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Indigenous Knowledge of Javanese in the Radya Pustaka Museum Collections

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Abstract
Radya Pustaka Museum is a museum that represents Javanese culture. The collections in the museum are proof of the indigenous knowledge of the people in making cultural products. This research aims to identify Javanese indigenous knowledge based on the Radya Pustaka Museum collections. Therefore, qualitative research was used with a museum study approach to identify types of indigenous knowledge based on various museum collections. The results of the research show that indigenous knowledge represented in the collection at the Radya Pustaka Museum is how to make Javanese men's headgear (*blangkon*), turn tree bark into paper (*daluang*), use palm leaves (*lontar*) as a writing medium, cast copper for writing media, turn metal into various weapons, making puppets (from animal skin and wood), creating traditional orchestral musical instruments (*gamelan*), mastering Javanese astrology (*pawukon*), turning a hill into a burial complex, assembling a traditional cruise ship, understanding the health benefits from coconut water, and making natural paint, natural dyes, and glue. This research found that the indigenous knowledge behind *gamelan* is not only about how to make musical instruments and how to create notes, but there is also knowledge about mental health. Music produced from gamelan can calm the mind, facilitate concentration, and increase enthusiasm for living life. Another finding is that there is ethnomathematics implicit in the Imogiri burial complex. The results of this research can be a reference source for further research on local knowledge management in information institutions, especially museums, so that employees can service the knowledge behind the collections.

Keywords: indigenous knowledge; knowledge management; javanese culture; museum; radya pustaka museum.

INTRODUCTION

Museums are a manifestation of the knowledge of the community where the museum is established. Many visitors deliberately come to museums to learn about the history and civilization of ethnic groups from the objects on display. For example, the Radya Pustaka Museum which stores Javanese intellectual property. If you look at the name, *radya* (palace) and *pustaka* (the concept of a collection of knowledge with collections such as books, manuscripts and other writings), the name of the museum (Radya Pustaka) represents the intelectual materials (ancient manuscripts and ancient books) inherited from the Javanese kingdom (Keraton Kasunanan Surakarta).

Based on the writing displayed on the walls of the Radya Pustaka Museum, this museum is the oldest museum in Indonesia. When it was first founded, on 28 October 1890 (the era of Paku Bowono IX), this museum was called Paheman Radya Pustaka. Its founder, KRA Sosrodiningrat IV (patih and humanist at Kasunanan Palace) aims to preserve written works from Javanese society, especially from the palace environment. Since January 1 1913 its name is Radya Pustaka Museum. Thus it can be understood that the Radya Pustaka Museum stores knowledge from Javanese ancestors.

This is in line with the results of research by Howard et al. (2016) that curators in museums also recognize that their work is closely related to knowledge. They collect, group, and display artifacts based on knowledge of the specifics of the collection. Not only is it the responsibility of the curator, but knowledge about the collection must also be mastered by tour guides at the

museum in order to increase visitors' knowledge. In accordance with this statement, based on the results of our visit, now the Radya Pustaka Museum has added a variety of collections, such as *blangkon*, *tosan aji* (Javanese heirloom weapons), copper inscriptions, traditional Javanese musical instruments, puppets, *pawukon* (Javanese zodiac), miniature burial places of the King's family, and a miniature traditional yacht. All collections represent Javanese culture; starting from the royal era, the colonial era (Dutch), and the modern era.

These collections are proof of the local knowledge of Javanese in making cultural objects. According to Philip (2015), local knowledge is commonly interpreted as indigenous knowledge and part of ethnoscience because it has a special uniqueness, namely knowledge that represents a particular culture. People who live in a place will form a culture that becomes their identity. They also make various objects that are their trademark. Sometimes these objects cannot be found anywhere else. These objects are then collected in museums to become a source of knowledge for visitors. These objects are clear evidence of their skills, abilities, and knowledge in making cultural products. Therefore, we conducted research to identify indigenous knowledge from museum collections.

In this research, we chose the collection at the Radya Pustaka Museum as objects that represent indigenous knowledge. The uniqueness of this museum is its status as the first museum in Indonesia and the diversity of its collections (ranging from ancient manuscripts, traditional weapons, inscriptions, replicas of ancient cruise ships, *wayang*, musical instruments, and Javanese astrology). Our previous research regarding the relationship between museums and local knowledge that we have carried out is Sundanese local knowledge in the collection at the Sri Baduga Museum. The people had the ability to make traditional cloth, livelihoods, city planning, lighting tools, handicrafts, small ironsmith industries, calendar, arts, children's games, and language and script (Nurislaminingsih et al., 2019).

Other previous research related to this research is research from Sukaesih et al. (2022) about the local knowledge of Javanese people which is implicated in the Mangkunegaran Museum collection. This museum represents Javanese knowledge in processing metal (making jewelry, knick-knacks, household utensils, musical instruments, and weapons), processing wood (making house and furniture), processing bamboo into handicrafts, making granulated sugar, and preserving animals.

