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Science Around Us: Development of a Community-based Science Curriculum for Local Preschools in the Philippines

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Abstract

Teaching science for preschool children is essential in setting the foundation for science literacy and in kindling young children's interest in learning science. Hence the goal for designing a culturally relevant science curriculum is a gigantic challenge to all preschool teachers. This study proposed a community-based science curriculum for local preschools in northern Philippines. It supports the idea that nature should be utilized in nurturing the interest of young children in learning science. Qualitative method was used in gathering data from parents, teachers, and community leaders. Community resources that could be utilized for learning scince were identified, the legal framework for preschool education was analyzed, and the current national curriculum standards for kindergarten was analyzed to design and develop a science-based curriculum for young children. The result, which is a proposed curriculum, integrates cultural scripts, indigenous knowledge and practices, learners' interests and needs, and community resources in the selection of curriculum contents and learning experiences. The proposed community-based science curriculum could be a model for developing a culturally relevant and responsive education for indigenous people.

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INTRODUCTION

Learning science is essential, however because of the thematic approach in designing the preschool curriculum, sience concepts and skills are not given importance. This explains why there are limited references and research on science curriculum for preschool in the Philippines.

In this study, a community-based science curriculum for preschool is proposed. The quest for quality science education is a continuous endeavor in almost every country in the world. Science is recognized as one of the pillars of economic development, and science literacy is fast becoming a necessity for the survival of humanity. In the Philippines, strengthening science education is one of the primary agenda of the Department of Education. Several efforts have been made in making science more learner-centered, innovative, relevant, and responsive to the nature and needs of all types of learners, however, in the Philippines, there is a need to strengthen science literacy as early as preschool level. This will set the foundation and interest for learning science among preschool children.

The result of the Programme for International Student Assessment (PISA) was also considered in the revision of the curriculum. Quality, relevance, access, equity, and cultural relevance are always considered in the design, development, implementation, and revision of the science curriculum. Since the researcher focused on the need to develop a community-based science curriculum for a local preschool in the Philippines, learner-centeredness of the curriculum is also a major factor to consider.

Over the years, the definition of science has continued to evolve to include *attitudes, processes,* and *skills* through which science as a body of knowledge is formed (Devereux, 2007). Traditionally, science is defined as the observation, identification, description, experimental investigation, and theoretical explanation of natural phenomena. It is a process of discovery that includes the organization of data and the reporting of the results of an investigation. From a historical standpoint. Science is both an intellectual and a social activity in pursuit of a better understanding of the environment as well as a cultural and individual process of thought (Pawilen, 2021, Pawilen & Sumida, 2009, Gribbin, 2003).

As children develop their interest in their environment, they also develop certain characteristics that make teaching science possible in preschool (Worth, 2010; Brunton, P., & Thornton, L. 2010; Conezio and French, 2002; Meador, 2005). As to cognitive development, young kindergarten children possess characteristics that prove their readiness to learn science concepts and to acquire science inquiry and process skills that are needed in all activities of society (Chalufour, 2010; Dodge, et al., 2002; Meador, 2005).

In the context of Filipino children, research results show that children already know something and have ideas about their environment, and they already developed some scientific skills. Thus, learning science in preschool is possible. This is already the practice in various countries around the world. Science is taught as early as preschool. What makes this study unique is that it is *community-based,* making use of everyday science, indigenous science, and the immediate environment of the learners to develop science literacy.

The everyday experiences of young children are the foundation for science, which includes the process of scientific inquiry theorizing, and practical and simple experiments that are developmentally appropriate. Through science, preschool children learn important concepts and skills that are associated with their daily experience (Carale and Campo, 2003; Conezio & French, 2002; Meador, 2005; Tolman,2001; Worth and Grollman 2003). They also learn important skills such as process skills, critical thinking, and life skills (Chaille and Britain, 2002; Martin, 2001; Tolman, 2001).

Developing a community-based Science Curriculum for Preschool

The Philippines is a mosaic of different ethnic groups. However, its education system, particularly the science curriculum, is greatly influenced by Western ideas. Most of the illustrations of the applications of science are influenced by western scientific ideas (Pawilen, 2021). Most science teachers are not trained to integrate local knowledge into the science curriculum, and there are insufficient indigenous instructional materials on science in Philippine schools. Hence, there is a need to plan a community-based science curriculum that reflects local knowledge and needs.

As the goal of developing a science culture becomes imminent in the country, schools must meet the needs of the growing population of culturally diverse learners, and the science curriculum should be grounded in the culture and history of the people. In doing this task, the nature of the community and other aspects of community life are important to know to determine the context in which the curriculum is situated and to determine curriculum goals and contents

(Ornstein and Hunkins, 2009).

