As to the teachers' readiness in the implementation of Science Theme-Based teaching in kindergarten in terms of instructional delivery and instructional materials, only the category of length of teaching experience gained the f–values that are less than the f critical value of 3.06 and the projected p-values that are greater than the alpha level of 0.05. This gives an interpretation of do not reject the null hypothesis and an interpretation that there is no significant

difference in the teachers' readiness for Science Theme-Based teaching in kindergarten in terms of instructional delivery and instructional materials. This implies that the educational status of kindergarten teachers is a factor that may affect their readiness to implement Science Theme-Based teaching, because the preparation of instructional materials and delivery of instructions are aligned to the learned training/workshops and post-graduate lessons. Sulaiman, Hamzah, and Rahim (2017) underscored that the ability of a teacher to get prepared before the delivery of the lesson is referred to as readiness towards implementing and applying the method of teaching.

Table 9. Difference in the Teachers' Readiness in the Implementation of Science Theme-based Teaching in Kindergarten in terms of Instructional design, Instructional Delivery, and Instructional Materials when Grouped based on their Profile

Profile	f-value	p-value	decision	sig
Instructional Design				
Highest Educational Attainment	6.50	0.003	reject H_o	significant
Length of Teaching Experience	6.07	0.004	reject H_o	significant
Relevant Trainings Attended	35.40	0.00001	reject H_o	significant
Instructional Delivery				
Highest Educational Attainment	31.46	0.00001	reject H_o	significant
Length of Teaching Experience	2.59	0.079	do not reject H_o	not significant
Relevant Trainings Attended	21.06	0.00001	reject H_o	significant
Instructional Materials				
Highest Educational Attainment	7.21	0.0019	reject H_o	significant
Length of Teaching Experience	0.63	0.648	do not reject H_o	not significant
Relevant Trainings Attended	4.86	0.010	reject H_o	significant

On the Significant Relationship between the Teachers' Knowledge and Teachers' Readiness in Implementing the Science Theme-Based teaching in Kindergarten

Among the projected p-values shown in the aforementioned table, only the category of "Delivery" in the teachers' readiness correlated with the category of "Content" in the teachers' knowledge gained the p-value of 0.99990, which is greater than the alpha level of 0.05. This meant do not reject the null hypothesis and gave an interpretation that there is no significant relationship between the teachers' knowledge in terms of "content" and the teachers' readiness in terms of "delivery" as far as Science Theme-Based teaching in kindergarten is concerned. The content knowledge of the kindergarten teachers could not affect their readiness to deliver the lessons. They managed to deliver the lessons in the way they usually deliver them on a daily basis. They need to be eminent in delivering the lessons thematically with science as a general theme. To prepare kindergarten teachers to confidently teach science, a comprehensive professional development program to support knowledge in early childhood, particularly in science, must be designed (Novianti, Puspitasari, Solfiah, Maria, & Garzia, 2020). However, kindergarten teachers with less content knowledge in Science Theme-Based teaching appear to be less prepared to design and craft Science Theme-Based lesson plans and Science Theme-Based learning materials because they lack concepts and ideas to write about. Teachers' knowledge of instructional design may improve to the greatest extent possible because they are constantly reminded of the various instructions (Seo, 2019). In this way, excellence in education may be achieved and a framework of intervention programs towards instructional design may be drawn and implemented.

With regard to the correlation between the teachers' knowledge in terms of "Process" and the teachers' readiness with three categories, only the category of "Design" in teachers' readiness correlated with the category of "Process" in the teachers' knowledge on Science Theme-Based teaching in kindergarten gained the p-value of 0.73526 implied to do not reject the null hypothesis and gave an interpretation of There is no significant relationship between the teachers' knowledge in terms of "Process" and the teachers' readiness in terms of "Design".