What this research has in common with these two studies is the research theme in the form of local knowledge behind museum collections. The similarities between this research and the research of Sukaesih et al. (2022) both identify indigenous Javanese knowledge. The difference between this research and the research of Nurislaminingsih et al. (2019) is ethnicity; we studied the Javanese while Nurislaminingsih et al. (2019) researched the Sundanese. The difference between this research and the two studies is the type of collection we found during observations. At the Radya Pustaka Museum, collections are different from others such as the Sri Baduga Museum and the Mangkunegaran Museum, for example, various *wayang*, chopper sheet inscriptions, replicas of ancient cruise, and Javanese astrology. Therefore, the aim of this research is to identify Javanese indigenous knowledge represented in the collections at the Radya Pustaka Museum.

METHOD

This research aims to explore the indigenous Javanese knowledge behind the Radya Pustaka Museum collection. Therefore, we use a qualitative design with a museum study approach. According to Leavy (2014), qualitative research is used when researchers want to explore social phenomena to describe or explain how activities, realities, and situations are based on events, documents, and artifacts. Tucker (2014) explained that museum studies are research based on

objects in museum collections. The main data collection in this study is observation and analysis of content in the collections. Additional data was obtained from text containing brief explanations displayed near each collection. The data analysis process is carried out by mapping themes according to collection clusters (which have been grouped by museum officials). The results of the analysis are reinforced with a brief explanation so that readers understand the essence of the collection.

We collected data by observing the collections at the Radya Pustaka Museum one by one, recording text explaining the collections, photographing the collections, and interviewing tour guides. We chose the collections that were originally made by Javanese people according to the explanation from the tour guides. Data analysis was carried out by mapping local knowledge according to the collection and grouping it according to themes. We also analyzed the information from the text displayed next to the collection. The text contains an explanation of each collection. The results of this text analysis strengthen the determination of the collection's theme clusters. The explanation of the results of the data analysis is accompanied by quotations from the results of other existing research. Quotations from journal articles provide scientific support for the theme of indigenous knowledge from the museum collections. The results of collection and text analysis, interview results, and quotations from journals become triangulation that supports the validity of the research data.

RESULT AND DISCUSSION

The Radya Pustaka Museum is one of the proud museums of the Javanese. In this museum, there are objects inherited from Javanese ancestors. Museum collections are physical evidence of their knowledge in making cultural objects. Kusuma et al. (2020) argue that the Radya Pustaka Museum is a representation of the Kasunanan Palace because everything related to this kingdom is stored in the museum. The life of the royal era is written in many ancient manuscripts which are the pride of this museum. Other collections that are not manuscripts also provide evidence of Javanese cultural products. Whatever is stored in the museum contains information about Javanese culture.

Based on this statement, it can be understood that museum collections are a medium for studying ethnic knowledge, including indigenous knowledge. This is as said by Kim (2012) that museums are memory institutions that have the task of managing cultural heritage as well as sources of knowledge for the community. The cultural and knowledge heritage in question is a museum collection. Latham (2015) explains that museums have a role as knowledge management centers that have activities to create, collect, and share knowledge with visitors. In this position, the collections in the museum are used as objects that store knowledge. The job of museum employees is to explain the knowledge behind the collection.

The results of this identification will give rise to various kinds of indigenous knowledge. These findings will be evidence of local knowledge possessed by certain tribes and will be additional knowledge for museum visitors. In this way, visitors not only learn about the forms of ancestral cultural heritage products, but also get information about local knowledge about the collection. The following are the results of identifying Javanese indigenous knowledge contained in the Radya Pustaka Museum collections.

Javanese Men's Head Cover

Entering the museum room, visitors will see displays of typical Javanese men's head coverings; *Klutuk*, Military Hat, and *Blangkon*. However, when confirmed to the tour guide at the museum, Mr. X explained *blangkon* has been used since royal times. It remains a typical Javanese hat until the modern era like today. According to Mukaromah et al. (2023), Javanese still have the

skill to make blangkon today. This is proven by the existence of Blangkon village in Serengan sub-district - Surakarta. Craftsmen still make *blangkon* manually. They also still maintain traditional motifs such as *Solo Kasatrian, Solo Czechok, Solo Perbawan, Solo Mangkunegaran,* and *Solo Mudha*. Craftsmen also have certificates and often serve as delegates to introduce *blangkon* to Singapore, Saudi Arabia, Malaysia, Brunei Darussalam, and Qatar.

Susilowati & Riyadi (2022) explain that *blangkon* is a headgear made from a piece of batik cloth and is used by men as part of traditional Javanese clothing. The cloth is wrapped around the head. There are 21 pleats or folds. These twists and folds contain the philosophical meaning that the wearer (Javanese men) is good at keeping secrets, and does not like to reveal disgrace (others or themselves). Dwijonagoro et al. (2022) argue that in ancient times the *blangkon* was also used as a differentiator between the nobility and the common people. Wearers are seen as noble and honorable, but for them commoners only wear headbands. Sasanti (2020) states that the social status of the *blangkon* wearer can be seen from the type of fabric and the motif. The better the fabric and the more complicated the motif, the higher the social status.