The Republic of the Philippines Constitution (1987) provides a legal foundation for planning a community-based science curriculum. The said constitution recognizes the *right* of every Filipino to access quality education regardless of race, ethnic background, or culture. Republic Act No. 8371, known as *The Indigenous Peoples Rights Act* of 1997, also recognizes the right of indigenous peoples to an *integrated education system* that is relevant to their needs. This act empowers indigenous local communities to preserve their culture, indigenous knowledge, traditions, and customs, known as *community intellectual rights*. These acts provide a legal foundation for indigenous education and community–based curricula in the country. They serve as a framework to further discover the indigenous peoples' culture and indigenous knowledge and find ways to utilize them to enhance the quality of science education in the Philippines.

The implementation of the Universal Kindergarten Act in the Philippines necessitates the government and private sectors to put a premium on the education and welfare of young children. Ensuring that all young children from different types of communities will have a complete and adequate quality education is not only a promise of the Philippine Constitution but a commitment to develop young children as the next leaders and professionals in the country. Early childhood education is an essential lifetime experience that sets a good foundation for young children's education. If much brain development happens during the early childhood years, designing a nurturing learner-centered education is essential.

In this study, the theories of learner-centered education and constructivism, are found to be very useful in developing a ground theory for the development of a community-based science curriculum for preschool in the Philippines.Constructivism believes that knowledge is constructed and influenced by the learner's previous knowledge and experiences. It also recognized the vital role of the learning environment in the development of knowledge.

Learner-centered education, on the other hand, considers the nature, interests, developmental tasks, learning preferences, needs, and culture of the learners in the design and implementation of the curriculum. The proposed community-based science curriculum is contextualized and localized. The language of the learners is the medium of instruction, and the content is contextualized using community resources, people's experiences, and indigenous science knowledge and practices. The framework for a community-based science curriculum must be the *place of the community, its environment, its history, and its people.*

METHOD

The study sought to answer the following research questions: (1) what are the community resources, activities, and challenges that could be considered in the development of the curriculum; (2) what are the different children's interests and activities that could be used in the development of the curriculum; and (3) what are the contents and learning experiences of the proposed community-based science curriculum for preschool.

Posner's (2004) model for analyzing curriculum was used as a framework in this study especially in analyzing the context, resources, and the connections of everyday science activities to the current science curriculum. To gather data, the study involves qualitative methods like interviews, community immersion, and focus group discussions (FGD) in a local community in the northern province of the Philippines. The key informants from the community were purposefully chosen from among preschool teachers, parents, barangay officials, and elders from the community. Parents, teachers, barangay officials, and community leaders were gathered in one venue for the FGD and interviews. First, a lecture discussion was done to explain the purpose of the study and foster understanding of the basics of preschool education and their role in curriculum development. After this activity, community resources that could be utilized in the development of the proposed community-based science curriculum were visited.

A curriculum analysis was done to look at the themes of the curriculum that could be used as benchmarks in the development of the curriculum content and learning competencies of the proposed community-based science curriculum.

Thematic analysis based on the work of Clandinin and Connelly (2006) was used to analyze the result. The qualitative data were organized into different themes that identify the community activities, resources, issues, and challenges that could be used for the proposed community-based science curriculum for preschool. The guidelines for the ethical requirements of conducting research in local communities were observed and complied with during the period of data gathering and interpretation. Confidential data was eliminated from the analysis in reverence for the privacy of the participants.

RESULT AND DISCUSSION

The results of the study are presented, discussed, and organized based on the research questions of the study.

What are the available resources, activities, and challenges in the community that could be considered in the development of the curriculum?

The local community is host to some natural resources that are useful in learning science. Since young children are interested in experiencing science by engaging themselves in science activities, the environment could be a natural laboratory for learning science.

Table 1 shows the available community resources and how they can be connected to different topics in the existing science curriculum. These community resources could be the venue for science investigations and observations. The bodies of land and water around the community are home to many living organisms and plants. Young children can observe these living things and their habitats and develop an understanding of a balanced ecosystem. In the process of appreciating the beauty of the natural environment, young children will develop different processing skills that are useful in everyday life.

Table 1. Available Community Resources that could be use for Science Activities

Community Resources	Science Curriculum Connection
Streams and small rivers Rice fields Vegetable farms Mountains Community garden for medicinal plants Ponds for freshwater fishes Farm animals Different variety of plants and trees	Earth, Ecosystem, Plants, Animals Science Process Skills: (communicating, observing, classifying, measuring, inferring, predicting, designing experiments)

Dewey (2001) considers the environment to be the foundation of early childhood curriculum. He stresses the importance of utilizing the natural environment when teaching young children. Science, which focuses on observing and interpreting various natural activities and the nature of *nature,* is essential for young children. Community-based science in preschool particularly provides a suitable foundation for learning science and for the development of scientific literacy and science culture among young children (Martin, 2001).

