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ETHNOMATHEMATICS IN PERSPECTIVE OF SUNDANESE CULTURE

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Abstract

This study is an exploratory research aims to find and know about a phenomenon by exploration. Therefore, the approach used in this study is ethnographic approach, an empirical and theoretical approach to get description and deep analysis about a culture based on field study. From the sustainable interviews and confirmation about field research with some community leaders in Cipatujah district, Tasikmalaya regency and in Santolo Pameungpeuk beach, Garut regency; it is found that Ethnomathematics is still widely used by Sundanese people especially in rural areas: the use of measurement units, mathematical modeling, and the use of clock symbols. The results of this study can be useful for Sundanese people and the government of West Java in education, cultural services, and tourism.

Keywords: Ethnomathematics, Unit Calculation, Modeling, Symbolic Time

Abstrak

Pada penelitian ini metodologi penelitian yang digunakan adalah penelitian eksploratif, merupakan penelitian penggalian, untuk menemukan dan mengetahui suatu gejala atau peristiwa dengan melakukan penjajakan terhadap gejala tersebut, dan pendekatan etnografi, merupakan pendekatan empiris dan teoritis, bertujuan mendapatkan deskripsi dan analisis mendalam tentang kebudayaan berdasarkan penelitian lapangan. Hasil penelitian menunjukkan, etnomatematika masih banyak digunakan oleh masyarakat Sunda, khususnya di wilayah pedesaan, penggunaan satuan ukuran, pemodelan matematika, dan penggunaan jam simbolik masih banyak digunakan di masyarakat pedesaan. Hal ini diperoleh dengan melakukan wawancara berkesinambungan dan verifikasi hasil penelitian dengan beberapa tokoh masyarakat di Kecamatan Cipatujah kabupaten Tasikmalaya, dan tokoh masyakat di pantai Santolo kecamatan Pameungpeuk kabupaten Garut. Hasil penelitian ini diharapkan bermanfaat khususnya untuk masyarakat Sunda, dan pemerintah, terutama untuk dinas pendidikan dan kebudayaan, serta untuk dinas pariwisata di provinsi Jawa Barat.

Kata kunci: Etnomatematika, Satuan Perhitungan, Pemodelan, Waktu Simbolik

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Mathematics is a subject that has always been considered difficult by students in general, this may be one reason is inconsistent of educators in providing learning in school, which not take can advantage of the local environment. Meanwhile, on the other hand at the *Sunda* people are already accustomed to using mathematics as a tool for calculations in performing daily activities in various fields, determining the time of planting in the fields of agriculture, using a single measure in the trade, the calculation of the days ahead, the forecast low tide water sea by fishermen, the timing of the symbolic, the use of symbolic measure by a carpenter, craftsman blacksmith art, the art of making wicker crafts, *tukang kiridit* , model of saving and loan money, children's games, and others.

Ethnomathematics is a research program that focuses on the relationships between mathematics and culture (Albanese & Perales, 2015). Ethnomathematics shifts mathematics from the places where

it has been erected and glorified (university and schools) and spreads it to the world of people, in their diverse cultures and everyday activities. An ethnomathematical program sullies mathematics with the human factor; not an abstract human, as the subject of modern science, but a human situated in a space and time that implies different knowledge and different practices (Pais, 2013).

By the very nature of mathematics has been around since the days of the ancestors of the Sundanese people, and is still widely used in daily life, especially by rural communities. The issue is how educators in formal schooling can utilize and combine the matter formally to be supplied to the culture of mathematical calculations that have been attached to the community, into the format of learning more dynamic, so that mathematics can be rendered more attractive, can be learned with fun, and can easier to learn, because students do not feel unfamiliar with the habits of everyday society. Therefore in this study examined several kinds of uses of mathematics in the perspective of Sundanese culture, which is still widely used, especially by rural communities. The research objectives are (1) assess the role of mathematics in the culture, especially the culture of mathematical calculations are still performed by the Sundanese people in the countryside, with regard to the measuring instrument symbolic to measure the length, width, area, height, volume, angles, unit numbers, measuring tools group, and comparison; (2) assess the role of mathematics in society Sundanese culture relating to the calculation of time informally valid, and is realized by forming a symbolic clock Sundanese people; and (3) assess the mathematical models are still in effect on Sundanese culture relating to the calculation model Tide, which is still widely used in fishing communities in West Java, and developing a calculation model with a fast time to determine the days ahead.