In Cisara's (2018) research, it was explained that the *blangkon* is a *batik* headgear measuring 105cm x 105cm. *Blangkon* holds the values of beauty, perseverance, thoroughness, and patience. Javanese men in ancient times wore their hair long but did not let it hang loose. They tied their hair with cloth. This cloth tie means self-control. The value of the blangkon which is not just a head covering was also expressed by Dwijonagoro et al. (2022). According to them, there are many values stored in the *blangkon*, such as beauty, perseverance, thoroughness, foresight, and patience. These values are the responsibility of the user. When wearing *blangkon* they are expected to maintain good behavior, in accordance with the meaning of *blangkon*.

The existence of blankon proves that Javanese ancestors not only had knowledge about how to make hats, but also about how men should live; maintain their attitude, speech, and self-esteem (as a man).

Ancient Manuscripts

Based on leaflets printed by Radya Pustaka Museum employees, there are around 400 Javanese manuscripts, both handwritten and stamped with Javanese script. The themes of the manuscripts are also varied, such as wayang stories, Javanese history, herbal medicine, dance, music, and *pawukon* (Javanese horoscope). This is also confirmed by the statements of Mr.T and Ms. N, as a philologist and employees at the museum. Although not all of the texts have been successfully translated, it is certain that most of the texts contain the way of life of the Javanese people, especially since the royal era. The manuscript was handwritten (Latin Javanese or Javanese script) on sheets of *daluang* paper, European paper, and palm leaves (lontar).

Gumilar et al. (2013) explained that the raw materials for making *daluang* consist of several types of wood trees, such as *saeh* (Broussonetia Papyrifera), *beringin putih* (Ficus benjamina variegata), green banyan (Ficus benjamina), *waru* (Hibiscus tiliaceus L), and *tisuk* (Hibiscus macrophyllus). Of these trees, *saeh* (Broussonetia Papyrifera) is the best material for making *daluang* paper. The research of Peñailillo et al. (2016) explained that Broussonetia papyrifera (L.) is a tree that originates from East Asia, Polynesia, Melanesia, and mainland Southeast Asia. This tree is often found in Indonesia. People in Hawaii use Broussonetia papyrifera as a material for making paper. Matisoo-Smith (2015) explains that Broussonetia papyrifera (L.), also known as paper mulberry, is a plant that was commonly used as a material for making paper in ancient times by Chinese and Japanese people.

Gumilar et al. (2013) outlined the stages of making *daluang* paper based on direct observations of the practices carried out by Aki Maman in Garut. In simple terms, paper making

begins with selecting a good saeh tree trunk (7-10cm in diameter, has no lumps, no holes, has never been slashed, and has never been cut). The tree trunk is cut down and cut to the desired paper size. Next, remove the epidermis from the stem. The technique of peeling the epidermis can be done in two ways; firstly by scraping the epidermis with a knife that is not too sharp (so that the inner fibers are not carried into the scraping results), and secondly by whittling the epidermis with a sharp sharpening knife to obtain clean inner skin that tends to be white.

After the epidermis has been peeled off, we peel the tree bark from the trunk (after removing the epidermis) sheet by sheet and then soak it for one night or more. Soaking is done using clean water in a large container so that the bark does not fold. The container for soaking should not be metal so as not to affect the color of the paper. The bark is then drained, beaten to make it wider and thinner (the hammer is a brass plate), and aged (wrapped in banana leaves) for at least one night. If the wood slime has come out and the bark has become very soft, then the ripening process can be stopped. The result of this process is that the bark has become a sheet of wood fiber. Wash the sheet thoroughly (Gumilar et al., 2013).

Clean wood fibers are spread out on a flat, smooth surface like a banana stem so that the resulting paper is smooth and smooth. We massage the paper fibers so that the water is reduced, the fibers become flatter, less wavy, and neatly arranged. Fiber sheets are dried in the hot sun. Occasionally check the clothesline so that the fibers do not bend and remain sturdy. When it is dry, the fiber is ready to be formed into sheets of paper. We trim the edges of the paper by cutting to the desired size. We know the results of this process as *daluang* paper (Gumilar et al., 2013).

Apart from daluang paper, several collections of ancient manuscripts at the Radya Pustaka Museum are also made from palm leaf (Borassus flabellifer L). According to Eagleton (2016), Borassus flabellifer L is a plant that is easily found on the island of Java. Javanese people know this tree by the name lontar or siwalan. Nasri et al. (2016) explained that palm (Borassus flabellifer Linn.) is a multipurpose tree that has benefits in almost all parts of the tree. The parts that are widely used from Palmyra include leaves, stems, fruit, and flowers. The part usually used for writing media (paper) is the leaves. In ancient times, our ancestors used *lontar* leaves to write manuscripts, letters, and royal documents.

