

Science Analysis of “*Nginang*” Culture In Context of Science Technology Engineering And Mathematics (Stem) Integration of Ethnoscience

S. Sudarmin¹, Miranita Khusniati², Nur F³, Seyla A⁴, and Khoirur R⁵

^{1,2,3,4,5}Chemistry Department, Mathematics and Natural Science Faculty Universitas Negeri Semarang, Indonesia

¹Corresponding email: sudarmin@mail.unnes.ac.id

Abstract

The ancestors in Indonesia often do *nginang* activities as a culture of hereditary. *Nginang* culture is the name of the tradition of eating betel and usually, before eaten betelau first mixed with tobacco, lime, gambier, and betel nut. In this research, a qualitative descriptive analysis of *nginang* culture was conducted to reveal the scientific explanation related to *Nginang* culture in Indonesia. In the research data revealed through interview and adoption, subsequent reconstruction of science science-based scientific community in the context and content of integrated STEM Etnosains, the data obtained validated with scientific laboratory data, research related components major in betel, textbooks, and experts. The results concluded that *nginang* culture is able to strengthen the teeth, because in betel contains essential oil from phenyl propanoid and tannin compounds. Essential and tannin essential oils are antimicrobial and antifungal properties are strongly suspected and can inhibit the growth of certain types of *Escherichia coli*, *Salmonella sp*, *Staphylococcus*, and *Candida albicans* bacteria. In *Nginang* culture is technically mixing betel leaves with some chemicals contained the concept of mixed chemistry, acid-base reaction, and substance changes. The results of the analysis on the answers of sources obtained various information related to how to produce *Nginang* ingredients composition, so that obtained the taste and benefits for dental health.

Keywords: *Nginang* Culture, STEM, Saintific, ethnoscience

1. Introduction

Nginang culture is the habit of old women who are now old. *Kinang* consists of Suruh leaves, lime and Gambier leaves chewed until soft and spit out. Then to clean the teeth used Susur (tobacco that is formed round or '*dikepel Javanese language*') as a brush. It will be even more perfect if you add Kanthil flowers. Thus the cultural tradition of eating betel or *Nginang* in Javanese is part of the culture and life of people in Indonesia. *Nginang* culture has been known since the sixth century AD and is practiced in almost all regions in Indonesia, such as; in Sumatra, Java, Kalimantan, Nusa Tenggara and Papua (Sundari, 2017). The tradition of eating betel nut cannot be ascertained from where it came from, some literature explains that the culture of *nginang* originates from India. This opinion is based on literary and historical stories. The results of Marcopolo's travel record, known as a 13th-century world explorer, noted that many people in the archipelago ate betel. Betel is used as a medicinal plant, which is also very instrumental in life and various traditional ceremonies from various ethnic groups in Indonesia. The reason is that at present there

are not many studies related to the reconstruction of scientific science based on community science related to *Nginang* culture, so as to provide a scientific explanation of the culture of the *Nginang* from the side of Science, Technology Engineering and Mathematics (STEM).

This research is on the rise, because of the observations in some Javanese communities in Indonesia and the analysis of articles, actually *Nginang* culture is not only chewing leaves with all their mixtures, but as a cultural symbol and contains scientific concepts. Culture relates to people's trust and knowledge of the efficacy of betel nut and its mixed ingredients (Tombong, 2018). The efficacy of *Nginang* is believed to be able to strengthen teeth from betel leaves if combined with lime, areca nut and gambier, then chew until crushed. The ingredients start when the mouth will look red, and this scientifically shows certain chemical reactions. However, even though it makes it red but feels good for *Nginang* lovers.