This study examined several theories and expert opinion Ethnomathematics especially in connection with the Sundanese culture, among others. According to anthropology, culture is a whole system of ideas, actions, and the man's work in the context of a society that belong to self-made man with learning (Koentjaraningrat, 1985). While experts interpret cultural history or tradition of cultural heritage as a society.

Ethnomathematics first introduced by educators and mathematicians from Brazil, Ubiratan D'Ambrosio in 1997 in a presentation to the American Association for the Advancement of Science. D'Ambrosio in 1993 implementing the program by using the naming etymology Greek roots, ethno, mathema, and tics to explain what he understands become Ethnomathematics. In language, the prefix "ethno" means something very broad refers to the socio-cultural context, including language, jargon, codes of conduct, myths, and symbols. Basic word "mathema" means explaining, knowing, understanding, and a variety of related coding, measure, classify, deduce, and modeling. The suffix "tics", has the meaning techne, and meaningful equal with technique. "Mathematics is practiced among cultural groups identified as a national community, ethnic, labor groups, children of a certain age group and professional class" (D'Ambrosio, 1985). "I have used the word Ethnomathematics as fashion, styles and techniques explained, understand, and face the natural and cultural environment in which different cultural systems" (D'Ambrosio, 1999). Barton (2016) also explain that D'Ambrosio in 1984 suggested

mathematics education must include its cultural roots reinstating the essential cultural processes of techniques of doing, explaining, and knowing about our natural and social environment and he emphasize mathematical experimentation, modeling and Ethnomathematics research.

Mathematics is an abstraction of the human mind, is used as a tool for problem solving. The value delivered in learning mathematics include: practical and use vales, the value of discipline, cultural values, social values, moral values, values aesthetic (art/beauty), and the value of recreation (entertainment).

Things were studied in Ethnomathematics include: symbols, concepts, principles, and mathematical skills that exist in the national groups, tribes, or other community groups. The difference or similarity between the mathematical nature of a community with other communities and the factors that are behind the differences or similarities. While the purpose of the study of Ethnomathematics are: understanding the relationship between mathematics and culture, so that students and the public perception of mathematics became more precise, and more easily understood. Optimizing the application of mathematics to the lives of students and the community, so as to obtain benefits in learning mathematics. Utilizing specific cultures that exist in a community, for example the procedure of thinking, working procedures and behave, and the way of using language, especially with regard to mathematics. Ethnomathematics in line with Realistic Mathematics Education (RME). Realistic Mathematics Education (RME) is a theory of mathematics education which has been developed in the Netherlands since 1970s. This theory is strongly influenced by Hans Freudenthal's concept of '*mathematics as a human activity*' (Shanty, N.O, 2016; Prahmana, *et al*. 2012). RME theory has been used in several schools in the United States of America (USA) as part of a collaborative project, Mathematics in Context (MiC), between the Freudenthal Institute (FI), Utrecht University and the University of Wisconsin. There are three basic tenets of RME, namely guided reinvention, didactical phenomenology and the emerging models principle. All these tenets are inspired by Freudenthal's view of 'mathematics as human activity'. This notion places a heavy emphasis on students' activity in their reconstruction of mathematical ideas and concepts under the guidance of the teachers (Sembiring, 2010; Sembiring, *et al*. 2008). Furthermore, the research Ethnomathematics is developed as part of research collaboration on ethnoscience and its application at year 2015, between Department of Mathematics and Department of Computer Science Faculty of Mathematics and Natural Sciences Universitas Padjadjaran with Leiden Ethnosystems and Development (LEAD) Programme Universiteit Leiden. It is also supported by Ministry of Research, Technology and Higher Education through Consortium Grant on Ethnomathematics and Ethnoinformatics for Mapping Indonesian Culture in 2016.

METHOD

The methodology used in this research belong to the exploratory research methods, the research excavation. It means that the methods is to find and to know a phenomenon or event (concept or problem) with conducting an assessment of the symptoms (Gulo, 2000). Moreover, in the process using

an ethnographic approach, is an empirical and theoretical approach, aiming to get a description and a thorough analysis of culture based on field research. How people organize their culture in mind and then use in life. Ethnographic task to find and describe the organization of the mind (Spradley, 2006). The procedure of research conducted adopting ethnographic approach by Spradley (2006), includes the following steps: establish informants, conducting interviews with informants, making notes ethnographic, ask questions descriptive, analyzing the results of ethnographic interviews, create a domain analysis, asking questions of structural, conduct taxonomic analysis, and writing ethnography.