Based on ancient manuscript collections, it is implied that the Javanese are able to turn tree bark into *daluang* paper and palm leaves (Borassus flabellifer Linn) into writing media.

Copper Plate Writing Media

Apart from being good at making writing media from tree bark and palm leaves which are now ancient manuscripts, Javanese are also experts in inscribing writing on copper surfaces. For example, the Wurutunggal (885 AD), Kasugihan (907 AD), Mantyasih (907 AD), and Banjaran (1052 AD) inscriptions with Old Javanese script carved on copper plates. The discovery of this inscription not only proves the natives' ability to make script but also their ability to make copper plates and carve them, hundreds of years ago.

Putra et al. (2014) explained that copper (Cu) is a metal with the Latin name Cuprum. Copper is reddish brown in color, strong, ductile, and stretchable. This metal is in the earth's crust. Therefore, mining, washing, drying, grinding, and sieving stages are required before the copper is finally processed into a product. Subagja (2014) believes that knowledge of hydrometallurgy is also needed to obtain copper metal that is ready to be processed. Minimum expertise is required in using solutions of sulfuric acid, ammonium chloride, or ammonium carbonate to produce copper metal. Another process that must be taken is institutional deposition using sulfide, hydroxide, and reduction with gas.

Traditional Weapons

The Javanese's expertise in making traditional weapons is clearly visible when entering the central room of the Radya Pustaka Museum. Keris, swords, and spears of various sizes, shapes, and motifs are neatly displayed there. According to the informant who is also a security officer, the traditional weapons in the Radya Pustaka Museum collection are known as *tosan aji*. Original weapons inherited from the Surakarta Kasunanan Palace, whether they belonged to the Royal Family or were given to them by their relatives and friends. The weapons were also originally produced in Central Java. Asih et al. (2023) argue that the term *tosan aji* refers to objects made of iron which are considered to have magical powers. *Tosan* means iron while *aji* means spell. Thus, Tosan Aji means iron which has supernatural or magical powers.

According to Rahmat (2010), traditional weapons always change shape according to the era. In primitive times, traditional weapons were hunting tools made of wood or bamboo. In the Stone Age, stones were used as weapons. Entering the Bronze Age, metal began to be recognized as the basis for traditional weapons, namely *tosan aji* (weapons made from metal). Examples of tosan aji in Indonesia include spears, *keris*, swords, *wedung*, *rencong*, *badik*, and so on.

Rahmat (2010) added to his statement that *tosan aji* does not only mean weapons but is also a combination of art, culture, traditional technology, and metallurgy that was mastered by our ancestors. If we imagine, our ancestors could process various metals such as titanium which has a high melting point of almost 2,0000 C with traditional technology. As a comparison, currently, titanium is used for missiles, rockets, and spacecraft, which are of course made with modern technology.

The *tosan aji* at the Radya Pustaka Museum is proof of indigenous Javanese knowledge of making traditional weapons. This knowledge is passed down from generation to generation in society. This legacy of knowledge is what we then know as intangible cultural heritage. One of the tosan aji recognized as intangible heritage by UNESCO is the *keris*. This recognition is proof that our ancestors had indigenous knowledge of making traditional weapons from metal. An example of one of the stages of making a keris can be seen in Figure 1.

Figure 1. One of the Keris Making Processes
Source: Researcher's Personal Documentation (2022)

Asih et al. (2023) acknowledged that the inauguration of the Keris as a world intangible cultural heritage by UNESCO on 25 November 2005 was something to be proud of. However, this also causes confusion because the *keris* is also an object. In order not to give rise to misperceptions, it is necessary to remember that for Indonesian, especially Javanese, the Keris is

not only interpreted as a traditional weapon but also has meanings of philosophy, history, mysticism, charm, magic, identity, and so on.

The definition of Keris from UNESCO (2026) is "Kris blades are usually narrow with a wide, asymmetrical base. The sheath is often made from wood, though examples from ivory, even gold, abound. A kris' aesthetic value covers the *dhapur* (the form and design of the blade, with some 40 variants), the *pamor* (the pattern of metal alloy decoration on the blade, with approximately 120 variants), and *tangguh* referring to the age and origin of a kris. A bladesmith, or *empu,* makes the blade in layers of different iron ores and meteorite nickel. In high quality kris blades, the metal is folded dozens or hundreds of times and handled with the utmost precision. *Empu* are highly respected craftsmen with additional knowledge in literature, history and occult sciences".

The *keris* parts generally consist of the *wilah, warangka* and handle. *Wilah* is the main part of a keris whose main material is metal. *Warangka* is a *keris* sheath that has a specific function in the social life of Javanese society. *Warangka* is generally made from teak (Tectona grandis L.f.) , sandalwood (Santalum album L.), timoho (Kleinhovia hospita), and *kemuning* wood ((Murraya paniculata). *Keris* handles are made from ivory, bone, metal, and wood (Rahmat, 2010).

