# MATHEMATICAL ASPECTS OF KASONGAN POTTERY ART

**Ana Easti Rahayu Maya Sari**

[1]*Department of Mathematics Education, Faculty of Teacher Training and Education, Sanata Dharma University, Mrican, Tromol Pos 29, Yogyakarta 55002, INDONESIA*

.

*anaeasti42@gmail.com*

**Abstract**

The purpose of this research is to know what activities of the pottery craftsmen in Kasongan. Bangunjiwo, Kasihan, Bantul in the process of making pottery and to know the mathematical aspects that exist in the activities of the craftsmen in the process of making pottery in Kasongan. The subjects of this study consist of traditional pottery craftsmen, modern pottery craftsmen, carving craftsmen, land entrepreneurs, household furniture entrepreneurs, and representatives of Kasongan residents. Object in this research is activity of pottery craftsman, carving artisans activity, and data obtained from interview result to other research subject.

The type of this research is qualitative descriptive research and analyzed based on qualitative data analysis techniques according to Sugiyono (2010). Data obtained in the form of interviews of research subjects and research documentation. Validation of data in this research is done by using source triangulation, triangulation time and triangulation technique. The data are then analyzed by qualitative data analysis steps according to Sugiyono (2010).

The result of the analysis shows that the activity of Kasongan craftsmen in general pottery making process in Kasongan, Bangunjiwo, Kasihan, Bantul, covers; 1) soil preparation, 2) the formation of pottery, 3) drying, 4) combustion and 5) marketing. Each activity is described to look at the mathematical aspects contained therein by using the six basic mathematical aspects of guidance according to Alan J Bishop (1988). Overall, the mathematical aspects of each craftsman's activities include; calculations in the production process of the materials used, estimates to determine the time of completion of production with pottery products that can be produced, explanation of the generated pottery, determining the location used to obtain soil to make pottery, making pottery by way of imagining of real activity, or the right ratio for good soil to be used for making pottery, using a strategy to determine the amount of pottery produced in order to obtain optimal profit and make pottery production with a pleasant taste.

Some of the benefits of this research include development to become contextual issues adapted to Basic Competency in the 2013 curriculum, and can be used for character learning. Examples of the application of mathematical concepts contained in the art of pottery, among others, through the making of problems that can be used in top-level mathematics learning as in SMP, on the material 1) Two-variable linear equation system, 2) Algebra Operation, 3) Build Room and in SMA in material 1) Space geometry, 2) Integral Calculus, 3) Three Variable Linear Equation Systems, 4) Linear Programs, 5) Mathematical Logic, 6) Statistics. In addition, the results of this study can also be used as knowledge or information to the community to see the art of pottery and history Kasongan region through the angle of the field of mathematics.

**Keywords**: Mathematical Aspect, Art of Kasongan Pottery.

## Introduction

Too many monotonous, theoretical, less contextual and abstract acutely. The learning models used are less varied, this is directly proportional to the low interest of students to learn more math. In school environments students often gain formal mathematics teaching so that students will have difficulty finding mathematics when students are in the daily environment. This is because of differences in situations and conditions received by students. In addition, in solving the problem of mathematics students will be guided in the form of a mathematical sentence. This indirectly makes students feel must memorize the formula in order to determine the completion, because students are still lacking in understanding the application of mathematics in the form of a contextual matter or about its application.

It is therefore important to convey to students the examples of mathematical applications and close contextual content in daily life. In the process of learning this can be delivered at the beginning of the learning process to foster the spirit and attraction for students in learning mathematics. Examples of this math application can be seen from various fields. One area that uses the science of mathematics is the art that is manifested in the form of craft. In the beginning the craft is done as a pleasure, a habit or a side job. But over the times and cost of increasing needs of the craft is used as one way to earn an income. Initially one considers crafts as a hobby and a side job. But over time the view then changed.

