Utilization of Traditional Palm Art in Teaching Science and Mathematics

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ABSTRACT

Excellence in the teaching is the most common goal of all teachers particularly in Science and Mathematics. The many challenges that science and mathematics teachers and educators face today make teaching difficult. With this, this quantitative-qualitative research described the different science and mathematics concepts developed while doing the traditional palm art (designing coconut leaves for Palm Sunday). The six (6) participants composed of residents in the different barangays basically with low knowledge of science and math were invited to do palm art. Recording and semi-structured interview were used to gather the responses while doing the palm art. It revealed that the Star Design accounted for the following mathematics concepts such as the square and its area, the right triangle and the pyramid. This helped them understand the number of sides they developed or created before making or finishing a certain design. For the science concepts it presented the concept or idea of the stars its shape and its sizes. After which the created stars were used as concrete visual of how the stars look. The next design was the Puso which formed the mathematics concept on cone, tetrahedron and solid figures while for the science, the concepts identified during the formation of the design were the phases of matter (solid), and composition and balance. The developed design can be utilized as a contextualized instructional material for teaching science and mathematics. After the lessons were introduced and presented using the palm art, the effectiveness of the contextualized instructional materials was determined in terms of its utilization in motivation, presentation of the lesson and discussion of the lesson. Results revealed that the palm art as used for instructional design was described as excellent in terms of motivation, very satisfactory in presenting lessons for mathematics and science, and very satisfactory to be used as part of the discussion.

Keywords: palm art, contextualized instructional materials, science and mathematics teaching

INTRODUCTION

The Philippines, despite numerous attempts to improve its educational outcomes, has instead become an educational laggard, taking the ignominious distinction of getting low rankings in three different global evaluations that scored students' performance in science, technology, engineering and mathematics (STEM).

There are several significant hurdles in improving STEM education in the Philippines. While the Philippine Statistics Authority reported in its 2019 functional literacy, education and mass media survey that 91.6 per cent of the population have functional literacy – higher than the 90.3 per cent functional literacy rate in 2013 – it has received low rankings in three different evaluations that scored students' performance in STEM within the past five years.

In the 2018 Programme for International Student Assessment (PISA), which evaluated the performance of 15-year-olds in reading, mathematics and science, the Philippines took the second-lowest spot in science and mathematics, with Dominican Republic being the only country that ranked lower than the South-East Asian country. The Philippines also took the lowest spot in reading.

PISA is a programme of the Organization for Economic Cooperation and Development (OECD). It is conducted every three years to assess whether 15-year-old students have acquired the knowledge and skills necessary for their social and economic participation.

According to Balagtas, et al(2020) the Philippines did not fare better in the 2019 Trends in International Mathematics and Science Study (TIMSS), which evaluated the performance of Grade Four students in math and science proficiency. It ranked the lowest among the 58 countries that were included in the study.

The Philippines also did not do well in the 2019 Southeast Asia Primary Learning Metrics (SEA-PLM), which measured the capacity of Grade 5 students in reading, writing and mathematics. The country – one of six in the region that participated in the assessment, alongside Cambodia, Lao PDR, Malaysia, Myanmar and Vietnam – performed below the regional average in all three areas.

Only ten per cent of Filipino students were able to meet the minimum required proficiency level for reading at the end of lower primary education. More alarmingly, nearly half of them belonged to the lowest proficiency band in writing literacy, and only six per cent were able to demonstrate proficiency expected of Grade Five students. Meanwhile, 41 per cent failed to meet the minimum proficiency level in mathematics science are expected at the end of lower primary education.

Meanwhile, the country fell eight slots lower in the 2022 Global Innovation Index and is now on the 59th spot among 132 economies. While the report recognized the country as having a strong potential for transforming the global innovation landscape, it is noteworthy that the country-specific report indicated that education in the Philippines as a weakness, putting special attention on low PISA scores and pupil-teacher ratio at the secondary level. The report also noted that the number of graduates in science and engineering has gone down by four percentage points between 2019 and 2020.

Countries such as the Philippines, Thailand and Indonesia did not perform well in PISA 2018. On the other hand, Singapore is one of the best-performing countries worldwide in the evaluation, ranking second only to China across all three categories (science, math, and reading). Japan, South Korea and Taiwan have also had good standings in the World University Rankings and the QS World University Rankings, penetrating the top 200 universities in the world. Brunei and India were also able to have one university each penetrate the World University Rankings, while Malaysia was able to have two of its higher education institutions placing within the top 150 universities.

With this, the bottomline of the result presented was about how lessons are being transmitted to the mind of the learners considering that the school have deficiency in the instructional materials used. Thus, contextualizing such is a strategy to be used. The Department of Education (DepEd) defines contextualization as educational processes relating the curriculum to a particular setting, situation, or application area to make the competencies relevant, meaningful, and valuable to all learners (DepEd 2016).