Keris, swords and spears are proof of the knowledge possessed by the Javanese about how to process metals (iron, nickel, etc.) and meteorite into traditional weapons. They are able to smelt metal and stone, then forge and shape them into various kinds of heirloom weapons.

Wayang

In general, we know *wayang* as a performing art, similar to life dramas portrayed by puppets. This puppet is *wayang*. *Wayang* is performed on stage by *dalang* or a puppeteer (director) who moves the puppet's body to make it act like a human. According to Sa'adah et al. (2022), originally wayang was used to worship ancestral spirits. The term *wayang* comes from the word '*Ma Hyang*' which means going to spiritual spirits, the gods, or the power. However, some people believe that wayang comes from the Javanese word '*wayangan*', which means shadow. This is because people who watch wayang only see the shadows played by the puppeteer.

Examples of typical types of *wayang* in Java are *wayang golek* and *wayang kulit*. These various types of wayang are also part of the proud collection of the Radya Pustaka Museum. According to Hapsari (2016), *wayang golek* is made from wood which is carved into the shape of several parts of the human body. The head is installed so that it is easy to move to look or shake the head. The hands are also installed as flexibly as possible so they can be moved according to human behavior. Nugroho (2018) said *wayang kulit* is a work of performing art that has a certain scene structure according to a theme agreed upon between the director and the audience. The theme usually adapts to the place where the wayang is played, for example, Pakeliran JawaTimuran (East Java) and Surakarta Pakeliran (Central Java).

UNESCO's recognition of *wayang kulit* is written on The Representative List of the Intangible Cultural Heritage of Humanity. *Wayang* is described as a handmade doll made of wood (*wayang golèk*) and animal skin (*wayang kulit*). The puppets are projected in front of a screen lit from behind. There is a director (*dalang*) who plays puppets as figures in people's lives. Apart from the puppeteers, there are also singers and musicians who provide background effects for songs that support *wayang* performances.

The collection of several types of puppets at the Radya Pustaka Museum is proof of the skill of our ancestors in making puppets from several materials. *Wayang kulit* is made from animal skin. Wayang golek is made from carved wood. Riffai and Sudartomo (2018) stated that the simplest stages of making *wayang kulit* are preparing sheets of animal skin, carving leather motifs (according to the character), adding color, and adding accessories.

In the research of Murtiasri et al. (2015), it is known that the skill of making *wayang kulit* still exists today. Sonorejo Village is the largest center for shadow puppet craftsmen in Central Java. In this place, craftsmen need a maximum of ten days to make shadow puppets. They also prioritize the quality of animal skin raw materials. Quality affects the flexibility, strength, fragility, and lifespan of the puppet.

Buffalo leather is considered the best choice compared to cow leather. After drying, buffalo leather becomes more stable and stronger against changes in weather and heat. On the other hand, cowhide usually bends easily. At this stage, *jidar* technology and pressing leather as puppet materials become very crucial. The process of cutting leather using a razor requires a high level of caution and precision in placing the leather precisely. Craftsmen also need leather-cutting machines to speed up the process with the right level of precision (Murtiasri et al., 2015).

Music Art

The complexity of making *gamelan* is reflected in the definition of gamelan given by UNESCO (2021), *gamelan* is "a traditional Indonesian percussion orchestra. This musical instrument is made of metal (bronze, brass and iron). *Gamelan* is played by hitting or knocking (*gong, saron, demung, slenthem, kecer*), plucking (*siter, kecapi, rebab*), beating (*kendang*) and blowing (*flute*). The tones in *gamelan* have their own frequency and interval patterns. Pairs of low and high pitched instruments, together produce Indonesian *Gamelan* melodies, which echo the sound of waves (knock) or serenades (vibrato). "*Gamelan* music has its own techniques and forms, namely one melody performed simultaneously by different instruments (heterophony), the technique of interlocking several instruments to compose the rhythm (interlocking parts), rhythmic and metric patterns of beats and punctuation (colotomic punctuation)" .

Based on this definition, it can be understood that in *gamelan* there is local knowledge about how to make musical instruments, how to play them, and the notes they produce. Apart from musical instruments (real objects), *gamelan* has other aspects. The resulting music will have a psychological effect on the listener. Other local knowledge behind the *gamelan* is represented by UNESCO's statement (2021) that the *gamelan* not only functions as a musical instrument for entertainment purposes, but is also useful for mental health therapy, calming the soul, increasing study concentration, increasing self-motivation, reducing joint pain (Osteoarthritis), and increase emotional intelligence.

Javanese Astrology

If we hear the words aquarius, libra, leo, gemini, or virgo, we will automatically realize that these are the names of the zodiac. However, if you hear the words *wuku sungsang, medhakungan,* or *watu gunung,* some people will definitely feel strange. Even Javanese may not have heard of these words, even though it is all part of the Javanese horoscope or *pawukon*. Widayat & Studyanto (2018) also explained the similarities between i and the western astrological zodiac. Both contain predictions (calculations/*péthungan*) about human life. *Pawukon* corresponds to the *wuku* script while the zodiac corresponds to the constellations.

