

TEACHING
MATHEMATICS
AROUND THE *UUM*
(EARTH OVEN)
IN CHUUK

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Historically, the concept of *uum* (earth oven) is known and practiced throughout the world. According to the Wikipedia (free encyclopedia), evidences of its uses by the early Europeans and Middle Easterners were discovered. Throughout the Pacific Islands the *uum* has been actively and practically used. The name used for such invention has been surprisingly identical from across the Pacific Islands. For the Polynesian islands such as Samoa, Hawaii, Tonga, New Zealand, Cook Islands, it is called *umu*. In Papua New Guinea, the word used is *mumu*. In Fiji, it is called *lovo* and in Rotuman it is *koua*. *Uum* is a known tradition throughout the world!

I have chosen to put together a research paper on the topic because of its traditional respect and notable proceedings. Most children from across the Pacific will enjoy the activity and find its meaning something beneficial and easy to grasp.

For the topic itself, “Teaching” and “Around” are two important words which significantly draw the true picture of the islands’ concept of teaching. Unlike the modernized classroom teaching setting, the islands’ indigenous teaching takes place around whatever activities is taking place. For example, children are gathering around a fire, around a *uum*, around a canoe, around a mat, or around whatsoever cultural activity is involved and where the older man or woman is passing on the traditional skills and knowledge. Thus “Teaching Mathematics around the Uum” is culturally meaningful and does present the indigenous traditional concept of teaching.

The word “*uum*,” as a topic is too general. It is indiscriminately and generally used for the baking of pigs, turtles, fish, bread, *kon*, and all other kinds of food. And consequently, these different applications of such an invention have influenced the designs and formations of the many different types of *uum*.

However, regardless of its multiple applications, there are only four major types of *uum* practiced in Chuuk. The first type is mostly used for the baking of pigs, turtles, and many other kinds of food. This is a flat *uum* build on top of the earth's surface. Digging of a hole in the earth is not necessary for this type. The rocks are scattered on the ground surface forming either a circular or a rectangular shape. The size will strictly depend on the number and amount of food to be baked. The fire is built on top of the rocks and many pieces of firewood are piled onto the rocks. More rocks are placed on top of the firewood in order to be heated as the *uum* goes up in flames. The second type is strictly used for baking bread and cakes. It is a small cave or an enclosed tunnel with a single opening at its front built into red soil. The inside is divided horizontally into two compartments by a flat tin. At the bottom compartment, the fire is built and the bread is placed in the upper compartment. The third type is a small hole in the ground where you put the food you want to cook, cover it up with leaves, then dirt, and then build fire over it. This type is usually used for baking small amounts of food, such as a whole chicken, or one or two breadfruits, etc. And the fourth and most popular type is what we call "*umun kon*". This type has an upright funnel-shaped pit built in the ground. Its mouth's diameter must measure at least three feet and its depth must measure three to four feet. At the very bottom part of the pit, large rocks are placed. We call the large rocks at the bottom "*foukep*". Medium-sized rocks are used for the covering of the *uum*'s inner sides and they are also put on the firewood. For the initial presentation of this project, the focus will be on the *uum* for *kon*-making.

The process of building the *umun kon* includes gathering all the necessary materials such as firewood, leaves for *uum* coverings, wrappings, picking the breadfruits, preparing the breadfruits, building the fire, cooking, and making the kon.

To provide a more detailed description of the materials involved, prior to presenting a complete layout of the subject, I will first identify the important elements involved in the activity, including the breadfruit tree itself and all the materials involved. Supplemental illustrations in the forms of pictures and drawings will be used to make the presentation easier to perceive.