The approval of the Republic Act (RA) 10533 which is the Enhanced Basic Education Act of 2013 that provides that education should adhere to the standards and principles in developing enhanced basic education curriculum by being contextualized and global as well as by being culture-sensitive.

In response, educators, teachers, and policymakers have embraced contextualization as a constructivist approach to bridging the gap between concepts and real-life experiences. Considering the popularity of this approach, it is imperative to examine the overall effectiveness of contextualization in improving students' achievement at all educational levels and in all science domains, compared to the traditional setup. By using a set of inclusion selection criteria, 10 Philippine-based studies conducted from 2017 to 2020 qualified to be included in a meta-analysis.

Contextualization is an approach to teaching science that could have a positive effect on students' achievement. The variables educational level and science domain were found to have no influence on student achievement. Contextualized instruction used various techniques to maximize achievement of learning outcomes. A further systematic review, covering a wider scope, must be conducted to examine indicators that may influence the implementation of contextualization in the teaching and learning process (Fortus, 2020)

Contextualization is one of the keys of engaging the students in teaching learning process wherein the students can relate their situations on their lesson. It makes the lesson meaningful and relevant to the students' lives by relating the students' context to mathematical content taught in school.

This study covered the concepts and practices of science and mathematics teachers on contextualization. On this premise, improving the teaching of science and mathematics through contextualizing instructional materials can be a vital aspect of creating better outcomes among students. . It is believed to refine teaching practices that contribute to their growth as professional teachers by reflecting on the effectiveness of the pedagogy implemented in the classroom [Giamellaro, M. (2017]. In the improvement of the instruction, quality students will be produced [Karisan, D., & Zeidler, D. L.(2017]. This study investigated the utilization of palm art as a tool in teaching simple interest using contextualization. While the leaves of the palm are too tough to be edible, palms have been used since ancient times for building materials, paper, and some varieties produce edible fruits that are popularly consumed today such as the coconut, date, and acai berry.

However, there are no explicit guidelines for how this information is taught. While school systems choose specific textbooks and curriculum, the choices of actual instructional material and activities are often left to the intuition of teachers. Therefore, it is important to examine the effectiveness of material and activities that teachers use, but may not be recommended by formal sources such as official curriculum or educational research journals.

This research study was advanced.

METHODOLOGY

Research Design

This used the quantitative-qualitative research is a process of naturalistic inquiry that seeks an in-depth understanding of social phenomena within their natural setting. It focuses on the "why" rather than the "what" of social phenomena and relies on the direct experiences of human beings as meaning-making agents in their every day lives. This used the observation and meta-analysis. Observation research is a qualitative research technique where researchers observe participants' ongoing behavior in a natural situation. Observation in qualitative research "is one of the oldest and most fundamental research methods approaches. This approach involves collecting data using one's senses, especially looking and listening in a systematic and meaningful way" (McKechnie, 2008, p. 573).

Observation, as the name implies, is a way of collecting data through observing. This data collection method is classified as a participatory study, because the researcher has to immerse herself in the setting where her respondents are, while taking notes and/or recording. In an observational study, researchers study how participants perform certain behaviors or activities without telling them what methods or behaviors to choose (Fiuna, et al, 2016).

From the findings, the science and mathematics teachers have two ideas of contextualization – about the student's life and using local materials or information. These ideas came from the reference materials, internet and seminar-training conducted by DepEd which seen on their teaching pedagogies. Lessons delivered effectively and efficiently if the math teachers used available materials or information in the surrounding which created better understanding of math concepts.

Context on students' lives made the class lively and engaging where the students construct their own meaning.

This study made use of self-made set of questionnaires to all of the respondents. The researcher then personally conducted the survey to readily answer or address any clarificatory questions that the respondents asked and to avoid problems in the retrieval of the questionnaires. The statements in the questionnaire were explained and translated to the local language for the student-respondents to fully assess their teacher's level of use of contextualization. The respondents were also oriented on the features and objectives of the questionnaires before they started accomplishing the same. The data gathered was held strictly confidential.

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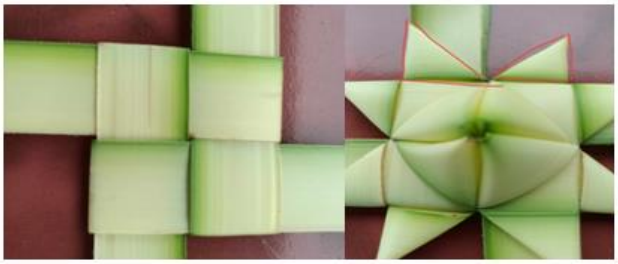
Data Analysis

Design1: Star



Mathematics Concept

Square and its area. The first figure formed in making a star is a square. A square has a side of 2 units. It was also found that the area of a square is 4 square units. This material can be used in teaching Geometry of grade 4 discussing the concept of area.