According to Fitriyani &Wahab (2019), *pawukon* is the science of *wuku* (week in Javanese and Balinese culture) which is part of the Javanese calendar and is passed down from generation to generation. *Pawukon* consists of 30 wuku. One *wuku* has 7 days. Each *wuku* has its own protective deity with an animal or plant as symbol.

Adisukma (2018) explained that *pawukon* is part of the *primbon*. Javanese know the term *primbon* as notes made by their ancestors containing life teachings, social events, and natural phenomena to be used as lessons for the future. One of the life teachings in the *primbon* is *petungan* (the science of calculation obtained from experiencing and researching social events and natural phenomena). *Petungan* in the *primbon* itself is called *pawukon*.

Petungan and *pawukon* are made based on the science of titen (knowledge gained from researching, remembering, and analyzing similarities and differences, so that there is a chance of it happening again) of environmental events, both natural and social events. *Pawukon* is used to calculate the good and bad of a day, a person's character, and even the profits and losses from our actions.

Widayat & Studyanto (2018) argue that *pawukon* is not just a science of calculations but also contains philosophical, sociological, and spiritual meanings that are useful for society. The philosophical meaning is that Javanese people must be careful in living their lives. The social meaning is in symbols (gods, humans, animals, plants) which are easily remembered by people because these figures exist in their social environment. The spiritual meaning relates to belief in gods.

The position of *pawukon* which is part of the *primbon* is also said by Azizah & Pratama (2020) that in Java the term Pawukon is considered as one of the life teachings contained in the *primbon* book. *Primbon* contains various kinds of life problems. *Pawukon* is a formula for calculating time, days, months, or years. It is similar to the calculations found in the zodiac which depicts 12 constellations. For comparison, it can be seen in table 1.

Table 1. *Pawukon* & Zodiac

Order of Season (Mangsa - Pawukon)	**Terms and meanings**	**Time/Period**	**Gods**	**Zodiac**
1.*Kasa*	*soto murco saking embanan* (the pearl fell out of its ring)	The time when farmers burned the remaining rice stalks in the fields	Vishnu	Aries
2.*Karo*	*bantolo rengko* (cracked ground)	It's time for farmers to look for water irrigate the plants	Sambu	Taurus
3. *Katelu*	*suto manut ing bopo* (children obey their father)	farmer watering the plants	Rudha	Gemini
4. *Kapat*	*waspo kumembeng jroning kalbu* (tears welled up in the heart)	*The period when farmers start planting*	Yama	Cancer
5. *Kalima*	*pancuran emas sumawur ing jagad* (a shower of gold illuminates the world)	the period when farmers began to repair and irrigate the edges of the rice fields	Metri	Leo
6. *Kanem*	*roso mulyo kasucian* (lots of fruit)	The farmers started doing their work in the fields	Naya	Virgo
7. *Kapitu*	*wiso kenter ing maruto* (the poison drifts away with the wind)	*a season marked by floods and strong winds, farmers start planting rice.*	Sanghyang	Libra
8. *Kawulu*	*anjrah jroning kayun* (come out of your heart)	lots of grains of rice	Durma	Scorpio
9. *Kasanga*	*wedaring wono mulyo* (the emergence of noble voices)	The rice season has turned yellow	Wasana	Sagitarius
10. *Kasapuluh*	*gedhong minep jroning kayun* (The building is trapped in the heart)	*The time when farmers harvest rice*	Basuki	Capricon
11. *Dhesta*	*sotyo sinoro wedi* (shining diamond)	The time when farmers start to harvest	-	Aquarius
12. *Sadha*	*tiro sag saking sasono* (the water left his house)	Farmers started drying rice	-	Pisces

Source: Azizah & Pratama (2020)

Pawukon is a prove of local knowledge about the meaning of life, how to socialize, how to recognize natural phenomena, and how to coexist with nature. All of this provides provisions for

analyzing social life and natural events that usually occur. The results of this analysis are used as predictions for things that will happen in the future.

Cemetery Landscape

Imogiri grave site is a royal tomb area in a hilly area. Sultan Agung was buried at the top of the ground. A few steps below his grave are the graves of his descendants (the royal family). The right side is for the royal family from the Surakarta Palace while the left side is for the royal family from the Yogyakarta Palace. When viewed from the miniature, this tomb site contains local knowledge about the architecture of burial complexes in the highlands and designing supporting buildings.

Figure 2. Miniature of the Imogiri Tomb
Source: Researcher's Personal Documentation (2022)

Savitri (2021) explains that the Imogiri Royal Tomb site is located in Wukirsari Village, Yogyakarta Special Region. This is a complex of graves for the kings of Mataram Islam, the sultans of the Yogyakarta Sultanate Palace, and the sunan of the Surakarta Kasunanan Palace. This site does not only consist of tombs but there are buildings such as cupolas, gates, screens, stairs, and mosques. These buildings also have ornaments such as antefixes, reliefs, and gates.