This research is part of Academic Leadership Grant (ALG), Universitas Padjadjaran, by first conducting a study literature, exploring use of math daily to the public, write it in the form of a draft paper, then verified by conducting a meeting to public figures customary in Cipatujah Tasikmalaya district and the fisherman's Beach Santolo Garut regency, in 2015 and 2016.

RESULTS AND DISCUSSION

The results showed that Ethnomathematics still widely used by the Sundanese people in conducting and communicating daily, especially by people in rural areas, various calculations and depiction Ethnomathematics still widely used among other things for the calculation of unit numbers, the depiction Ethnomathematics symbolically to determine the time, determination models for forecasting sea water at low tide, before conducting business, and models of computation time quickly. In detail several types Ethnomathematics are still widely used by the Sundanese people are described as follows:

Sundanese Community Symbolic Measuring Instrument

Measuring instrument is a universal communication tool, applicable in community life, consisting of formal measurement tool that applies at international level, and measuring symbolic only specific to a particular community. Formal measuring tools such centimeters, meters, kilometers, to measure length; kilograms, grams, to calculate the weight; acre, hectare, to calculate the area; and cubic, liter to calculate the volume. This research examined the symbolic measuring instrument that apply to the Sundanese people. The habit of using the symbolic measuring instrument, is still widely used, especially by the Sundanese people in the villages. Symbolic measuring instrument that is still widely used in the Sundanese people, among others:

Symbolic Tools to Measure Length

Sundanese people in their daily life already has some benchmarks to measure the length of an object, usually use a lot of members of the human body as a tool to measure the length of the object to be measured. Members of the body which are widely used include *tangan, jari tangan, siku, depa, jeungkal* (hand, finger, elbows, fathoms, and span). In addition, part of leg is using as a tool to measure the length and height, for example, *bitis, tuur, cangkeng, lengkah* (step, calves, knees, and hips), etc. Some examples relating to the length measuring tools are described as follows:

1. **Jeungkal**, describe the distance between the thumb and little finger when stretched to the maximum, is used to measure relatively short objects, objects stored horizontally, then measured how *jeungkal*, one *jeungkal* equivalent to 20 cm.
2. **Depa,** illustrate the length measured object using a hand span of a maximum of the left hand end to the right hand straight position with the shoulder, was used to measure relatively short objects, objects stored horizontally, then measured how many fathoms, 1 fathom is equivalent to 1 meter.
3. **Siku**, a tool to use for the length of the object measured by the elbow of the tip of the hand to the base of the elbow, usually used to measure the length of the rope, one *siku* is equivalent to 50 cm in length.
4. **Lengkah**, depicts a leg span up when stepping, is used to measure the distances are not too long, one *lengkah* equivalent to 1 meter.

Symbolic Measuring Tools to Measure Width

Sundanese people in their daily life already has some benchmarks to measure the width of an object, usually a lot of use of limbs as a tool to help measure the width of the measured object. Limbs that are widely used include *tangan, jari tangan, siku, depa, jeungkal* (hand, finger, elbows, fathoms, and span). Some examples to measure the width is described as follows:

1. **Ramo**, *ramo* wide depict humans, used to measure objects that do not exceed 5 fingers, objects stored horizontally, then measured how *ramo*, 1 *ramo* is equivalent to 1 cm.
2. **Jempol**, the width of a human thumb describe, is used to measure relatively short objects, objects stored horizontally, and then measured with *jempol* or a thumb, *1 jempol* width is equal to 1.5 cm.
3. **Tampah**, describing a width of 5 fingers of hand, is used to measure objects that are relatively short and not exceed 5 *ramo*, 1 *tampah* equivalent to 5 cm.

Symbolic Measuring Tools for Higher

Sundanese people in their daily life already has some benchmarks to measure the height of an object, usually a lot of use of human body parts that are used as a tool to help measure the height of a particular object. Limbs that are widely used include *tangan, jari, tangtung, mumuncangan, bitis, cangkeng, sirah* (hand, finger, heights, legs, chest, and head), etc. Some examples of measuring devices for measuring symbolic of the height described as follows:

1. **Curuk**, describing the high waterfall when placed vertically, used to measure the high volume of water, *sabuku curuk* equal to 2 cm.
2. **Tangtung**, describe a certain high natural occurrence, to measure the natural occurrence from toe to tip of the hair, is used to measure the depth of water is not deep, 1 *tangtung* equivalent to 1.5 meters.
3. **Mumuncangan, bitis, cangkeng, dada,** and **sirah** are used to measure the height of water is usually when the river floods.

