

Introduction

NAHS - POHNPEI FEAST HOUSES

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My understanding of ethnomathematics and its use with Pacific students

The MACIMISE Project is practically a study to implement Ethnomathematics in the classrooms. “The term ethnomathematics is used to express the relationship between culture and mathematics. The term requires a dynamic interpretation because it describes concepts that are themselves neither rigid nor singular—namely, ethno and mathematics” (D’Ambrosio, 1987, p. 308). The term ethno describes “all of the ingredients that make up the cultural identity of a group: language, codes, values, jargon, beliefs, food and dress, habits, and physical traits.” Mathematics expresses a “broad view of mathematics which includes ciphering, arithmetic, classifying, ordering, inferring, and modeling” (D’Ambrosio, 1987 p. 2–3).

In a Pacific island classroom ethnomathematics should be included into the mathematics curriculum. To find out the students’ capabilities in mathematics, we should teach them mathematics that is relevant to their culture so that they can be able to identify the problem and be able to solve the problem. One important element in problem solving is that to prevent the temptation of the student solving problem in a way to try to show what the teacher is trying to think rather to problem solve the problem. In a study conducted by Wallace 2007, the author points out how a lesson plan plays an important role in planning to anticipate student responses improves problem solving. In her article she pointed out in a study by Stigler, Fernandez and Yoshida (1996) how they contrast American and Japanese lesson planning. American lesson plans are typically presented in outline form: Japanese lesson plans are more detailed (Wallace, 2007). The lesson plan format that the teachers in Pohnpei are using is similar to American Lesson plans. This limits the students’ ability to explore their own ideas. Their responses will be limited to what they would expect the teacher would think.

I know this unit is the beginning for the education system in Pohnpei to start thinking about changing the whole math curriculum to include a math curriculum that revolves around ethnomathematics. The unit that was developed is suitable for the students because it is about something they know. When the students know the background of the problem, it is more likely that they will continue working on the problem.

How I chose the topic for the unit

My unit is about the Traditional Feast House, Nahsen Pohnpei. The reason I chose this topic is because of them many mathematics surround the Nahs. There are abundant math activities that one can use in a classroom about Nahs. A handful was used in my unit and there are endless of mathematical knowledge that are available yet due to time it was not possible to include it in the lesson. Nahs is so common in Pohnpei that many Pohnpeian interactions evolves around a Nahs. Most elementary schools in Pohnpei erect a Nahs in the school vicinity.

There are lots of lessons that can be developed from the Nahs. Not only from the construction of the Nahs or the layout of the complex yet, every activity that is done in the Nahs all have mathematics embedded in it. All the cultural activities, ceremonies and funerals that are held one can extract a mathematical lesson because of so much mathematics that is involved in each. Part of this creates a world of mathematics for a Pohnpeian student living an ordinary life and all the mathematics surrounding gives a purpose of learning to an individual. Galileo (1564–1642) said,

The universe cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word. Without these, one is wandering about in a dark labyrinth.

What I learned from elders and other people who influenced my unit

I give credit to the elders who are knowledgeable in our culture because of their great inputs that they shared with me. At first it was challenging when they explained about the project and that we were to look at culture and extract the mathematics from that knowledge. The reason why is because I am not a pure Pohnpeian and knowledge is only passed through lineage. I knew my task would be harder than the others. But the elders that were selected were kind enough to provide enough information for my works.

I had learned how the people from the past built a Traditional Feast House (Nahs) without the tools to measure to make it squared. It was a unique method that showed how creative and wise the ancient people were. The ceremonies that they did for each stage of building the Nahs were also fascinating because of the purpose that they served. Much of the information that I will share in this project was gathered from the elders that helped me. Learning from the elders had influenced me to keep on searching for other cultural knowledge that will be useful for me in my classroom.

Unit Overview

NAHS - POHNPEI FEAST HOUSE

Enduring Understandings

Mathematics that is embedded in a *nahs*
Mathematics required for building a *nahs*

Knowledge

Traditional Pohnpeian units of measurement -
Ngahp, Tupwengen Peh
Names of mathematical shapes and patterns
and identify lines and angles
Ways to measure using traditional Pohnpeian
measuring units

Skills

Measure using *Ngahp* and *Tupwengen Peh*
Recognize shapes and patterns.

Learning Strategies

Exploring and discovering
Modelling and observing
Participating in a group

Rationale

Students often struggle to learn about things that are unfamiliar to them and strange to their culture. This unit is designed to encourage students to learn academically as well as to recapture and honor the mathematics that is seen throughout their everyday living experiences.