In the *Nginang* culture, after betel mixed with lime, gambier, and betel nuts and chewed, then finally rubbed with tobacco on the mouth, teeth, and finally produced holes and discarded

(Sundari, D, 2017). In ancient times, culture was obligatory for women, but the culture was almost gone. Thus historically, Nginang culture is a habit of eating betel nut and its mixed ingredients carried out by a group of Indonesian women. Knowledge of the culture of Nginang and its benefits for health is believed by the community as the original knowledge of the community, but it has not yet been scientifically explored why there are many benefits for dental and oral health. so that it can be reconstructed into scientific knowledge. This research will be carried out the reconstruction of community science-based scientific science for Nginang culture in terms of STEM and Ethnology (Etho-STEM).

2. Methods

This type of research is a descriptive qualitative cultural research. Nginang is linked between Science Technology Engineering and Mathematics in the ethno-STEM context. This approach was chosen with consideration, so that science teacher students understand the indigenous knowledge of the culture of Nginang culture and scientific explanation of the Ethno-STEM aspects. In this study to obtain information according to the research objectives, the informant selection technique in this study used purposive sampling, and students were involved in data collection and analysis of research results. While as a resource person or research subjects are grandmothers who are still doing Nginang activities and location of research in the Central Java region of Indonesia. Data collection techniques through active participation observation and interviews with resource persons conducted by the research team. The focus of the question is related to ingredients for fire, technique, ways to produce a delicious taste of Nginang; and the composition of ingredients in Nginang. During interviews the photos and notes are recorded and documented. Each resource person was visited twice to verify and validate the data. The collected data was verified, reduced for data that did not contain scientific concepts, then validated by experts and some literature related to Nginang culture.

3. Discussion

3.1. Reconstruction of Scientific Knowledge from Nginang Culture in the aspect of Science

In this study begins with interviews as resource persons, namely mbok Tombrong (80 years of no school) from the village of Klegenharjo Kebumen, (2) mbok Paimah (70 years, no school), and (3) Maruji (106 years old, no school) Bedono Semarang. In this study resource persons were asked around the culture of Nginang with the focus of knowledge possessed by the three interviewees in the context of STEM. The results of data from resource persons were verified, reduced, validated, conceptualized, in accordance with the rules of the ethnics approach (Sudarmin, 2016) The results of Nginang cultural research in the context of Ethno-STEM are presented as follows.

a. Questions about knowledge from resource persons about any material for Nginang.

On this question all the speakers all answered that the ingredients for Nginang were leaves suruh (betel), Gambier, tobacco. and injet (lime deposits). The results of data related to materials from Nginang are presented in Figure 1.



Figure 1. Main ingredients for *Nginang* (Clockwise from top left betel, gambier, tobacco, and injet)

In this study, the answers of the speakers (Mrs. Tombrong, Painah, and Mujiari) were obtained, then the reconstruction was carried out into scientific science and the results are as follows: Reconstruction of scientific science about betel leaves: The search results from various sources of betel names for some Indonesian regions are Ranub (Aceh); base, sedah (Bali); sere (Madura), suruh (Java); demban (Batak); sireh, suruh (Palembang, Minangkabau) (Dirjen POM, 2014). Taxonomy of betel plants is Kingdom: Planta, division of Magnoliopsida, Class: Magnoliopsida, Order of Piperales, Family of Piperaceae, Genus: Piper, Species: Piper betle L. Research results test the number of components and content of betel leaves, known betel leaves contain essential oils 0.8 - 1.8% with the main components of khavikol, eugenol, eugenol methylether, p-cymene, cineole, caryophyllene, cadinene, t,

sesquiterpene, phenyl propane, and tannin which cause red color. Chavikol compounds that cause typical betel-smelling and have antibacterial properties (the ability to kill bacteria five times stronger than ordinary phenols) and immunomodulators (Dalimartha, 2006).

The second question's focus is the red color change after betel nut is chewed. Scientifically the red color produced by betel leaves is due to tannin content as a natural dye which is one component of flavonoids (Dalimartha, 2006, and Balasoka, 2017). Besides that, the red color produced from *Nginang*, the resource person said that it is better to use betel leaf which is rather old, because the red color will be a lot and this scientifically shows that the levels of anthocyanins and tannins from rather old betel leaves contain a lot (Anisfiani, 2014). As for the red and green betel, the main components are alkaloids, flavonoids, saponins, essential oils, charvakrol, and eugenol (Heyne, 1987).