Symbolic Measure Tools for Measuring Volume

Sundanese people in their daily life already has some benchmarks to measure the volume of an object, usually a lot of use of household appliances are widely used in everyday activities, examples such as: *kulak, dolak, bakul, and other* as a tool to measure the volume of the object to be measuring. A tool to help measure the volume of commonly used cans, cups, and limbs that are widely used include hand, namely *keupeul*, etc. Some examples of these are described as follows:

1. **Kulak**, describing 1 *kulak* cylindrical object, is used to calculate the volume of objects that cannot be calculated unit, 1 kulak equivalent to 1 liter.
2. **Dolak**, describing one *dolak* truck or a small truck, used to measure the volume of a pile of sand, one dolak is equivalent to 1 cubic.
3. **Bakul**, describes the first basket of objects that cannot be measured unit, is used to measure the volume amount of rice, 1 *bakul* is equivalent to 10 cm^3.
4. **Gantang**, describing 1 kulak cylindrical object, is used to calculate the volume of objects that cannot be calculated unit, 1 *gantang* is equivalent to 10 liters.
5. **Cangkir**, used to measure the volume of rice, or other object that is sold, size 6 *cangkir* equals 1 liter.
6. **Keupeul**, describe the person's fist, is used to measure the volume of objects that can only be grasped hands, 1 *keupeul* equivalent to 3 cm^3.

Symbolic Measure for Measuring Tools Group

Sundanese people in their daily life already has some benchmarks to measure the group of objects, grouped objects usually is in the form of vegetables, rice, or leaves, usually grouped with bound objects in accordance with certain rules, and then sold per group. Some examples of symbolic measuring instrument group, is described as follows:

1. **Kompet**, illustrates one great bond, typically used to classify objects shaped leaves are rolled and tied, one *kompet* equivalent to ten sheets.
2. **Beungkeut**, describe one small bonding, is used to classify objects, usually vegetables to simplify the calculation, one *beungkeut* equivalent of ten to twenty seeds.
3. **Eundan**, describe the size handful hand, is used to sort and bind the rice after harvest in order to easily dry and strong, one *eundan* equivalent of one's handful hand.
4. **Dugel**, describing the size of three's hand, or three *eundan*, used to sort and bind the rice after harvest in order to easily dry and could be kept.
5. **Geugeus**, describe the size of a handheld two hands, or two *eundan*, used to sort and bind the rice after harvest in order to easily dry and could be kept.
6. **Manggar/turuy**, depicting a stalk of the same group, used to see groups of fruits, one *manggar* equivalent to 10 to 15 pieces.

7. **Dapur,** describing a plant that originated from the same group, usually for tall plants, large and lots, one *dapur* equivalent to 30 to 50 stalks.
8. **Pincuk/bungkus**, food packaging typically describe using leaves as wrappers and *seumat*, used to wrap food.
9. **Sagunduk**, used to compare groups of objects, or bumps, to the other mounds, for easy sharing. For example divides the catches little hard to count unit, crops etc.

Symbolic Measure Measuring Tools for Broad

Sundanese people in their daily life already has some benchmarks to measure the area of location, location is usually measured using a variety of tools to measure widely used among other rope, or mine. Some examples of symbolic measuring tool to measure the area described as follows:

1. **Tumbak**, a unit of rice area to describe the size or the size of the parcel of land, one *tumbak* equal to 14 meters squared
2. **Bata**, a unit of rice area to describe the size or the size of a piece of land, one *bata* is equal to one *tumbak* equal to 14 meters squared.
3. **Bau**, a broad measure of the unit to describe a piece of land or a plot the size of the field, one *bau* the same as 5,000 meters squared or half a hectare.
4. **Bebecek**, a unit to describe the vast rice fields, used to describe the breadth of the fields that are not too wide, one *bebecek* equivalent of 5 to 10 meters squared.
5. **Nengah**, a unit to describe the results of arable land area divided by two, use of land sharecropper result divided by two at harvest with the landless, middle- size depending on the results obtained.
6. **Mertelu**, is the unit to describe the results of arable land area divided by three, used by tenant farmers of land harvest is divided by three, usually work the land, involving the three people.