Right triangle. The second figure formed in making a star is right triangles. Based on the actual figure, the star has eight right triangles. The eight right triangles may be congruent or not depending on the size of coconut leaves being used. This material can be used in teaching in teaching Geometry of Grade 4 discussing the different types of triangle according to angles.

Pyramid. The last figure formed in making a star is pyramid. Based on the actual figure, there are two pyramids in a star. The pyramids may be similar depending on the sizes of leaves used.

Science Concept

Meteorology (Stars and its Shape). In the making of the design, the shape of star came from the concept which stated that stars are huge celestial bodies made mostly of hydrogen and helium that produce light and heat from the churning nuclear forges inside their cores. Aside from our sun, the dots of light we see in the sky are all light-years from Earth. They are the building blocks of galaxies, of which there are billions in the universe. It's impossible to know how many stars exist,

Analysis:

The developed design out of the traditional palm art was utilized to as instructional material to introduce the topic on mathematics and sciences. Discussion of the lessons was done while the participants were creating the design. Through question and answers, the participants had increased their knowledge about basis mathematics and science.

Design 2: Pusô

Mathematics Concepts

Cone. The cone was found at the lower part of male pusô. This can be used in teaching geometry in grade 6.

Tetrahedron. The female pusô can be used as a representation of tetrahedron. This can be used as aid of instruction in discussing the concepts of tetrahedron.

Solid figures. Both male and female pusô can be as an examples of a solid figures. Solid figures are topics in Geometry for elementary grades.

Science Concept

This helped the participants understand the developed design was an example of a solid in which solid is not an abstract idea only. It can also be used to introduce the lessons about heart as part of the circulatory system by letting them concretely see t the shape of the heart of the person.

Analysis:

Utilizing this shape out from the traditional palm art had gained understanding and more knowledge about some mathematics shape and science concepts.

Effectiveness of the Palm Art as Used in the Lessons

The effectiveness of the palm art as used in the lesson was determined using the mean and the standard deviation. Table 1 presents the results.

Table 1. Effectiveness of the Palm Art as in the Lessons

Category	Mean	Standard Deviation	Description
Motivation	4.32	0.3231	Excellent
Presentation of the Lesson	3.91	0.3312	Very Satisfactory
Discussion	3.88	0.3182	Very Satisfactory

Legend: 1.00-1.80 Needs Improvement; 1.81-2.60 Fair; 2.61-3.40 Good; 3.41-4.20 (Very Satisfactory; and excellent

Results revealed that the palm art as used for instructional design was described as excellent in terms of motivation, very satisfactory in presenting lessons for mathematics and science, and very satisfactory to be used as part of the discussion.

Comparison of the Regular Teaching Method and Using Palm Art in Teaching

The effectiveness of the regular teaching load and palm art in teaching was determined using the mean.

Table 2 presents the data.

Category	Mean	Description
Regular Teaching Method	4.32	Excellent
Using of Palm Art	4.34	Excellent

Results showed that using of palm art and the regular teaching method are all both excellent as used in science and mathematics in terms of motivation, presentation of the lesson and discussion.

RESULTS AND DISCUSSION

In fact, many of the core skills in art and math are closely related. Both disciplines require spatial reasoning skills and the ability to recognize patterns. Artists and scientist and mathematicians use geometry in their work, including shapes, symmetry, proportion, and measurement.

Science, Mathematics and art are areas of knowledge that demonstrate different degrees of interaction between critical and creative thinking. Whether considering mathematics or art, creative thinking evaluates a new or original idea containing some degree of value. Critical thinking examines assumptions and challenges a current belief or theory that has previously assumed to be true. Although general assumptions and creativity may be considered separately when considering extreme examples of concrete ideas and abstract ideas, the interplay of critical and creative thinking is one method in which new and validated knowledge is attained.

There is anecdotal evidence that many teachers integrate science and mathematics lessons and art activities by having students first make colorful, rich material that is subsequently used in an instructional activity. However, it is unclear whether such activities effectively promote learning and transfer of mathematical concepts. The goal of the present research was to examine the use and effectiveness of such "sci-math-and-art" activities on children's ability to acquire basic fraction knowledge (Belen, 2020)

CONCLUSION AND RECOMMENDATIONS

These findings suggest that rich, contextualized representations, including those made by the student, can hinder students' learning and transfer of science and mathematical concepts. We are not suggesting that teachers never integrate science, mathematics and colorful, contextualized material, and activities. We do suggest that students' mathematics learning can benefit when initial instruction involves simple, generic, pre-made material and opportunities for students to make and use colorful, contextualized representations come later.

Intuitively, it may seem that incorporating art activities, such as making representations of mathematics from everyday objects, into mathematics lessons may make mathematics seem more fun and hence increase student engagement. In addition, these activities can provide students with physical material to manipulate for instruction and potentially provide a familiar context such as sharing food. There is evidence that both physical material and familiar contexts can be beneficial for mathematics learning.

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