Now art is not only used as a hobby or a side job but becomes the main livelihood for some people in a certain area. Areas that most people use craft as one of the family income is Kasongan area. Kasongan is a hamlet of Bangunjiwo Village located in the Special District of Yogyakarta where most of its citizens work as a craftsman art craftsmen. The handicraft that is synonymous with hand preparation has many kinds and types of art craft, weaving, painting and

others. Crafts is one of the mainstay products of Yogyakarta Special Region. Many various companies that produce handicraft products are widespread in various Daerah Istimewa Yogyakarta. One of them is a pottery company in Kasongan. Kasongan is administratively located in Bangunjiwo Village, Kasamat District, Bantul District, Yogyakarta. Located approximately 7 km from the center of Yogyakarta City to the southwest.

The rapid development of the number of business units and the reputation of kasongan pottery to encourage the government of Bantul District to establish the center of Small and Medium Enterprises (SMEs) Gerongan Pottery into a leading SME region as well as a tourist area under the name of Kasongan Pottery Industrial Center Kasongan. The scope of SMEs developed along with the increasing economic value of tourist village location. In this kasongan area, there are many varieties of pottery products made by kasongan craftsmen in processing clay. The result of handicraft products in the form of high quality pottery and competitive in local and global markets. The production of the business owned by almost all citizens of this kasongan region in the form of pottery or pottery in various forms such as jars, vases, statues of animals and humans, cool, cauldron, tempayang and candle holder. Various production is about 80% marketed abroad such as Korea, Japan, Singapore, Malaysia, the United States and the Netherlands. Starting from a talent owned by the community in the area that produces an art pottery from clay.

Kasongan then became a tourist area famous for its pottery. This is due to the enthusiasm, diligence and hard work of these pottery craftsmen to develop the preparation of the artistic talents possessed by most of the Kasongan community to become their main livelihood to provide for daily survival. An art which is then developed and manifested in the form of the work of pottery and increasingly expanded by its citizens in the area in the end become a typical

culture of a region. Making pottery in Kasongan Bantul area is inseparable from the involvement of mathematical sciences used in the manufacturing process such as geometry of space, calculation by using integral volume for a product and others. Seeing that there is a link between pottery with the science of mathematics became the basis of researchers to examine more deeply about the process in making pottery Kasongan with relation to the science of mathematics. This will then be discussed further and deeper by researchers in the study entitled MATHEMATIC ASPECTS ON ARTS CRAFTS KASONGAN GERABAH.

**Theory**

Ethnomatematics is a mathematics that grows and develops in a particular culture. In Ethnomatematics contained elements of society, history and mathematics. These three elements can be said to be a major component of Ethnomatematics. The object of Etnomatemtika is an activity or a mathematical idea that exists in society. Ethnomatmatic ideas will be able to enrich existing mathematical knowledge. Therefore, if the development of ethnomatics has been much studied then it is not impossible math is taught modestly by taking the local culture. According to Bishop (1994), mathematics is a form of culture. Mathematics as a form of culture has actually been integrated in all aspects of community life wherever located. Thus a person's math is influenced by his or her cultural background, because of what they do based on what they see and feel. Culture affects individual behavior and has a major role in the development of individual understanding, including mathematics learning (Bishop, 1991).

Ethnomatmatologists argue that basically the development of mathematics until whenever will not be separated from the culture and values that already exist in society. In learning the formation of new schemes in students should start from the students themselves. Therefore it is appropriate if in teaching mathematics should use elements of mathematics that are often found

in the daily life of students in the student's residence area. For example to convey the material of building the space or calculate the volume of the puppets are invited to the artisans pottery vessel kasongan to see the process of making pottery, and various forms of building pottery space. Then directs and guides the students to write down the various elements that students can derive from the information they have acquired and they observe in making the pottery associated with the math material being discussed.