Goal

Student will learn about mathematics embedded in the Pohnpeian Traditional Feast House, the *Nahs*.

Essential Questions

What mathematics are seen in a traditional feast house, the *Nahs*?

What are the names for the different kinds of mathematics used?

Background to this Unit

Nahs is so common in Pohnpei that many Pohnpeian interactions revolve around a *Nahs*, the traditional feast house. Most elementary schools in Pohnpei erect a *Nahs* in the school vicinity. Many lessons can be developed not only from the construction of the *Nahs* or the layout of the complex. Much mathematics is involved in all the cultural activities, ceremonies and funerals held in the *Nahs*. This creates a world of mathematics for a Pohnpeian student living an ordinary life, which gives good purpose for learning mathematics. For this unit, local elders shared their knowledge about how people from the past built a *Nahs* without the tools to measure to make it squared. It was a unique method that showed how creative and wise the ancient people were.

Assessment

The teacher observes students' participation, process and progress as they develop and apply specific skills and knowledge. The teacher asks specific questions to confirm learning and assigns writing and initiates conversations to support learning process (e.g., reflection, knowledge).

Lesson One

FIELD TRIP TO THE NAHS

Focus

Field trip to the Nahs

Materials Needed

Pencil
Paper for notes

Objectives: *Students will*

- use Pohnpeian body measures to discover the dimensions of a *Koupahleng* traditional feast house.
- identify geometric figures and patterns/repetitions.

Teacher Activities

1.1. Prepare for field trip.

Assemble students and put them at ease.

Put students into groups of three: leader, recorder, time keeper, and explain their roles and responsibilities.

1.2. Give an introduction and encourage discovery.

Tell students the purpose of a *Nahs*.

Explain that there are different kinds: *Koupahpwel*, *Koupahleng*, *Wen umw*.

Ask questions for students to think about and direct them to make notes.

Student Activities

1.1. Listen to instructions and ask questions.

Select roles (recorder, leader, time keeper) be sure of responsibilities.

1.2. Listen and take notes.

Ask questions and document answers and observations.

Sample Questions

- How is the traditional feast house built?
- What mathematics can be seen?
- What kinds of mathematics was used to build houses in the past?
- From what can be observed, how was mathematics used?

Teacher Activities

1.3. Have students record the dimensions of the *Nahs* using Pohnpei units of measurement (*Ngahp* and *Tupwengen Peh*)

Discuss the use of body measures and ropes.

Measure the length, width and height of the *nahs*.

1.4. Have students use a particular *ngahp* and *tupw* for the measurement.

Challenge students to find the average or common measure for *ngahp* and *tupw* for each group.

1.5. Assign students to write an essay or report on the field trip, explaining what they learned and why it matters to them.

1.6. Have a discussion about their experience using traditional methods of measuring.

Prompt with questions.

Sample Questions

- How did they use *ngahp* and *tupw* to measure the big *nahs*?
 - If they used a rope, how did they convert the measurement into *ngahp* and *tupw*?
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Student Activities

1.3. Determine units by sharing ideas and discussing.

Record the dimensions of the *Nahs*.

1.4. Respond to the directions related to measuring.

Discuss to solve the challenge.

1.5. Write a description of the field trip activities and the learning.

1.6. Share thoughts and ideas.

Answer questions and contribute to the discussion.

Lesson Two

MEASURING THE NAHS

Focus

Mathematics of the Nahs - measurements and measuring

Objective: *Students will*

- use collected data from the field trip to find the area and perimeter of the traditional feast house.

Materials Needed

Twine string
Sticks
Paper and pencils

Teacher Activities

2.1. Review the field trip and have students share their experiences. Ask students to share any findings or other features of traditional feast houses in their own communities.

2.2. Discuss the mathematics of the *Nahs*, using prompts.

Sample Prompts

- Identify patterns and geometric structures.
- Name the geometric structures in Pohnpeian and English
- Discuss the terms *perimeter* and *area* and explain how they can be directly measured.
- Is there a Pohnpeian unit of square measure to use for area? (e.g., is the surface of the hand regarded as an area unit?)

2.3 Discuss measurement:

- Discuss techniques for measuring perimeter directly, e.g., using string.
- Discuss how to measure area using a 'tool', e.g., a paper square 1 foot by 1 foot moved over an area. Connect this procedure with multiplying length measure by width measure.

Student Activities

2.1. *Listen and participate in the discussion by sharing and asking questions.*

2.2. *Share ideas and ask questions.*

Listen and take notes.