Kindergarten teachers have a limited background knowledge of the instructions and correct procedure for implementing Science Theme-Based Teaching in kindergarten, but this does not affect their readiness in designing and planning their lessons. Regardless of whatever degree of their process knowledge, they are reprimanded to write a thematic learning plan even if it is not aligned with the Science Theme-Based teaching pattern since it is a requirement for them. However, the little knowledge of the kindergarten teachers in terms of process has a relationship to the readiness of the kindergarten teachers in terms of instructional delivery and instructional materials. Teachers are less ready to implement Science Theme-Based teaching as their knowledge is not as concrete to equip and support the teachers. The less background they have on Science Theme-Based Teaching, the less ready they are to implement it. With this, they need to be acquainted and be more exposed to the manner of delivering the lessons and utilizing learning materials during the delivery of the lessons to encourage the learners to gain interest and enjoy classes, which could be a way to bequeath maximum learning among the pupils. Early childhood teachers are eminent in delivering lessons thematically through igniting the learner's curiosity and enthusiasm in various domains such as gross motor, fine motor, cognitive, receptive language, self-help, expressive language, and social-emotional (Kurniah, Andreswari, & Kusumah, 2019).

Table 10. Relationship between the Teachers' Knowledge and Teachers' Readiness in the Implementation of Science Theme-based Teaching in Kindergarten

	r-value	p-value	decision	sig
Content				
Design	- 0.664	<0.00001	reject H_o	significant
Delivery	0.001	0.99990	do not reject H_o	not significant
Materials	- 0.663	<0.00001	reject H_o	significant
Process				
Design	0.039	0.73526	do not reject H_o	not significant
Delivery	- 0.410	0.00019	reject H_o	significant
Materials	0.947	<0.00001	reject H_o	significant

Conclusion

The kindergarten teachers have average level in their professional profile and that they are not oriented to the content-knowledge of Science Theme-Based teaching most particularly on drawing the thematic concept with a science theme as its general content focus. They lacked the concepts and ideas in designing the instructions and learning materials. With regard to their process-knowledge, they do not have ample background to equip and support the correct procedural conduct of carrying out the Science Theme-Based teaching that includes the integration of various learning domains/areas. The kindergarten teachers are still in the process of preparing themselves to adopt the Science Theme-Based teaching in kindergarten.

Recommendation

Based on the conclusion of the study, the kindergarten teachers are recommended to attend and take various training-workshops, development programs, and courses on Science Theme-Based Teaching for them to become oriented in drawing the thematic concept with science theme as its general focus and to be ready to implement the correct process, which includes the integration of various learning domains/areas.

References

[1] Alzahrani, A. A. (2019). The effect of distance learning delivery methods on student performance and perception. International Journal for research in Education, 43(1), 293-317.

[2] Barenthien, J., Lindner, M. A., Ziegler, T., & Steffensky, M. (2020). Exploring preschool teachers' science-specific knowledge. Early Years, 40(3), 335-350.

[3] Brown, R., Ernst, J., Clark, A., DeLuca, B., & Kelly, D. (2017). Engaging Females in STEM. Technology and Engineering Teacher; Reston Vol. 77, Issue. 3. Pages 29-31.

[4] Cheng, G., & Chau, J. (2016). Exploring the relationships between learning styles, online participation, learning achievement and course satisfaction: An empirical study of a blended learning course. British journal of educational technology, 47(2), 257-278.

[5] Del Rey, R., Ortega-Ruiz, R., & Casas, J.A. (2019). Asegúrate: An Intervention Program against Cyberbullying Based on Teachers' Commitment and on Design of Its Instructional Materials. Int. J. Environ. Res. Public Health 2019, 16, 434.

[6] DepEd Order 47, S. 2016 – The Omnibus Policy on Kindergarten Education.

[7] Dikici, İ. Z., & Kunt, N. (2018). Sustainability of Vocabulary Teaching after Explicit Instruction in Kindergarten Children.

[8] Eason, S.H. & Ramani, G.B. (2018). Parent–Child Math Talk About Fractions During Formal Learning and Guided Play Activities. Society for Research in Development. First published: 19 December 2018

[9] Ellis, R., Li, S., & Zhu, Y. (2018). The Effects of Pre-task Explicit Instruction on the Performance of a Focused Task.

[10] Elm, A. & Liljestrand, J. (2019). Preschool Teachers' Design for Learning Physics in Early Childhood Science Education. In ATEE 2019 Winter Conference Science and Education in the 21st Century. University of Minho, Braga, Portugal. 15-17 April 2019.

[11] Ezenwa, P. C. N. (2018). Evaluation of teachers' use of instructional materials for teaching French in junior secondary schools. Global Journal of Educational Research, 17(1), 39-45.

