# Presenting local cultural knowledge as a bridge to aid students' comprehension in identification and classification: the case of cassumunar ginger (*Zingiber purpureum*) and marsh fleabean (*Pluchea indica*)

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**Abstract**. Various researches have showed that people nowadays are not able to identify and classify plants – a problem that derived from the lack of motivation to learn it and the difficulties in understanding it. The objective of this study is to propose a solution to help students more motivated, learn better and easier in order to classify plants and identify it in real life situation. A Javanese manuscript called *Buku Jampi* could be a solution to this as teachers could introduce plants in local (Javanese) language and highlight the implementation of knowing these plants since the manuscript contain traditional medicine recipes. Although this research is still in its framework, several previous researches showed the positive trends in students' motivation and comprehension in identification, classification and their local culture as well.
**Keywords:** *identification and classification, indigenous framework, cultural heritage, local language*

## 1. Introduction

The subject of classification and identification taught in biology class during junior high and senior high school is actually aimed to make students comprehend the diversity of living things because basically every species has their own characteristics and traits. However, students are neglecting this specific topic and most of them even do not have the motivation to learn it as they do not understand the correlation of this material and their everyday life, as well as the uncomfortable learning environment and the monotonous ways of teaching [1], [2] even though this competence is useful for their life, notably in surviving skill when they are in the wilderness area. The lack of motivation made it more difficult for students to understand deeply about classification and identification of organisms, and plants in particular. Due to these problems, it is felt that there must be another stepping tool to aid students understand better. This is where authors came up with the idea of introducing Javanese cultural aspects as a stepping stone. It is believed that traditional aspect is closer in many aspects that formed an individual surrounded by their society, such as traditional language, meanings, pragmatic meaning and even the way of thinking.

This miscomprehension is veritably derived from the fact that students learn the classification and identification using the western system for classification, the cladogram (phylogenic tree). The cladogram method relies on the evolutionary relationships that each species has, which made it

complicated for students to learn [3]. In addition, students must understand the organisms' names in latin as well, which is not an easy language to be learnt nor to memorize. This research aims at introducing the Javanese cultural aspect in order to facilitate the students' learning phase in classification and identification. Authors believed that the Javanese method of classification and identification could bridge the nation's organisms and the western-type knowledge. Both the traditional method of classification and regional language to enrich students' plants vocabulary in local language are somewhat closer to Indonesian's culture and language, unlike the western systems. Elatedly, this could help students to better understand the classification and to be able to directly identify organisms.

The cladogram method is actually mentioned in the biology official syllabus for high school from the Ministry of Education and Cultural. As mentioned above, the method is particularly hard for students since they must recognize the revolutionary relationships between species. Nevertheless, authors Novick and Fuselier suggest adding the Gestalt principle of grouping (identify and group objects according to their similarity) when introducing the method of classification. The Gestalt principle is based on the visual perception of similarity or connectedness. In this case, teachers will provide a group of organisms which belong to the same genus, for example, and will divide it as the evolutionary tree goes down. This method is supported with pictures that students could, supposedly, perceive the information better and faster. In this case, student will continue their competence in identification only through pictures and could have other difficulties in identifying directly. To highlight the advantage of visual approach, there was also a research conducted in the United Kingdom that proved even the elderly learners had better memory in identifying plants when they were brought outside and learnt the use of plants [4]. In addition to this, the authors mentioned as well the importance of showing the relevance between the plants and the daily lives.

Stagg and Donkin has mentioned the importance of presenting subject materials as near as possible to its implementation in the daily life. One of the most significant studies conducted was from Rioux, *et al*. [5] who mentioned the clash between the Aborigine local knowledge and its culture and the western method of teaching classification in a remote area in Queensland, Australia. The authors then explained the steps in bridging these two ethnics and ameliorate the students' outcome in understanding the classification both in local and Western way. This article offered a new perspective and methodology in teaching classification by combining the traditional and western scientific knowledge. The study in Australia showed the similar trend in Indonesia, as the education system in both countries is heavily influenced by the western system, which, sometimes it cannot be applied directly with the biodiversity of the local ecosystem. This education system is nonetheless the effect of being colonized by several European countries. Rioux *et al* also highlighted the possibility of presenting some cultural aspect to the biology lessons in order to engage more students and to show the correlation between the biological theory and its application.