Art is a human effort to imitate, complement, change or work "against nature" and is a skill achieved through the study of practice and observation. In addition art is a set of artfull, stratagem, and artful discovery (According to Alo Liliweri in New Oxford American Dictionary, 2010; Merriam-Webster Dictionary, 2011). Art is a craft, skill, talent, knowledge, technique that shows the skill in doing what the study, practice, observation or the art of rhetoric ranges from working on pottery, the ability to teach and so on. A village that has a large area of land with the majority of its citizens work as craftsmen this over time showed a fairly rapid development in a tourist area of kasongan pottery. This situation encourages Bantul District Government to establish this business as a Small Medium Unit (UKM) of kasongan pottery into a flagship area under the name of Kasongan Pottery Industrial Center of Kasongan. Along with the development of SMEs, the coverage of the region is also growing along with the increasing economic value of this tourist village location. The area coverage of this area includes the hamlets of Kajen, Tirto, Kali Pucang, Gedongan, Sembungan and Kasongan.

Among other hamlets Kasongan hamlet is a hamlet that still retains the traditional patterned pottery. But along with the growing needs and interests of tourists, the craftsmen began to innovate from traditional pottery into art items that are more attractive, modern and new look compared to the type of pottery that is generally produced and displayed in the area. This makes

the Tourism Region of Kasongan Pottery into a tourist area that has a diversity of art products that are more interesting land. The products of pottery produced have high quality and competitive enough in local and global market.Through the road Bantul from the north of Yogyakarta City on the right side of the road there is a gate as the entrance of Kasongan Tourism area where the gate there are two statues of horses with opposite directions and pottery as a distinctive feature of existing products in the Kasongan

Kasongan village is a residential area of the kundi, which means a pitcher or whistle. In ancient times people who make a kind of pitcher, gendi, cauldron and others belonging to kitchen items, pottery, as well as ceramic decorative goods is referred to as kundi. The Kasongan pottery is a jar with various motifs (peacock, dragon, rose, elephant, bamboo, and many others), pots of various sizes, ceramic ornaments, small statues, frames, bamboo furniture, even masks made of clay. The results of the Kasongan village tourism handicrafts are of excellent quality so that the marketing done for these products is not only local but exported to many countries such as Europe and America is also widely done.

Kasongan pottery is a clay processing that has been going on for centuries and able to maintain until now because systematically in this area there is a skill transfer process that is done for generations. This is used by citizens of this kasongan so as to be able to maintain its existence as a regional pottery industry until now. Natural processing environment by the pottery craftsmen is an activity that mutual profitable. This is because the interaction made by artisans not only use but also preserve and keep nature and environment to remain in a balanced state.

Kasongan was originally a rice field owned by villagers in the south of Yogyakarta. During the Dutch colonial period in Indonesia, a rice field belonging to one of the residents was found by a dead horse, it was thought the horse belonged to a Dutch official. Because then the Dutch

colonial period, the people who own the land is afraid and immediately release the land rights so as not to be prosecuted by the Dutch. Similar fears also occur in other residents who have rice fields in the vicinity who eventually also release the rights of land ownership. The amount of free land, making other villagers immediately recognize the land. Residents who relinquish the rights of the land and then turned the profession into a ceramic craftsman who initially just to throw the ground that does not break if put together. At first the land was only used for children's toys and kitchen furniture only. However, due diligence and tradition that is done for generations, finally Kasongan region became known as a pottery clay pottery area which until now a fairly famous Tourism Village.

Pottery is a product made from red clay or clay called quartz (body earthenware). The process of making is done by mixing the soil and water sufficiently then twisted to become clay and easily formed. After getting the appropriate shape then the next stage is drying. The drying stage is carried out by drying the processed products in the previous stage under the sun for 2 - 3 days or adjusted to the size and thickness of the formed object and weather conditions until the object is obtained dry. After that the next stage is burning. Burning is done in a haystack for approximately 8 - 12 hours. The end result is strong, hard and reddish vessels. The techniques commonly used by pottery or ceramic craftsmen include plate techniques, spinning techniques, rotary techniques, press printing techniques and casting techniques. At first ceramics made with clay base material, but over time the manufacture of ceramics began to use the raw materials in the form of white porcelain stirred then filtered until smooth. The process of drying and combustion is carried out at almost the same stage in a closed furnace with a heat temperature of 1200 degrees Celsius with a time of 8-12 hours. Manufacture of porcelain material is more complicated and uses more power.