2.3. *Contribute to the discussion by sharing ideas and asking questions.*

Take notes.

Teacher Activities

2.4. Ask students to work in pairs or groups to calculate perimeter and area of the *Nahs*.

Monitor and assist students within their groups.

Ask students how they determined the perimeter.

If they used their body measures, ask them to describe how they arrived at a common unity of measurement.

2.5. Ask each group to present their result.

Ask them to describe their process.

Follow up with additional questions.

Sample Questions

- What will happen to the area and perimeter if only the length changes?
- Happens to perimeter and area if length and are are both doubled?

Student Activities

2.4. *Determine perimeter and area.*

Record data and the process.

Share ideas and listen to others.

Compare and contrast findings and ways of measuring.

2.5. *Work with group to present result and explain process.*

Listen, ask questions, and share ideas.

Lesson Three

NAHS - GEOMETRICAL FIGURES

Focus

Geometric figures and patterns in a *Nahs*

Materials Needed

Pictures taken during the field trip

Objectives: *Students will*

- identify and name geometric figures and patterns in a *Nahs*, in Pohnpeian and English.
- define terms in Pohnpeian and English.
- compare and contrast mathematical figures and describe different patterns.

Teacher Activities

3.1. Invite reflections from the previous lesson.

3.2. Have students identify and name geometric figures, using Pohnpeian and English names) and describe patterns seen at the *Nahs* during the field trip visit.

Use photographs taken during the field trip to prompt their memories.

Ask students to pair up and share their findings.

3.3. Have students create definitions for terms, using both Pohnpeian and English.

Ask students to decide if there are language differences in the definitions.

Guide students to talk and discuss while they work.

Have students share their findings to the whole class.

3.4. Have student list all the things they have learned in today's lesson.

Invite sharing with others.

Student Activities

3.1. *Discuss and ask questions.*

3.2. *Listen to each other and share ideas.*

Take notes.

3.3. *Write down definitions.*

Discuss ideas together, and share as a group.

3.4. *Share ideas and listen to others.*

Lesson Four

NAHS - GEOMETRICAL PROPERTIES

Focus

Pohnpeian counting system

Objective: *Students will*

- count objects found in the Koupahleng using Pohnpeian counting system (which counts classes of objects differently)

Materials Needed

Pencils
Notebooks
Flip chart

Teacher Activities

4.1. Review the learning on shapes and patterns.

4.2. Group students for “Pair and Share.”

Write the number 68,546,234,791 for students to name.

Introduce the Pohnpeian counting system and classifiers.

Name place values using the Pohnpeian counting system.

Record on flip chart.

4.3. Have students recall the geometric objects and patterns.

Ask students to list the objects and patterns.

Count them using the Pohnpeian counting system.

Have pairs share their work by presenting to the whole class.

Invite students to ask questions and to answer questions raised.

Build on the questions raised for further discussion and learning.

4.4. Write a short paragraph of what they learned in the lesson.

Student Activities

4.1. *Listen and share ideas.*

4.2. *Listen and take notes.*

Ask questions and offer ideas.

4.3. *Record and list objects and patterns.*

Count using Pohnpeian counting system.

Share findings.

Ask and answer questions.

4.4. *Organize ideas and write a paragraph.*

Lesson Five

MODEL OF A NAHS

Focus

Building a scale model of a *Koupahleng (Nahs)*

Objectives: Students will

- build a scale model of a *Koupahleng*.
- learn proportion and scale modeling.

Materials Needed

Rods
 Scotch tape
 Cardboard
 Construction paper
 Scissors
 String
 Paper

Teacher Activities

5.1. Briefly discuss what has been learned in the unit on the traditional feast houses in Pohnpei.

5.2. Divide students into groups of 5 or 6.

Introduce activity of building a model Nahs and explain what they will do.

Assign group members with task: leader, timekeeper, secretary, presenter and engineer.

Provide available materials for students to build the model.

5.3. Allow students to freely build their model of the *Nahs*.

Monitor and assist.

Remind student to take in account the parts of a *Nahs*.

Student Activities

5.1. *Listen and contribute to the review.*

5.2. *Listen and take notes. Ask questions and respond. Participate in roles.*

5.3. *Share Ideas and discuss. Build model.*

Plenary for Unit: Nahs - Pohnpei Feast House

Have students list 10 things they learned from the lesson series.

Discuss the lists made by students.

Review the unit.

Make a list of 10 things learned in the unit.

Share and listen to others.