Symbolic Measure Tool for Measuring Angles

Sundanese people in their daily life already has some benchmarks to measure angles, usually measured vertex is the starting point for the measurement and angle measurement using ropes or mine. Some examples of these are described as follows:

1. **Masekon**, is a term that describes the condition angles must dogleg, applied when building a house, make it more robust, large corner *masekon* value equivalent to a right angle, or 90 degrees.
2. **Masagi,** is a term that describes waking condition that each consisting of a right angle or a square or rectangular, applied when building a house, make it more robust, the large of *masekon* is similar with right angle or 90 degrees.
3. **Nyerong**, is a term that describes the condition of the building tilted, has an angle of approximately 45 degrees.

Symbolic Measure for Measuring Tool Unit

Sundanese people in their daily life already has some benchmarks to measure the force of numbers, usually the object is calculated using a variety of specific terms. Some examples of these are described as follows:

1. **Sajodo**, is a term used to describe two different types of couples, are used to describe the number of couples, usually depicted in animals, first mate consists of two types.
2. **Salikur**, is a term used to describe the same number with 21 digits usual.
3. **Salawe**, is a term to describe a number which is equivalent to 25 regular number.
4. **Sawidak**, is a term to describe a number which is equivalent to 60 regular number.
5. **Salaksa**, is a term to describe a number which is equivalent to 100 regular number.
6. **Saketi**, is a term used to describe the same number means the 1,000 regular number.
7. **Saeuheum**, is a term used to describe a lot, equivalent to infinite.

Symbolic Measure for Comparison Tools

Sundanese people in their daily life already has some comparative benchmark to measure objects with other objects, usually depicted symbolically. Some examples of these are described as follows:

1. **Sacongo buuk**, is a term used to describe a smaller, used to compare the size of a person's success or experiences with others.
2. **Saujung kuku**, is a term used to describe not nothing, is used to compare the number of one's wealth with others.
3. **Satungtung deuleu**, is a term to indicate far away, or infinite, is used to describe a very far distance, unlimited, or infinite.
4. **Salaput hulu**, is a term to indicate a lot, used to describe the high or the amount of debt a person has.

Portrayal Symbolic Time in the Community Sunda

The clock is an important factor for humans in organizing daily activities, nowadays many technology products that generate it. Example watches, usually used on the arm, wall clocks typically used in home, office, or mosque, and the latest is a clock that can be displayed automatically on HP and more practical, because it can be taken anywhere. *Sunda* ancient ancestors had known the clock, in a way described by the symbols of expressions that are tailored to specific natural conditions. Symbol of hours with the expression of words commonly used by the ancestors of the Sundanese people to describe the time, as well as equality with the clock in digital form, among others:

1. **Wanci janari leutik**, equivalent to 2:00 am, is a term used to describe the right time to get ready for the evening prayer, and the time vulnerable of crime.
2. **Wanci ngagayuh ka subuh**, equivalent to 3:00 am, is a term used to describe the night time will end, people started to prepare the afternoon activities and portray a good time for evening prayers.

3. **Wanci harieum beungeut**, equivalent to 5:15 am, is a term to describe it was still dark, will soon turn during the night, the preparation work.
4. **Wanci carangcang tihang**, equivalent to 5.30 am, is a term used to describe the time when the day is not bright, but can already see with vague, describing a great time to get ready to go to start the job.
5. **Wanci haneut moyan**, equivalent to the time between the hours of 7:00 am to 9:00 am, is a term used to describe a great time to enjoy the fresh sunshine.
6. **Wanci pecat sawed**, equivalent to 10:00 am, is a term to describe the use of buffalo in the break time to help the work of man, who is working on the fields in preparation for planting.
7. **Wanci manceran**, equivalent to 12 noon, a term to describe the time the sun was right above our heads, and the weather was very hot.
8. **Wanci lingsir panonpoe**, equivalent to 3:00 pm, is a term used to describe the time is approaching to human activities in working to end soon.
9. **Wanci sariak layung**, equivalent to 5.30 pm, is a term used to describe the sun almost set, but the light still looks beautiful, daylight soon gave way to night.
10. **Wanci sareupna**, equivalent to 5:45 pm, the time before sunset, it is time to stop humans from its activities, especially children, to get some rest.
11. **Wanci sanekala**, equivalent to 6:00 pm, is a term used to describe the time before sunset, usually used to scare young children as soon turn during the night.
12. **Wanci reureuh budak**, equivalent 7:00 until 8:00 at night, is a term used to describe children had slept soundly for the rest.
13. **Wanci tengah peuting jemplang jempling**, equivalent to 12.00 a night, is a term used to describe the time the rest to sleep soundly.
14. **Ba'da subuh, ba'da dluhur, ba'da asar, ba'da magrib, ba'da isa**, is a term for the show after the prayer times, usually used to invite people for the community important meeting.