The results of the analysis of literature and literature are delivered by healthy and strong teeth owned by parents who have a habit of *Nginang*. Scientifically explained that, the content of tannin and terpenoid compounds in betel leaves in concoctions causes strong teeth. Betel leaf has the ability as an antiseptic, antioxidant, and fungicide (Herijulianti, 2002). According to Hariana (2013) in his book entitled 262 Medicinal Plants & Its Benefits Medicinal Plants and Their Benefits, betel leaves contain essential oils up to 4.2%, phenyl propanoid compounds and tannins which are antibacterial and dental enhancers. The compounds in the betel leaf are anti-microbial and antifungal strong and inhibit the growth of *Escherichia coli*, *Salmonella sp*, *Staphylococcus*, and kill *Candida albicans*. According to a report from the Directorate of Drug and Food Control (1980), it was found that betel leaves found flavonoid and tannin compounds that were anti-microbial and Chavikol compounds which had the power to kill bacteria. This means that betel leaves can cure diseases caused by these three bacteria

b. Scientific Explanation about Gambier

Gambier is a type of dried resin that comes from extracts of plant leaves and twigs called *Uncaria Gambier* (Wikipedia, 2013). The important ingredient of Gambier is a catechin polyphenol compound, one of the

natural ingredients is anti-oxidant and causes red color in the Nginang, while the catechin compounds in gambier are in the form of acid or anhydrous (Heyne, 1987, Chaovanalikit, 2004). Gambier causes reddish brown on the lips. The color comes from tannin and catechin contents in the form of tannin compounds condensed on the sap of leaves or twigs. The scientific explanation is when the catechins found in this tannin are flavan-3-ol when added acid or enzyme in saliva in the mouth produces a red color called phlobaphens. Catechins when subjected to prolonged heating or heating with alkaline solutions will easily become catechintannates because of their own condensation and become easily soluble in cold water or hot water (Yeni, et al., 2017). The polyphenol compounds in Gambier have antibacterial properties (Pambayun, 2007). The Gambier planters include Kingdom Plantae, Magnoliophyta Division, Class Magnoliopsida, Order Solanales, Family Solanaceae, Genus Nicotiana, and Species *Nicotiana tabacum* L. Commercial images are obtained by processing Gambier leaves by boiling, pressing and drying solids. In trade, one component of gambier quality is determined based on the content of the catechins (Pambayun, et al, 2007). Catechins are a source of natural antioxidant benefits that can attack systems that are exposed to free radicals and are able to attack various types of diseases (Hamilton, et al. 2000).

c. Scientific explanation of tobacco (mbako in Javanese)

Tobacco is usually used by the community as an ingredient of Nginang or nyusur (Javanese). Previous studies have been conducted on the activity of tobacco leaves as antibacterial against *Staphylococcus aureus* and *Escherichia coli*. The results of this study showed that the concentration of 20% tobacco leaf extract had a inhibitory zone diameter of 4 mm in both types of bacteria (Rusli, 2011). Nicotine is produced from plant roots and then distributed in leaves through stems and pure form nicotine is a colorless liquid, bitter and spicy, easily soluble in water and organic solvents (Alegantina, S. 2017). Tobacco contains active alkaloid classes other than nicotine, namely anobarin, nicotinoid, nicotelline, nicotyrine, and norcotine (Hossain, A.M et al., 2013). Tobacco used in chewing betel contains toxic substances such as tar,

nicotine, and CO which are addictive or addictive to those who consume them (Fernando, 2011)

d. Scientific Explanation of Injet (Lime betel)

The scientific explanation of injet (Betel lime) is as follows: whitening is a compound of CaCO₃ (Calcium carbonate). Betel lime contains calcium needed for dental health. In general, calcium is a salt that is very important for humans, especially as forming bones and teeth (Nurnabila, 2011). Lime used in consuming betel leaves actually has benefits for the health of periodontal tissues because they contain chitin which is beneficial for the health of periodontal tissues. Nonetheless, chitin products are used when harvesting in the form of lime powder which can damage the tissue periodontium mechanically by calculus formation which will cause periodontal tissue inflammation and tooth mobility (Siagian, 2012).