If science is a social activity, doing science and experiencing science are therefore integral parts of people's lives. It is embedded in the culture of the people.

Table 2 shows the different activities of the people and the related science topics to which they could be connected. Pawilen (2021) and Cajete (2009) observed that these community activities are creative applications of science concepts and an artistic application of various science process skills.

Table 2. Community Activities and their Connections to the Science Curriculum

Community Activities	Science Curriculum Connection
Celebrating Christmas	Earth, Season, Climate, Weather, Ecosystem, Temperatures, Materials, Mixtures, Energy, Electricity, Sounds, Light
Festivals	Ecosystem, Atmosphere, Water Resources, Energy, Ecosystem, Earth, Season, Climate, Weather
Planting and harvest season for summer	Living Things, Animals, Plants, Ecosystem, Earth, Season, Climate, Weather, Ecosystem, Temperatures
Experience of electric failures (brownouts)	Energy, Electricity
Planting and harvest season for rainy season	Living Things, Animals, Plants, Ecosystem, Earth, Season, Climate, Weather, Ecosystem, Temperatures

Science should also address the different challenges in society. Hence, it is essential to develop young children to be science literate. At their age level, young children have a limited grasp of the different issues around them, but they experience these social challenges every day. It is essential for them to develop a scientific understanding of these natural phenomena and social challenges. Learning science in preschool lays the foundation for the development of science literacy and science process skills (Pawilen, 2017; de Boo, 2000).

Table 3 shows the different social challenges experienced by the people and their possible connections to different science topics.

Table 3. Community Challenges and their Connections to Science Curriculum

Community Issues	Science Curriculum Connection
Changing of climate Experience of typhoons and bad weather condition Death cause by lightnings Flooding Droughts Experience of earthquakes	Earth, Season, Climate, Weather, Ecosystem, Temperatures
Air and water pollution	Ecosystem, Atmosphere, Water Resources, Energy, Ecosystem
Pests and insects destroying their crops	Living Things, Animals, Ecosystem
Experience of electric failures (brownout)	Energy, Electricity

All curricula should be relevant to the context of the society where they will be implemented (Pawilen, 2017). Any curriculum development model should emphasize the importance of situational analysis or needs analysis as a starting point for the curriculum development process. Identifying the available resources in the community, recognizing the cultural celebrations and festivals, and understanding the different challenges and issues are essential in making the proposed community-based science curriculum for preschool responsive and reflective of the community and culture it represents.

What are the interests and activities of young children that could be used in the development of the curriculum?

In preschool education, the learners are the best source of curriculum. Thus, it is important that the proposed community-based science curriculum be learner-centered. A learner-centered curriculum considers the interests and needs of every learner.

Table 4 shows the interests and activities of the learners in the local community and their connection to the different topics of the science curriculum. The result supports the notion that young children are naturally curious about their environment. They have the natural desire to know and learn more about the things around them and the natural phenomena that they experience. These interests of young children could be used in the development of the science curriculum. Science reinforces among young children scientific discipline and attitude — the love for knowledge, passion for innovative things, curiosity to study nature, and creativity. Science begins with childhood curiosity that leads to the discovery and investigation of the environment (Evans, 2005; Harlan and Revkin, 2004; de Boo, 2000).

What are the contents and learning experiences of proposed community-based science curriculum for preschool?

For this study, *science* is defined as a subject area in the preschool curriculum that includes concepts, cognitive skills, process skills, life skills, and values. It involves a process of developing children's ability to use science knowledge in understanding the environment and natural phenomena, and to use science skills and processes such as observing, classifying, problem-solving, inferring, and communicating in daily life.

Table 5 shows the contents of the proposed community-based science curriculum. The proposed science curriculum for preschool has the following essential features: Its contents are contextualized based on the nature and needs of the community; It uses various community resources as inspiration and venue for learning science; It addresses local issues and challenges; It is aligned with the activities and experiences of the people in the community; It reflects the culture of the people in the local community.

The contents of the curriculum are aligned with the activities of the people during the various months of the year. The contents are also contextualized to reflect the different changes and life activities brought about by the two changing seasons - the rainy season and summer. August is the start of the school year, and it is also the peak of the rainy season in the country. Most typhoons and heavy rains arrive from August until September; harvest season starts from October to November; cold months start from December to February; and summer is from March to April. May is a special month of the year. It looks like springtime when trees change their leaves and flower, and wild plants bear flowers.

Through the proposed community-based science curriculum, nature and the environment will serve as inspiration. The connection of science to everyday life is firmly established. Since the community is a farming village, learning competencies and some themes are related to the farming activities of the people.