The results of the discussion of the symbolic time later depicted in a symbolic clock of Sundanese people, as follows:

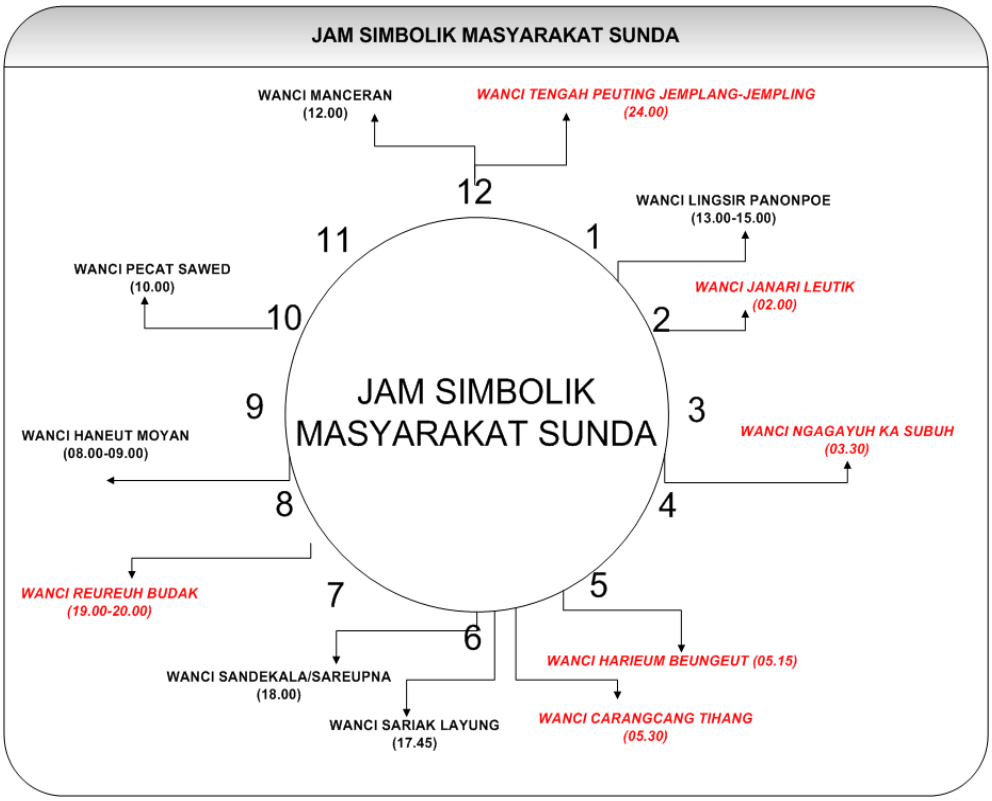

Figure 1. Symbolic Clock of Sundanese People

Figure 1 describes the symbolic clock Sundanese people, whose implementation is still widely used by the Sundanese people in the villages. The purpose of making this symbolic clock is expected to be a reference for both students and teachers at various levels in the area of West Java Province.

Mathematical Modeling

Model Determination of Time Tide Sea Coast Fishing at Santolo Beach

People in the south coast at West Java Province in general use the sea as a livelihood. Enterprises utilizing the results of such marine, fishing, fishing on the high seas, taking seaweed, catch reef fish, catch shrimp, *ngobor*, *nua*, *ngecrik*, etc. Business activities to utilize the results of the sea is generally done during low tide. There are two conditions in their daily behavior of sea water: **sea water in tidal conditions**, an event where the condition of sea water in a state of great reach the shore. In this condition practically stopped all fishing activities, both at sea and on the beach, considering the sea water big and dangerous.