Table1: Descriptions of Materials Used with the Activity

No.	Name of Material	Cultural Names	Descriptions	Counting System Used
1	Breadfruit Tree	<i>Echepw</i> – western parts of Chuuk lagoon use this word <i>Mai</i> – eastern parts of the lagoon including the outer islands use this word	There are more than 10 different species in the breadfruit tree family on the islands of Chuuk. Most outer islands have as many as 3 to 4 species.	The counting system used for long objects
2.	Breadfruits (Fruits)	<i>Foun Echepw</i> or <i>Foun Mai</i>	Hard-ripe breadfruits are the only fruits selected and picked. Unripe breadfruits are not good for <i>kon</i> .	The counting system used on round objects but sometimes the regular system.
3.	Breadfruit Leaves	<i>Cheen Echepw/Mai</i>	Breadfruit leaves are used for <i>kon</i> wraps. The <i>kon</i> lasts much longer if wrapped this way.	The counting system for flat objects is used
4.	Dry-Land Taro-Leaves	<i>Cheen Ka</i> or <i>Mulu</i>	Leaves are used for the top opening (mouth) of the <i>uum</i> where water can be poured over the heated rocks to steam-cook the breadfruits (<i>tipen</i>)	The counting system used for flat objects
5.	Merremia peltata (Convolvulaceae)	<i>Cheen Fitaw</i> (general name is “ <i>ouuf</i> ” meaning “to dress”).	Leaves are use for the covering of the overall body of the <i>uum</i> .	Counting system for flat objects
6	Banana (trunk of the banana tree)	<i>Popun Uuch</i>	The banana trunk is stripped into about half inch by a yard strips to be used atop the hot rocks.	Counting system for the tree’s trunk....
7.	Banana Leaf	<i>Cheen Uuch</i> (General name “ <i>enen</i> ” meaning floor coverings.)	Leaves are used for floor covering for the area where the pounding of <i>kon</i> is taking place.	Counting system for flat object

8	Grass	<i>Fetin</i> (sometimes refer to as “ <i>fetinin kou</i> ” which means grass for the cow.	Grass are spread on top of the banana strips and they are called “ <i>sachung</i> ”	Counting system used for a bundle
9	Firewood	<i>Muchun Uum</i> (firewood used specifically for <i>uum</i>)	The only fire-woods use for the <i>uum</i> is the “ <i>chia</i> ” local name for mangrove	Counting system used for fire-woods...
10	Rocks	Solid black rocks are connected and used.		Counting system used for round objects.

Table2: Counting Systems Used Throughout the Activity

Numerals	General System	Flat Objects	Round Objects	Long Objects	½ Cut Objects	¼ Cut Objects
1	<i>Eet</i>	<i>Eche</i>	<i>Efow</i>	<i>Efoch</i>	<i>Epek</i>	<i>Etip</i>
2	<i>Teruw</i>	<i>Ruache</i>	<i>Ruefew</i>	<i>Ruafoch</i>	<i>Ruwepek</i>	<i>Ruetip</i>
3	<i>Een</i>	<i>Unuche</i>	<i>Unufew</i>	<i>Unufoch</i>	<i>Unupeek</i>	<i>Unutip</i>
4	<i>Faan</i>	<i>Fatche</i>	<i>Feffew</i>	<i>Foffoch</i>	<i>Fepeek</i>	<i>Fetip</i>
5	<i>Niim</i>	<i>Nimache</i>	<i>Nimefow</i>	<i>Nimefoch</i>	<i>Nimepeek</i>	<i>Nimetip</i>
6	<i>Woon</i>	<i>Wonache</i>	<i>Wonofow</i>	<i>Wonofoch</i>	<i>Wonopeek</i>	<i>Wonotip</i>
7	<i>Fuus</i>	<i>Fuche</i>	<i>Fufow</i>	<i>Fufoch</i>	<i>Fupeek</i>	<i>Futip</i>
8	<i>Waan</i>	<i>Wanuche</i>	<i>Wanufow</i>	<i>Wanufoch</i>	<i>Wanupeek</i>	<i>Wanutip</i>
9	<i>Tiww</i>	<i>Tiwache</i>	<i>Tiwefew</i>	<i>Tiwefoch</i>	<i>Tiwepeek</i>	<i>Tiwetip</i>
10	<i>Engon</i>	<i>Engon</i>	<i>Engon</i>	<i>Engon</i>	<i>Engon</i>	<i>Engon</i>