[12] Fleer, M. (2019). Scientific Playworlds: A model of teaching science in play-based settings. Research in Science Education, 49(5), 1257-1278.

[13] Fristiara, C., & Rahmawati, R. (2017, April). The Use of Theme-Based Approach in Teaching Young Learners' Vocabulary of English Club at Nur Hidayah Islamic Elementary School. In The 2nd TEYLIN International Conference Proceedings April 2017.

[14] Gonzalez, G. & Deal, J.T. (2019). Using a creativity framework to promote teacher learning in lesson study. Thinking Skills and Creativity. Volume 32, June 2019, Pages 114-128.

[15] Haynes, A.S. (2019). Reaching Diverse Learners by Offering Different Course Delivery Methods. Source Title: Diversity, Equity, and Inclusivity in Contemporary Higher Education (University of South Carolina, USA). Copyright: 2019 |Pages: 22.

[16] Jwaifell, M. (2019). In-Service Science Teachers' Readiness of Integrating Augmented Reality. Journal of Curriculum and Teaching, 8(2), 43-53.

[17] Ko, Y., Han, I., Kwon, H., & Sug Shin, W. (2019). Elementary Teachers' Perception on Student Competencies, Teacher Role, and Instruction in the Forthcoming Educational Environmental Change. Educational Technology International.

[18] Kuo, E. & Wieman. C.E. (2016). Toward instructional design principles: Inducing Faraday's law with contrasting cases. Physical Review Physics Education Research.

[19] Kurniah, N., Andreswari, D., & Kusumah, R. G. T. (2019, April). Achievement of development on early childhood based on national education standard. In International Conference on Educational Sciences and Teacher Profession (ICETeP 2018) (pp. 351-354).

[20] Kurt, S. (2016). "Instructional Design," in Educational Technology.

[21] Lapsley, D., & Chaloner, D. (2020). Post-truth and science identity: A virtue-based approach to science education. Educational Psychologist, 55(3), 132-143.