The sea water in low tide conditions, the occurrence of sea water in good condition, small sea waves, and sea water at the seaside reduced. In this condition the fishermen use to catch fish, take

seaweed, looking for crayfish, etc. In the daily life of fishing communities, especially be true in the Santolo beach at Pameungpeuk district Garut, hereditary own benchmark or a simple mathematical model. Making it easier for fishermen to determine when they need to conduct business activities livelihood, either on the beach or on the high seas. The model was obtained by conducting interviews with several prominent sustainable fishermen who daily conduct business uses of the sea.

The formula or model to determine when the tide happened is still used in Sundanese people is:

Sea Water Receding = 4/5 x date *hijriyah*

where the number 4 is derived from the events of ups and downs happen four times at the sea within 24 hours or each day, number 5 is obtained from 1 hour 60 minutes divided by the number of months, or 12 each year, so we got the result is 5. The *hijriyah* date is the date on which calculation models the use, starting from the date 1 to 30 each month.

To facilitate understanding of the timing models tide still in use at the beach Santolo Pameungpeuk Garut, we illustrated in the following figure:

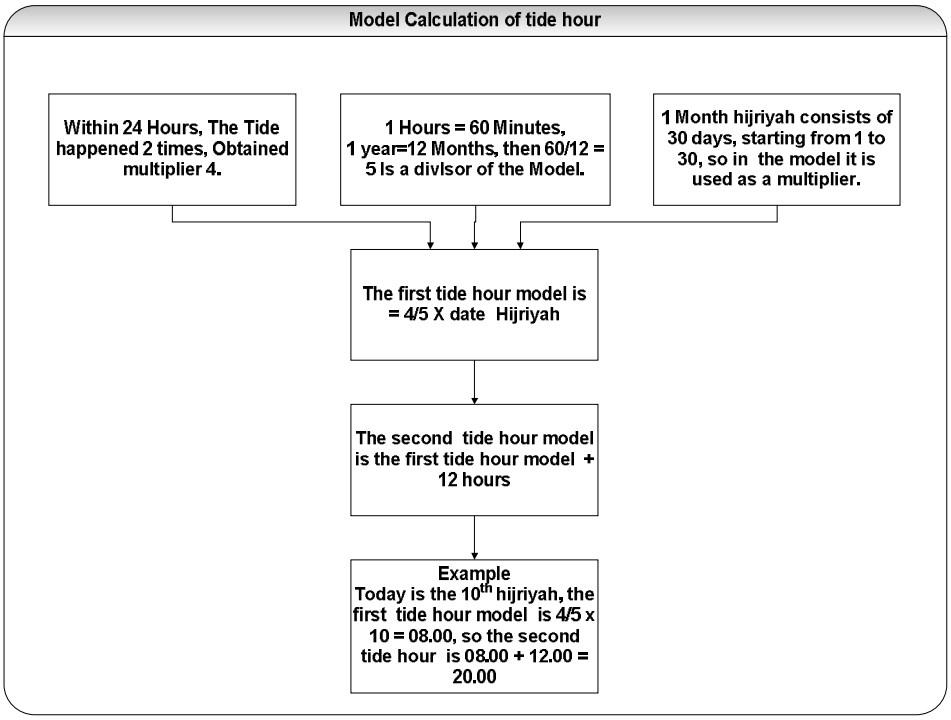

Figure 2. Model Calculation of Receding Sea Water

To facilitate the fishermen, we created a table to estimate the determination of sea water at low tide, as shown below:

Table 1. Time Prediction Table of Sea Water Receding

The Date of Hijriah	The First Time Tide of the Sea	The Second Time Tide of the Sea
1	0.80	12.80
2	1.60	13.60
3	2.40	14.40
4	3.20	15.20
5	4.00	16.00
6	4.80	16.80
7	5.60	17.60
8	6.40	18.40
9	7.20	19.20
10	8.00	20.00
11	8.80	20.80
12	9.60	21.60
13	10.40	22.40
14	11.20	23.20
15	12.00	24.00
16	12.80	0.80
17	13.60	1.60
18	14.40	2.40
19	15.20	3.20
20	16.00	4.00
21	16.80	4.80
22	17.60	5.60
23	18.40	6.40
24	19.20	7.20
25	20.00	8.00
26	20.80	8.80
27	21.60	9.60
28	22.40	10.40
29	23.20	11.20
30	24.00	12.00

The calculation can only be used under normal circumstances ocean conditions. Another calculation is going to happen seas tide, when the moon sank and the moon appears, will occur *Tandes* or receded during the middle of the month, and when it happens tile roe deer or missing star will occur *Guntur* or pairs of which are not normal. All business model development is done by ancestral fishermen

to provide a formula of normal forecast by the behavior of the sea over the years. Truth and actual events depend on God Almighty.