Table3: More counting Systems used Throughout the Activity

Numerals	Breadfruits	Pails of Water	Tree trunks	Firewood	<i>Kon</i>	<i>Kon</i> in wraps
1	<i>Ew</i>	<i>Epe</i>	<i>Epop</i>	<i>Emuch</i>	<i>Ennu</i>	<i>Etikum</i>
2	<i>Ruu</i>	<i>Ruape</i>	<i>Ruepop</i>	<i>Ruomuch</i>	<i>Ruonnu</i>	<i>Ruetikum</i>
3	<i>Unungat</i>	<i>Unupe</i>	<i>Unupop</i>	<i>Unumuch</i>	<i>Ununnu</i>	<i>Unutikum</i>
4	<i>Ruanu</i>	<i>Fappe</i>	<i>Fepop</i>	<i>Femuch</i>	<i>Fennu</i>	<i>Fetikum</i>
5	<i>Nimuw</i>	<i>Nimape</i>	<i>Nimepop</i>	<i>Nimemuch</i>	<i>Nimennu</i>	<i>Nimetikum</i>
6	<i>Wonu</i>	<i>Wonope</i>	<i>Wonopop</i>	<i>Wonomuch</i>	<i>Wononnu</i>	<i>Wonotikum</i>
7	<i>Fisu</i>	<i>Fupe</i>	<i>Fupop</i>	<i>Fumuch</i>	<i>Funnu</i>	<i>Futikum</i>
8	<i>Wanu</i>	<i>Wanupe</i>	<i>Wanupop</i>	<i>Wanumuch</i>	<i>Wanunu</i>	<i>Wanutikum</i>
9	<i>Tiww</i>	<i>Tiwape</i>	<i>Tiwepop</i>	<i>Tiwemuch</i>	<i>Tiwennu</i>	<i>Tiwetikum</i>
10	<i>Engon</i>	<i>Engon</i>	<i>Engon</i>	<i>Engon</i>	<i>Engon</i>	<i>Engon</i>

One day before the *Uum* Day, usually Friday, all the necessary materials for the *uum* except for the breadfruits are gathered and prepared. These includes firewood, leaves for coverings and wrappings, bundles of grass, banana trunks, rocks, and the hole in the ground. On the actual *Uum* Day, usually a Saturday, the process takes place, including the following activities.

First, the picking and gathering of breadfruits takes place. A pair from each team normally works together, one picking the breadfruits using a special tool called “*yas*,” while the other stands under the tree counts and records the number of picked breadfruits. For the recording part of the number of picked breadfruits, some make marks on any smaller branch of a tree or cut down leafs and then count the total after. After that is done, both will collect the breadfruits. Since the number of bread fruits is recorded, the two know how many breadfruits they can collect from under the tree. If the number of breadfruits collected falls short of the number recorded, the following mathematical calculations may possibly be applied:

1. Total breadfruits picked – number collected = number of breadfruits lost.
2. Write simple equation: Unknown Lost number + the known found number = the total number picked
3. We can develop a percent problem using ratio and proportion technique:

$$\frac{\text{Total Breadfruits picked}}{\text{Lost Breadfruits}} = \frac{100\%}{X}$$

Secondly, the breadfruits are peeled or scraped to remove the outer rind, and then they are cut into fractional parts. Usually the boys are the ones doing these jobs. To peel the breadfruits, we use a special tool called “*ngingi*” made from a large cowrie shell. The name maybe derived from its rhythmic sound. For cutting the breadfruits, we use a long and very sharp machete. First the breadfruits is cut into halves, and then into fourths.

On some special occasions, different families will share one large *uum*. They do that sometimes because it is more fun to work together with more people than working alone by themselves. They use different shapes and cuts of breadfruits in order to recognize their breadfruit pieces among the others. Some will use the half cuts, some will

use the quarters, some will use eighths, and some will use different shapes or fractional sections.

And because the *uum* is shared by different people, the *uum* itself is divided into various sections and each section will be filled with different shapes and sizes of *tipen*. A certain section of the *uum* will be filled with half-pieces of *tipen* while the other sections are filled with different fractional slices of *tipen*.

Picture 1 - 4



Thirdly, when the *uum* is ready, meaning that the firewood has burned down almost completely, we use a strong rod to stir the hot rocks so they are evenly scattered. Then we use a flat heavy object to press the rocks further down so they are tightly packed together