Krisma & Nurjanah (2023) saw that there was knowledge about ethnomathematics (mathematics and culture) in the Imogiri tomb complex. The results of their research findings show that in the tomb complex, there are mathematical concepts hidden behind the objects in the building. It can be seen from the shapes of trapezoids, rectangles, similarity, congruence, beams, truncated pyramids, reflections, and rotations.

The roof of the Pajimatan mosque (the mosque built in front of the gate entering the tomb complex) is trapezoidal. The foot washing place is in the shape of a block. The pool in front of the mosque is an inverted pyramid. In front of the mosque there is a monument at the top of which is the royal crown of Pakubuwono X. At the bottom of the crown there is a framed wall clock. At the bottom of the clock, there is the writing PXB as the symbol of Pakubuwono. This framed wall clock can be related to the concept of circle and square. This frame with Javanese script content can be linked to the concepts of rectangles and comparisons (Krisma & Nurjanah, 2023).

The concept of mathematical calculations is clearly visible in the number of stairs leading to the tomb complex. Visitors need to climb 409 steps. If arranged, a formation of 80, 49, 75, 142, 26, 18, and 19 steps is formed. The mathematical concept of this number is the addition of natural numbers. The gate also contains mathematical elements. Gapura Kori Supit Urang is the entrance

to the main tomb of Sultan Agung's tomb. This gate is made of brick. On the legs, there are geometric decorations. The Tumpal decoration on the Kori Supit Urang Gate has a flat square shape and rotation of 90°, 180°, 270° and 360° (clockwise and anti-clockwise). This object can be related to the perimeter and area of a square (Krisma & Nurjanah, 2023).

The indigenous knowledge implied by the Imogiri grave site is not only the art of turning mountains into burial complexes or making supporting buildings but also the concept of ethnomathematics (mathematics and culture) which can be seen from the shape of the building components. There is geometry or the science of geometric shapes (trapezium, rectangle, beam, square, truncated pyramid), number calculations (natural numbers, addition, multiplication, circumference, and area), and degrees of rotation.

Coconut Shell Mug

Another collection from the Radya Pustaka Museum is a coconut shell. According to Mr. T, it is from the Poh Jenggi coconut tree which is believed to be one of the trees that has health benefits. Even the shell was usually used as a drinking mug. Poh Jenggi coconut fruit is believed to be able to remove poison. Mr T added, apart from the various types, one of the general properties of coconut water which has been believed by Javanese people since ancient times is to counteract poison. The best benefits of coconut water are from green and young coconuts. Research by Rachmawati et al. (2018) also proves this efficacy. Coconut water can reduce toxic metals such as mercury (Hg) and cadmium (Cd).

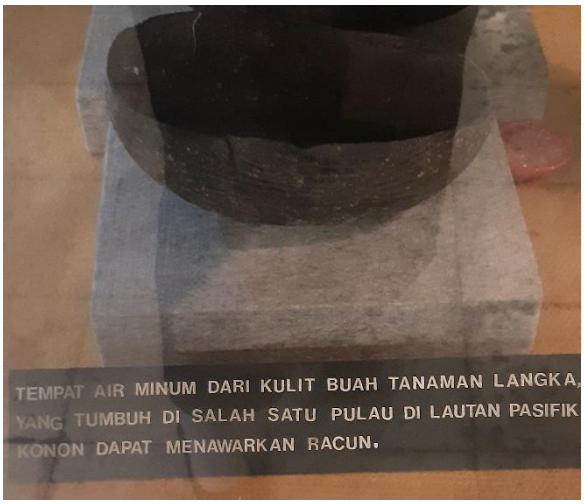

Figure 3. Poh Jenggi Coconut Shell
Source: Researcher's Personal Documentation (2022)

Traditional Cruise Ship

Rajamala is proof of Indonesian indigenous knowledge in making traditional wooden cruise ship. This ship, had 47 meters long and 6.5 meters wide, was built in 1820-1823 for use by the royal family to sail on the Bengawan Solo River. The boat design is considered luxurious, complete with gathering space, private rooms, toilets, and weapons storage. Several years later renovations were carried out so that the length became 68 meters to add the King and Queen's throne, the entertainment stage (dancing, playing music), musical instrument room, and servants' bedroom.

Figure 4. Miniature of the Rajamala ship
Image Source: Researcher's Personal Documentation (2022)

Traditional knowledge in making this ship can be seen from the details of the ship's structural components. Based on the information board near the Rajamala replica, even though the ship was made of wood, its structure was complex. Blabag, the name for a series of pieces of wood where the walls of the ship must be made tightly so that water did not enter. How to fasten the blabag with *ipung* wood pegs or *pung* wood. The ship craftsmen also paid attention to the drainage aspect for passenger comfort. Ship gutters (wideng)were made for water passage if the ship experiences leaks, especially due to rain. Water was channeled to the bow or stern so that it did not wet passengers in the cabin.