Quick Ways to Calculate Days Ahead in Sundanese Culture

If it's Sunday, then what is the day of the 70th day? To answer this question requires a minimum of 70 seconds if counted one by one quickly, carefully and sequentially. Since ancient times, the ancestors *Sunda* have own method to calculate the days ahead, to know the name of the day quickly. To answer the above questions, the ancestral *Sunda* spend a maximum of 28 seconds, or 60% faster than manual calculations, even for those who already understand the methods sufficiently answered by 1 second. From a mathematical point, the ancestors *Sunda* used a number system tithing. If it's Sunday, then the next ten days are calculated by using the following method, Monday Monday-Tuesday-Wednesday, Monday-Monday showed eight days, plus two days on Tuesday and Wednesday, making the total 10 days. Now the day of the week, then the next ten days Wednesday, and twenty days next Saturday, and the next 30 days Tuesday, and so on. This can be done continuously for the next ten days, as needed.

Calculation of the next 10 days, described by Mathematical Model

$$H\ (a)\ (b) = H\ (a)\ (b\ /10)$$

where:

H (a) (b) = Multiples of 10 days after the day Now

(a) = Monday, Tuesday, Wednesday, Thursday, Friday, Saturday (current day)

(b) = Natural Numbers divisible by 10

Mathematical Model for Calculation same day to- n

$$H\ (a)\ (n) = 70\ (n)$$

where:

H (a) (n) is the same day were all n

(a) = Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday. (Current day)

(n) = Natural Numbers = 1,2,3, ...

Example:

Now Sunday, it will meet again with the first Sunday is: H (Sunday) (1) = 70 (1) = 70, which means that after 70 days. Will meet again the second Sunday is: H (weeks) (2) = 70 (2) = 140, which means that after 140 days, etc.

If the question is not the addition of a multiple of 10, the method is still valid by adding dozens of days remaining in the calculations above, according to the desired number of days. Suppose now

Sunday, then the next 25 days are: Monday-Wednesday-Monday Tuesday, Thursday-Thursday Friday-Saturday, and already 20 days, simply add 5 consecutive days, Sunday, Monday, Tuesday, Wednesday, and Thursday. So the answer to the question if it's Sunday, then 25 days in the future is going to fall on Thursday.

Mathematical models for the calculation of any day ahead

$$H\ (a)\ (b) = [H\ (a)\ (c)] + d$$

where:
H (a) (b) = b from day to day now

(a) = Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday (Current day)

(b) = Natural Numbers

(c) = Natural Numbers divisible by 10

(d) = Time b reduced by (c)

Example:

1. Now a Sunday, then 27 days in the future will fall on any day?
H (Sunday) (27) = [H (Sunday) (2)] + (27-20) = [(H (Sunday) (2)] + 7 = Saturday + 7 = Saturday

2. It was Wednesday, then 32 days in the future will fall on any day?
H (Wednesday) (32) = [H (Wednesday) (3)] + (32-30) = [(H (Wednesday) (3)] + 2 = Friday + 2 = Sunday

So how to quick calculate the days ahead that is practiced by the ancestors of the Sundanese. We hope to remind the younger generation in particular *Sunda*, and for those who have an appreciation of Sundanese culture, so the role of Sundanese culture in Ethnomathematics can be preserved.

CONCLUSION

In the culture of Sundanese people, generations are accustomed to using symbolic mathematical calculations that are used in daily activities, with regard to the calculation of the base unit, length, width, area, height, weight, group and time. In addition, also known mathematical calculations, to model, to forecast certain natural phenomena. Use cases such Ethnomathematics is still widely used, especially by rural communities. This illustrates that the Sundanese people have the ability good in Ethnomathematics, and need to be socialized, used and maintained in particular by the formal educators. Besides giving an overview to the Sunda younger generation to come, that the Sundanese community rich with Ethnomathematics, and needs to be preserved so that no time lost. This research is expected

to provide inspiration and motivation for the government especially in education authorities to preserve the culture, through Ethnomathematics on realistic mathematics education program, and can improve information for tourism in their respective regions.

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