3.2. Scientific explanation of aspects of technology and engineering

In this aspect of technology and engineering, the focus of the question is how are the techniques and stages of Nginang? The answers of the three interviewees were the same, namely gathering ingredients for Nginang, namely betel, gambier, and injet, then pounding in a "ngejroh" tool in Javanese, which is the tool as in Figure 2.



Figure 2. *Nginang* Materials for Mixing (Ngejroh Tools)

After the material has been mixed and then pressed or ngunyah, so that in the process of the chemical reaction occurs which occurs in the mouth which is assisted by the enzyme

in saliva. Scientific Explanation of visiting activities from Nginang namely controlled movement of the side and front teeth to bite, chewing to soften the Nginang material. Integrated activity of the jaw muscles in response to the activity of efferent neurons in the motor nerve in motion which controls the relationship between the upper and lower jaw teeth. Jaw movement is an integrated movement of the tongue and other muscles that control the perioral, pharyngeal, and laryngeal areas. So, it can be concluded that the opening and closing of the jaw during shaking which is relatively simple movement with regulation of limb as a driver (Balasoka, 2017). During chewing or mastication, ingredients are reduced in size and mixed with saliva as the initial stage of the initial process of Nginang. In this activity, the teeth are one of the chewing organs consisting of teeth in the upper, lower jaw, tongue and saliva producing channel (Rahmadhan, 2010). Oral hygiene plays an important role in maintaining and maintaining dental health (Herijulianti, 2002).

At this time, our society is lacking in cleaning teeth like brushing teeth. They only brush their teeth twice a day while bathing. Brushing your teeth is not an important habit. The habit of brushing your teeth has been replaced by the habit of chewing betel or Nginang. This stretching habit is believed to be a substitute for brushing your teeth because the stretching function that is used to clean teeth and chew betel nut can strengthen teeth (Rooney, 1995). Thus pounding on the Nginang process is a dry extraction technique because without using water or solvent media (Waluyo, 2008) Engineering Aspects, the questions raised by the resource person are what tools are used so that the Nginang mixture can produce a delicious taste. The answer to this question is that the ingredients are mixed in the *jojohan* or knocked out. Scientific explanation is small *Lesung* and *Alu* included in the simple plane because it can facilitate human work. This tool belongs to the third group lever. Where the power point is between the load point and the fulcrum. In the last activity *Dubang* was produced. *Dubang* stands for *idu-abang*, which is the meaning of red saliva, in a literal sense, the true meaning that the saliva is bright red. *Dubang* is arguably the product of the Nginang

3.3. Scientific explanation of aspects of Mathematics

In this study, the questions to the resource persons to reveal the aspects of Mathematics are the composition for Nginang materials, is there a certain size. Based on the question, the three speakers answered the following: The composition of the Nginang is told to *suruh* or betel leaf (2 pieces), a small *Gambier*, and a small *injet*.

4. Conclusion

Based on the results of the research and discussion, it was concluded that the following Nginang culture in Indonesia has a different name based on its region. The results include that the culture is able to strengthen teeth, because it contains essential oils from phenyl propanoid and tannin compounds. Essential and tannin essential oils are antimicrobial and antifungal properties are strongly suspected and can inhibit certain types of *Escherichia coli*, *Salmonella sp*, *Staphylococcus*, and *Candida albicans* bacteria. In Nginang culture is technically mixing betel leaves with some chemicals contained the concept of mixed chemistry, acid-base reaction, and substance changes. The results of the analysis on the answers of sources obtained various information related to how to produce Nginang ingredients composition, so that obtained the taste and benefits for dental health

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