## Methodology

The research is included in this type of qualitative research, so the paradigm of this study according to Capra (1996) in Research Methodology (Lexy J.Moleong 2009) as a constellation of concepts, values of perception and practice shared by the community that formed a special vision reality as the basis of how to organize it self.

1. Place of study

   The research was conducted in Kasongan, Bangunjiwo Village, Kasihan District, Bantul Regency, Yogyakarta.

2. Time of study

   Research carried out in some time:

   a. The observation stage begins in December 2016.

   b. The first phase of research starts in January 2017

   c. The second phase of research begins in May - June 2017

   The object in this research is the process of making pottery by artisans, pottery sales and pottery craft businessman, as well as statistical data of Desa Bangunjiwo, Kasihan, Bantul.

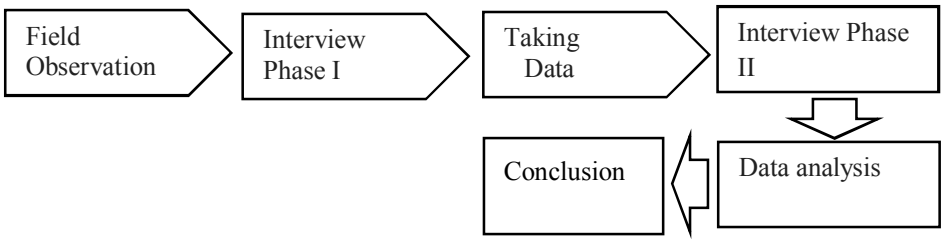


**Figure 1.** Scheme of data collection steps

**Results and Discussion**

Initially the land used to make this pottery comes from the land belonging together but over time the soil on the land has decreased the quality, so it is not good if used to make pottery. Therefore the land used for making this pottery by the craftsmen brought in from Tirta region. Land from Tirta has been processed so that by the artisans the land can be directly formed. Apart from Tirta this land is also taken from Godean. In the sale of clay units used are cabbage. The price of one colony of land is 400,000 rupiah. The price of land purchased by craftsmen to produce pottery every day about ¼ cup cabin with a price of 100,000 rupiah.

Marketing made by this artisans is by traveling around Sleman by riding a bicycle and bringing pottery produced approximately 20 pottery. The marketing done by these craftsmen include Sleman, Tempel and Minggir. In addition to marketing various regions conducted by cycling marketing is also done by way of entrusted to the market. If both sales results are compared between sales in the market with sales made around the results will be better if done alone by going around.

This can happen because if the craftsmen make their own sales then he will immediately get the results without any pot or sharing the results with any party. However, if the sale is done by way of goods goods marketed then the acquisition of the proceeds from the goods will be divided a percentage with the resellers who became intermediaries so that the goods can be sold. When the artisans began to make a sale is from 07:00 to 17:00 pm. Craftsmen give a unit price of goods produced ranged between Rp 5000 to Rp 6000 for each product which produced.

The process of making pottery made by craftsmen is presented in scheme 4.2. In scheme 4.2 the process is initiated from the formation of clay with a technique of striking. The soil used in

the making is red and brown soil with a mixture in such a way as to produce a reddish clay color if it is burned. Initially the clay used is black soil that originated from the local area but over time, climate and conditions resulted in soil structure began to change so that if still used to make the pottery is not good results because it will be easily damaged. Then for the next land used to import from the Tirta region already in the form of clay such as clay and ready to be processed. Then by the craftsmen the soil is processed with a dose that has been adjusted to obtain the desired form results. Craftsmen will only make cool (traditional stoves using fuels in the form of wood and dried leaves) and braziers (stoves that use charcoal as fuel).