The traditional naming of plants is a result of past cultures inherited to the present, although the implementation is not as much as before. The Javanese way of giving this kind of naming is in accordance with the definition of culture according to Koentjaraningrat [6], namely as a system of ideas, actions and results of human work in the context of community life which belongs to human beings by learning. Thus, this study proposed to use plants' name in its traditional language. This study wants to prove that the traditional naming of plants is not just a matter giving a name, but it has meanings or background phenomena related to the name itself.

The traditional method of plant classification was apparently already used by the elderly generation in several regions of Central Java [7]. The method showed the process of classifying according to its physical characteristics, for example *pala gemantung* (pala= fruit, gemantung= hanging) or *pala kependem* (pala= fruit, kependem= buried in the soil). The classification used plants' name in their local language which could be the first thing to bridge the understanding differences between the local heritage and the western knowledge. Thus, it is possible that it could make the learning of name plants and the taxonomy easier for students. However, the methodology is merely traditional and does not correspond to the western standardization as it only covers the cultivated plant and not the whole plant kingdom. In addition to this, the article could not extend the terminology of each name of the

classification and its organisms. The terminology of name could describe the way of thinking according to our ancestors, as each lexicon contains its own heritage that could tell the cultural and local aspect so students may have a better understanding about their own domicile region.

This introductory research will be divided into two parts where each part will explore the previous research focusing at the refinement of methods in teaching classification and identification of plants. The first step is to discuss the methods that are currently being used in Indonesia's biology lesson. To do this, a qualitative approach became the option as authors are trying to examine and analyze the official syllabus of biology and various researches that have proposed other methods in enhancing students' performance in classification and identification. The second step is to provide a solution as a means to ameliorate the classification and identification of the biology's learning materials by illustrating a framework and its implementation. A Javanese manuscript will be observed to give examples on how this method could be applied in the classroom. By learning the name of the plants using regional language lexicons, it is elatedly that both students and teachers will find it easier to teach, to learn, and to do direct observation of these plants.

## 2. Research method

This study is conducted by exploring the local knowledge and heritage that are related to the materials of classification and identification in biology lesson using the cultural-ethnographic approach. Since the main difficulty for students is the identification and classification of the plant kingdom, the examination is limited in both materials mentioned. This research aimed to provide a framework of teaching method that could introduce the cultural and local heritage or knowledge during the biology lessons.

Before discussing the classification method, regarding the theory of reading and evaluating Javanese texts from manuscript as a 'work', Teeuw [8] suggests several important aspects. Concerning the reading process, texts must be understood as language codes, literary codes and cultural codes. Language codes are closely related to understand the use of grammar and language vocabulary; while literary codes are used to understand literary genres; and the cultural codes are affiliated to cultural backgrounds such as historical, religious, mythological, cosmological, philosophical texts etc. The Javanese texts used for this study were read by translating them into English first and not using translations from previous researchers who translated it in Indonesian. This was done because the absolute requirement to understand Javanese texts was the ability to read it as well as possible. In other words, the ability to read Javanese texts is the most important to be able in exploring the values contained therein.

The research started at the assessment of biology syllabus based on curriculum 2013 version 2016. Our assessment focused on the objectives of the classification and the methods proposed in the syllabus which are the phylogenic tree and CTL. The latter are being deeply observed in order to better understand its definition, use, principles, and steps. Several conducted studies regarding these methods are founded as well, showing its benefits and disadvantages – some of which have proposed other approach and method to help students learn the classification better and deeper.