The learning competencies are not very prescriptive. Thus, there is enough time for the

Table 4. Children's Interests and activities and their Connections to the Science Curriculum

Children's Interests	Science Curriculum Connection
Insects during planting and harvest seasons (dragonflies, bugs, ants, and butterflies) Birds Farm animals (cow, goat, chicken, carabao) Fish, frogs, freshwater crabs	Living Things: Animals, Habitats, Ecosystem
Observing stars, moon, and other heavenly bodies that are visible	Earth, Solar System, and other Heavenly Bodies
Playing with rocks and soil Playing with water (taking bath in the river or streams, or during the rainy season)	Earth: Water, Soils, Rocks and Minerals, Mixtures
Making lanterns and other decorations during Christmas Making tools from indigenous materials Riding on a cart Flying a kite Observing fire during harvest season	Energy Sources, Electivity, Tools and Materials
Plants, fruits, flowers Different trees (especially fruit bearing trees or small trees where they could play on the branches)	Living Things: Plants, Habitat. Ecosystem, Uses of Plants
Eating local foods like rice cakes and other delicacies	Food, Nutrition
Engaging in local sports, games, and dance	Materials, Physical Body Fitness,
Doing arts like painting, drawing, molding clays and soil	Materials, Mixtures, Colors, Shapes
Listening to stories from parents and community elders Singing songs and playing instruments	Values and Character Formation Music, Sounds

Table 5. Proposed Community-based Science Curriculum for Preschool

Month	Curriculum Theme	Learning Competencies
August	Me and My Family	Recognize themselves as part of a family Identifying the members of the family Practice good manners in dealing with adults and other children Describe the place where they live Recognize that there are physical characteristics that they inherited from their parents Know their different body parts and functions of each part Recognize their individual differences and uniqueness in terms physical body structure and other observable characteristics and traits Identify their favorites: food, color, place, game, book etc. Practice health habits like proper brushing of teeth, combing hair, putting shoes, cleaning fingernails etc. Practice proper way of eating and drinking
September	Our Community	Identify different places in the community Identify different land formations and bodies of water in the community Recognize what people do in everyday in the community Identify the different kinds of weather: sunny, rainy, cloudy, stormy Observe different patterns of changes during each weather. Ex. Temperature becomes hot or cold Know what to do during different types of weather ex. What to wear, where to stay, what not to do, what to expect, how to behave.

October	Living Things around Us	Recognize different kinds of plants that grow in the community Classify plants based on observable properties Observe different parts of plants Recognize the different uses of plants Recognize different kinds of animals in the community Classify animals based on observable properties Observe different external plants parts of animals Observe different plant and animal habitats Understand the concept of ecosystem
November	It's time for Harvest	Identify crops that are harvested during November (rice & vegetables) Identify insects and animals (bird species) that can be seen during harvest season Observe activities that are done during harvest season Share favorite local stories about harvest season Draw some pictures about harvest season Know that other places are different in crops they harvest, activities to celebrate harvest season etc.
December	Its Christmas Time	Make Christmas cards and other Christmas decorations Perform Christmas songs, dance and plays Experience gift-giving Know how other people celebrate Christmas Prepare foods for Christmas (simple dishes, salad, rice cakes)
January	Lights & Sounds	Identify sources of light. Ex. Sun, bulbs, flashlights, fire etc. Know what lights can do Identify the importance of solar energy in everyday Identify different sources of sound Know what types of sound are produced: music, noise, etc. Observe how light and sound is produce
February	Rides & More Rides	Know different forms of transportation. Ex. Land, air, and water transportation Name different transportation equipment Know the importance of transportation equipment to human activities Make models of transportation using blocks, boxes, and other materials
March - April	Summer is Beginning	Observe some temperature changes during summer Observe activities conducted during summer like festivals, ceremonies, going to picnic in the beach or in parks Identify crops that grow on summer Observe what changes happen around their place during summer Play with sand soil Classify rocks and stones based on observable properties
May	Changes in the Environment	Observe what happened to plants and trees during the month of May Observe changes in temperature and weather condition during May season Observe what people do in the community during thanksgiving celebration Identify what people do to prepare their fields for planting season

teachers and young learners to conduct scientific observation, investigation, and experimentation.

CONCLUSION

The study supports the idea that science should relate to everyday life, and nature serves as the foundation and inspiration for learning science. The study also reinforces the idea that learning science in preschool education sets a good foundation for learning science in basic education. The proposed community-based curriculum for preschool likewise nurtures young children's interest and curiosity in learning science and in using science to understand natural phenomena. It utilizes young children's interests, questions, and challenges in the development of themes and learning competencies. The proposed community-based science curriculum for preschool reflects daily life activities, uses the natural environment as a resource and a natural laboratory for conducting a scientific investigation, and uses science

knowledge to explain natural events happening in the community.

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