**Conclusion**

Mathematics and local culture have a very close relationship. Many mathematical elements can be found in the process of making pottery. Starting from the processing of raw materials to the delivery of goods there are some parts that could associated with mathematical elements. The relationship that can be obtained from the process of making this pottery is a contextual mathematical problem making it easy for students to be able to understand the mathematical problems found in social life.

**References**


Bambang, Widianto et all. 2009. *Perspektif Budaya*. Rajawali pers. PT Rajagrafindo Persada.

Bishop, A.J. 1988. *Mathematical Enculturation: a cultural perspective on Mathematics Education.* Holand: D. Reidel Publishing Company, Dordrecht.

Bourdieu, Pierre. 1993. *The Field of Culture Production*. Columbia University Press.

Charles, LIndholm. 2007. *Culture and Identity*. Oneworld Oxford.

Coomaraswamy, Ananda K. 1934. *The Transformation of Nature in Art*. New York: Dover Publications.

Creswell, Jhon. 2015. *Riset Pendidikan Perencanaan, Pelaksanaan Dan Evaluasi Riset Kualitatif Dan Kuantitatif*. Celeban Timur: Pustaka Pelajar.

Daryanto, dkk. 2004. *Analisis Upah dan bahan (Analisis Bow)*. Jakarta: Bumi Aksara.

Endraswara, Suwardi. 2006. *Metode, Teori, Teknik Penelitian Kebudayaan*. Yogyakarta: Pustaka Widyatama.

Faridatul, Yuni. 2015. *Studi Industri Kerajinan Gerabah Kasongan Di Desa Bangunjiwo Kecamatan Kasihan Kabupaten Bantul*. Skripsi. Universitas Negeri Yogyakarta.

Puspadewi, Kadek Rahayu dan I Gusti Ngurah Nila Putra. 2014. *Etnomatematika Di Balik Kerajinan Anyaman Bali*. Jurnal Matematika. Universitas Mahasaraswati Denpasar.

Sugiyono. 2010. *Metode Penelitian Pendidikan*. Bandung: Alfabeta.

Sutrisno, Heru. 2011. *Museum Seni gerabah kasongan Bantul*.Skripsi:Universitas Atma Jaya.

http://bangunjiwo.bantulkab.go.id/index.php/first/statistik/0

http://ie.akprind.ac.id/sites/default/files/2011%20Edhy%20Sutanta%20Makalah%20Jurnal%20Riset%20Daerah%20Kab%20BantulPengembangan%20Aplikasi%20mCommerce%20Sebagai%20Media%20Publikasi%20dan%20Promosi%20Produk%20Gerabah%20Kasongan-a.pdf.

Sutanta, Edhy.Pengembangan aplikasi mobile commerce sebagai media publikasi dan promosi produk.(6/4/2016)

http://stta.name/data_lp3m/14.Mei2015_Yasrin.pdf. Zabidi,Yasrin. Pengukuran Dan Analisis Kinerja Industri Kreatif Gerabah Kasongan Bantul Guna Meningkatkan Daya Saing Dan Kekuatan Daerah. (28/2/16)

http://www.jogjacityguide.blogspot.co.id/2013/12/sentra-industri-gerabah-kasongan-bantul.html. Sentra Industri Gerabah Bantul. (12/3/16)

http://www.p4mriundiksha.wordpress.com. (10/3/2016)

http://gudeg.net/direktori/582/desa-wisata-gerabah-kasongan-yogyakarta.html. (3/3/2016)

http://ie.akprind.ac.id/sites/default/files/2011%20Edhy%20Sutanta%20Makalah%20Jurnal%20Riset%20Daerah%20Kab%20BantulPengembangan%20Aplikasi%20mCommerce%20Sebagai%20Media%20Publikasi%20dan%20Promosi%20Produk%20Gerabah%20Kasongan-a.pdf