and leveled evenly with the surface of the ground. Once the surface is nicely leveled, we scatter the banana strips on the top of the rocks. The banana strips should be scattered evenly over the rocks and then the grass should be spread over the banana strips. Then we shovel in the prepared breadfruits on top of the grass and stack them up in the shape of a volcano. Over the stacked breadfruits, we place six to eight land-taro leaves with their tips facing upward and overlapping each other to cover the peak of the *uum*. From the base up to the peak of the *uum*, we cover it completely and heavily with the *fitaw* (Convolvulaceae) leaves. Then we lay some heavier leaves on top of the *fitaw* leaves to keep them from falling. When the covering of the *uum* is done, we flip outward the tips of the taro leaves located at the peak of the *uum* to create an opening. Then, depending on the size of the *uum*, we pour a number of pails of water into the *uum* through the opening. When the water hits the hot rocks it causes an explosion of steam that makes the ground shake and you can even hear a roaring sound like angry thunder as the hot steam bursts from the top opening of the *uum* like a volcano erupting with lava. After pouring the water, we immediately close the opening of the *uum* and secure the coverings with even heavier sheets or leaves. This is the end of the second part of the process. Then we wait for the last part of the process, which is the *kon*-making part.

Depending on the size and heat of the *uum*, usually the waiting takes 20-30 minutes. What are the mathematical principles involved throughout the process? There are many, including counting systems, addition and subtraction of whole numbers, and fractions. Following are a few examples of possible mathematical activities we can develop from the process:

1. Example of addition of fractions: If 20 breadfruits are divided into four equal fractional parts each, how many one-fourth pieces altogether can we collect?

2. Example of a geometrical problem: The *uum* is shaped like a funnel. If its height is 3 feet and its diameter is 3.5 feet, what is the volume of the *uum*?

3. Example of a ratio and proportion problem: If it takes 3 breadfruits to make 1 kon, and you have 50 breadfruits, how many kon can we make?

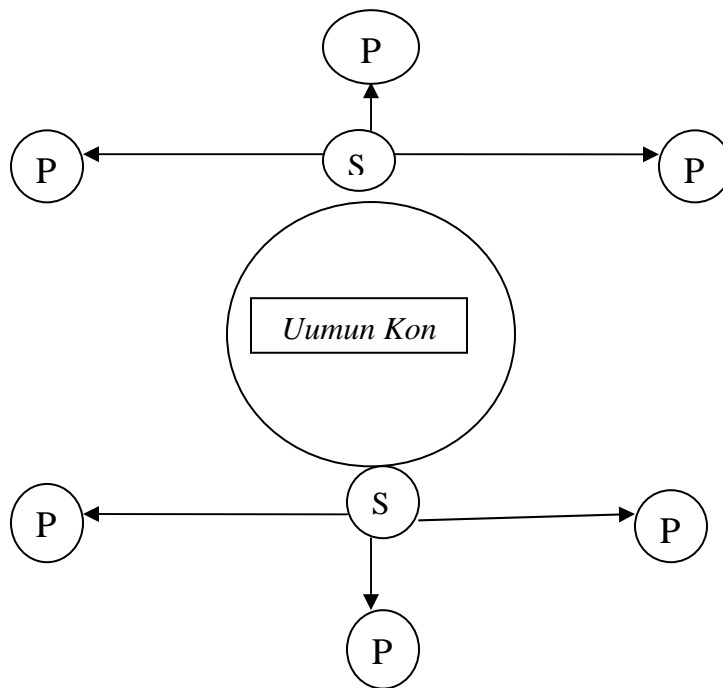
Picture5 - 8



We can tell whether the *uum* is ready for *kon*-making by the appearance of the coverings. Even the height of the *uum* will reduce to a minimum height as the *tipen* is cooked and softens. And now comes the most fun part of the *uum*: making the *kon*.

Normally four or five people but sometimes more sit around the *uum* with their tools to do the pounding. The tools we use for pounding are the *nuf* (a flat piece of wood carved from the trunk of a breadfruit tree), and a *usuus* (a piece of rock carved from hard coral). If six people are doing the pounding, then two other people will taking the *tipen* from the *uum* and serving them to the ones pounding.

Diagram1: Arrangement: P=person pounding S=person serves



This process goes on until there's no more *tipen* left in the *uum*. Usually the leftover *tipen* in the *uum* are for the children to start learning the skill of *kon*-making (*usuus*).

Throughout the process, we see that the mathematical concepts embedded in this activity have evolved from simple mathematics such as counting associated with shapes and physical property of the objects to higher mathematics involving operations such as addition, subtraction, multiplication, division, ratios and proportions, geometry, and more. Children who go through this activity will not only marvel at the remarkable aspects of the traditional trademarks exhibited throughout the process, but they will also benefit mathematically from all the concepts encountered and practically applied.

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