[22] Larimore, R.A. (2020). Preschool Science Education: A Vision for the Future. Early Childhood Education Journal.
[23] Lee, O., Llosa, L., Grapin, S., Haas, A., & Goggins, M. (2019). Science and language integration with English learners: A conceptual framework guiding instructional materials development.
[24] Mensah, F.S. & Agyei, D.D. (2019). Philosophy of teaching, teaching style and ICT use: a qualitative study of the perspectives of high school mathematics teachers.
[25] Mueller, J. J., & File, N. (Eds.). (2019). Curriculum in early childhood education: Re-examined, reclaimed, renewed. Routledge.
[26] Miller, T. A., Lisanti, A. J., Witte, M. K., Elhoff, J. J., Mahle, W. T., Uzark, K. C., & Butler, S. C. (2020). A Collaborative Learning Assessment of Developmental Care Practices for Infants in the Cardiac Intensive Care Unit. The Journal of Pediatrics.
[27] Morrison, Wilcox, Bird, Murdoch, Bursey, and Helvey (2020. Inference Types in Instructional Materials for Elementary Students. Reading Psychology.
[28] Na, J., & Moon, J.-W. (2020). Why do primary school teachers find science class materials on the site? - Center for science professor • learning materials support website -. Journal of Elementary Science Education, Elementary Science Education, 39 (1), 69–83.
[29] Neden, J., Cleak, H., & Thomson, S. (2019). Towards Agility: Scaffolding Anticipative Education in Social Work. The British Journal of Social Work, Volume 50, Issue 4, June 2020, Pages 1258–1276,
[30] Nilsson, P., & Elm, A. (2017). Capturing and developing early childhood teachers' science pedagogical content knowledge through CoRes. Journal of Science Teacher Education, 28(5), 406-424.
[31] Nind, M. (2020). A new application for the concept of pedagogical content knowledge: teaching advanced social science research methods. Oxford Review of Education, 46(2), 185-201.
[32] Novianti, R., Puspitasari, E., Solfiah, Y., Maria, I., & Garzia, M. (2020). Readiness in Teaching Science: Early Childhood Education Teacher's Online Experience. In Journal of Physics: Conference Series (Vol. 1655, No. 1, p. 012065).
[33] Oliver, J.s., Hodges, G.W., Moore, J.N., Cohen, A., Jang, Y., Brown, S.A., Kwon, K.A., Jeong, S., Raven, S.P., Jurkiewicz, M., & Robertson, T.P. (2017). Supporting High School Student Accomplishment of Biology Content Using Interactive Computer-Based Curricular Case Studies. Research in Science Education volume 49, pages1783–1808(2019).
[34] Papandreou, M., & Kalaitzidou, K. (2019). Kindergarten teachers' beliefs and practices towards elicitation in science teaching. Educational Journal of the University of Patras UNESCO Chair.
[35] Park, M. H., Dimitrov, D. M., Patterson, L. G., & Park, D. Y. (2017). Early childhood teachers' beliefs about readiness for teaching science, technology, engineering, and mathematics. Journal of Early Childhood Research, 15(3), 275-291.
[36] Pendergast, E., Lieberman-Betz, R. G., & Vail, C. O. (2017). Attitudes and beliefs of prekindergarten teachers toward teaching science to young children. Early Childhood Education Journal, 45(1), 43-52
[37] Persky, A. M., Medina, M. S., & Castleberry, A. N. (2019). Developing critical thinking skills in pharmacy students. American Journal of Pharmaceutical Education, 83(2).
[38] Ramanujan, D., Zhou, N., & Ramani, K. (2019). Integrating environmental sustainability in undergraduate mechanical engineering courses using guided discovery instruction. Journal of Cleaner Production, 207, 190-203
[39] Seel, N.M., Leehman, T., Blumschein, P., & Podolsky, O.A. (2019). Instructional Design for Learning: Theoretical Foundations.
[40] Seo, S.D. (2019). Development of Instructional Model App Design for User Experience. International Conference on Human-Computer Interaction. pp 284-292.
[41] Setiawan, A. R., & Siayah, S. (2020). A Brief Explanation of Science Education.
[42] Shambaugh, N. (2020). Developing a Reflexive Teaching Model: Multicultural Instructional Design: Concepts, Methodologies, Tools, and Applications. Pages: 22.
[43] Sulaiman, T., Hamzah, S. N., & Rahim, S. S. A. (2017). The Relationship between Readiness and Teachers' Competency towards Creativity in Teaching among Trainee Teachers. International Journal of Social Science and Humanity, 7(8).
[44] Trams, R. Holley, E.S. & Williams, L. C. (2018). Research-Based Elements of New-Teacher Induction Programs in the Saint Louis Metropolitan Area.
[45] Tussa'diah, H., & Nurfadillah, K. (2018). The Implementation of Theme Based Teaching to Improve Students' Achievement in Narrative Text. KnE Social Sciences, 352-360.
[46] van Duijn, T., Crocket, H., Masters, R.S.W. (2019). The role of instruction preference in analogy learning: Brain activity and motor performance. The role of instruction preference in analogy learning: Brain activity and motor performance
[47] Veloo, A., Md-Ali, R., Krishnasamy, H.N. (2019). Teachers' Knowledge and Readiness towards Implementation of School Based Assessment in Secondary Schools. International Education Studies; Vol. 8, No. 11.
[48] Wong, A.M. (2019). Instructional Design for LIS Professionals: A Guide for Teaching Librarians and Information Science Professionals.
[49] Yamin, Y., Permanasari, A., Redjeki, S., & Sopandi, W. (2017). Application of model project based learning on integrated science in water pollution. In Journal of Physics: Conference Series (Vol. 895, No. 1, p. 012153).
[50] Yu, M., & Li, F. (2019). Research on Instructional Design Model of K-12 Science Curriculum Based on STEAM.
[51] Zambak, V. S., Alston, D. M., & Marshall, J. (2017). Convincing Science Teachers for Inquiry-Based Instruction: Guskey's Staff Development Model Revisited. Science Educator, 25(2), 108-116.

Author Profile

Adelfa Emba Cagula finished her Bachelor in Elementary Education major in Science and Health on 2002 and her Bachelor in Early Childhood Education on 2015 in Saint Paul University Surigao. She has been a kindergarten teacher in Thailand and Philippines since 2003 and currently serving the Department of Education in the