The wood used as pegs was *rimpung* wood. In the past, this wood grew a lot on the banks of rivers. The tree was a type of bush and had large thorns all over its branches. *Rimpung* wood was very hard, did not break easily, and the wood would bloom when wet (exposed to water). Thus it was the best choice for boat pegs because it will bloom and lock the planks.

Natural Paint

On the information board displayed on the museum wall, it is also written that at the time the boat was made, there was no paint factory. Colorings are made from natural plants and minerals. White was made from bone ash and yellow was from stone atal. The red color was made from a mixture of *sirih* (Piper Betle L), *gambir* (Uncaria Gambir Robx), and limestone. These ingredients are mixed with *gondarukem, latung oil* or petroleum to make natural paint. Santoso et al. (2022) explained that *gondorukem* is produced from the sap of pine trees (Pinus merkusii) which is tapped and distilled. *Gondorukem* is crystalline, clear yellow to dark yellow, and is used for making resin oil, varnishes, materials for making paint, wood polish, and as a mixture for *batik* wax.

Effendy et al. (2017) explained that teak leaf extract which contains carotenoids can be used as a natural dye in making wall paint. Teak leaf extract is boiled with 350 ml water until boiling and filtered. As an adhesive, a mixture of 75 grams of tapioca flour and quicklime is used with a composition ratio of (1:3, 1:1, 3:1). As a solvent, a mixture of aquades, PVAc glue, and white cement was used.

In Anisa's (2011) research, it was explained that *gambir* (Uncaria gambir Roxb.) can be used as a dye in making natural paint. The catechins and tannins contained in *gambir* are easily soluble in water, making it easier to make paint. These two substances will give a brownish-red color. According to Irianty & Yenti (2014), we can use the leaves and twigs of *gambir* (Uncaria gambir Roxb.) to produce sap. We then use this sap for textile dyes, kinang additives (chewing betel leaves mixed with limestone), medicinal herbs, leather tanners, and paint dyes.

The benefits of *gambir* (Uncaria Gambir Roxb) are also written in research by Erwin (2020) that Indonesian people have long used *gambir* as an ingredient for eating betel, raw materials for the pharmaceutical industry, leather tanners, dyestuffs for the textile industry, paint ingredients, vegetable pesticides, spices, and for traditional medicine (such as diarrhea and dysentery). Prabawa (2015) said that betel nut extract (Areca catechu L.) produces a natural soft pink color.

Based on this explanation, it can be understood that natural paint is made from gondarukem, latung oil, petroleum, tapioca flour, limestone, and natural dyes (teak leaf, bone ash, stone atal, Piper Betle L, Uncaria Gambir Robx, etc.).

Natural Glue

On the information board at the Radya Pustaka Museum, it is also written that our ancestors were able to make natural glue from gelatin (which is made from animal body parts). This product is called *acur* glue. This glue is useful for coloring shadow puppets, masks, and *keris* frames. The research of Mosleh et al. (2023) explained that animal glue can be made from cow bones, cow skin, rabbit skin, and fish glue. According to Sulistyanto et al. (2015), some fish bone waste can be used as an ingredient for making natural glue. Glue is an adhesive substance made from extracting fish skin and bones which contain collagen. Types of fish that can be used for glue are mackerel (Scomberomorus commerson), tuna (Euthynnus affinis), and cobia (Rachycentron canadum). Tuna fish bones are the best fish glue ingredients.

CONCLUSION

Indigenous knowledge represented in the collection at the Radya Pustaka Museum is how to make Javanese men's headgear (*blangkon*), turning tree bark into paper, using *lontar* leaves as a writing medium, casting copper as a writing medium, and turning metal into various weapons (*keris*, spear, sword). Another skill lies in the spirit of performing arts, namely the ability to make puppets (from animal skin and wood) and create a series of traditional orchestral musical instruments (*gamelan*). Javanese ancestors also mastered astrology with Javanese calculations (Pawukon). The people were also skilled in landscaping by turning hills into burial complexes. Other architectural skills include knowledge in assembling traditional yachts, making natural paint, making natural dyes, and natural glue. They also understand the health benefits of coconut water.

This research found that the indigenous knowledge behind gamelan is not only about how to make musical instruments and how to create notes, but there is also knowledge about mental health. Music produced from gamelan can calm the mind, facilitate concentration, and increase enthusiasm for living life. Another finding is the existence of ethnomathematics (mathematics and culture) implied by the Imogiri grave site. The results of this research can be a reference source for further research on local knowledge management in information institutions, especially museums, so that employees can service the information and knowledge behind the collections. The results of this research can be a source of inspiration for further research on indigenous knowledge management in information institutions, especially museums, so that employees can service the information and knowledge behind the collections.

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