To support our main idea that was to find a stepping tool in introducing Western-style knowledge, authors searched for manuscripts that discussed about plants, medicinal plants, its use and function as phytotherapy medicine. It has been mentioned that the key is to highlight the use or implementation of these plants so learners could apply the knowledge taught. The phytotherapy medicine is eventually not a new topic for Javanese society as it has been taught for generations through oral and written tradition. Javanese manuscripts have recorded the phytotherapy medicine since the 18$^{th}$ century, some of them are: *Boekoe Primbon Djampi Djawi, Serat Primbon Djawi, Pratelaning Jampi Warni-Warni, Serat Primbon saha Wirid, Serat Primbon* dan *Buku Jampi.* The latter manuscript, *Buku Jampi,* has been transliterated and translated by Alit in his undergraduate thesis [9]. Mulyani *et al* [10] have archived as well the other six manuscripts, as their intention was to gather Javanese manuscripts mentioning the phytotherapy. However, both Alit and Mulyani *et al* studies only provided the transliteration, translation and the descriptions of the manuscripts; even though the authors could prolong the research in order to introduce the history of medicinal plants and phytotherapy from the perspective of Javanese society in the 18$^{th}$ century.

In this study, two examples of the plants mentioned in the manuscript are taken in order to analyze its terminology and cultural aspects. The plants chosen are *bangle* (*Zingiber purpureum*) and *beluntas* (*Pluchea indica*) as these are the two plants most mentioned in all of the six manuscripts. With the data gathered, the application of teaching plant identification and classification will be demonstrated with the two-way pedagogy. Both *bangle* and *beluntas* will be described in its etymological term, the history, and their use as a medicinal plant mentioned in the manuscript. The objective is to introduce the local knowledge and heritage to students, and to implement the use of local language through biological lexicon.

## 3. Results and Discussion

This part will be conducted into two subsections: the reflection of methodologies and the demonstration using the two-way pedagogy.

### *3.1. Reflection on The Methodologies of Learning Biology Classification*

Cladogram is one of the most used methods in teaching classification. The method relies on the evolutionary process of the taxa, selecting and separating each species when analyzing and identifying it into a smaller group of taxa. Evolution is the key to understand this process. However, it is difficult for students as they had to process the evolutionary process through the recent images of the organisms. From the perspective of perceptual and cognitive psychology, the Gestalt principal is highly suggested to enhance the students' perception in the basic knowledge of the evolution of the organisms [11]. Visual perception is the key to introduce the grouping of the organisms. For example, cats and lions could be grouped in the same box as they belong to the same taxa, and the other box could be filled with lizards and turtles. As the analysis goes further, teachers will guide the students to observe its differences and similarities so it could be linked with other species or taxa. Teachers could also make this approach as a game in order to reduce the tension in the classroom [12].

One of the ways to make students better understand and comprehend the materials is to pay attention with the language used in the classroom. Indonesia has a high cultural-diversity that involves thousands of regional languages which many of them are facing the danger of extinction as the native speakers are now limited to only the elder generation. Most of the younger generations do not have the willingness to preserve nor to learn these languages, as they are preparing themselves for the globalization by strengthening their knowledge and competence in foreign languages. However, biology could be an aid to preserve regional languages by introducing students the plants' names in local language, in Indonesian, and in Latin.

A research conducted by Rioux *et al* [13] demonstrate the conflation of two-way pedagogy and Indigenist Research Framework (IRF). The latter serves to give three key principle with the objective to remove power barriers between actor involved, which are: (1) resistance as the emancipatory imperative, the research attempts to support personal, community, cultural and political struggle of the indigenous people; (2) privileging indigenous voice, the study must focus on the historical experiences, ideas, tradition, and aspiration of the local community; (3) political integrity, the actors must set the political agenda for the sake of the local community [14]. From the two-way pedagogy, Rioux suggested that teachers could make a course and material planning by including the input from the local community: name of the organisms to be observed, its traditional classification, and the cultural aspect that surround this organism. Once the local aspects and knowledge has been introduced to students, only then teachers could introduce the Western ideas and methods of classification, name of the organisms and its evolution.

Another approach suggested that is worth to mention is the constructivism. According to Hakim *et al* [15], it could be emphasized as the students will be encouraged to develop their own idea in order to construct their own new knowledge and skills. Nonetheless, how exactly could the teachers create and nurture this environment if students cannot be curious with their surroundings? An OPAL (Open Air Laboratories) could be the answer to this [16]. As students were previously given basic knowledge about the description of the plants by pictorial game (associating names with pictures printed on cards), they

will be sent outside to a 'laboratory' to make direct observations. This laboratory could be anywhere as long as it has terrain and contain different plants. The research is conducted in the United Kingdom with adults and resulted in better identification and understanding of plants.

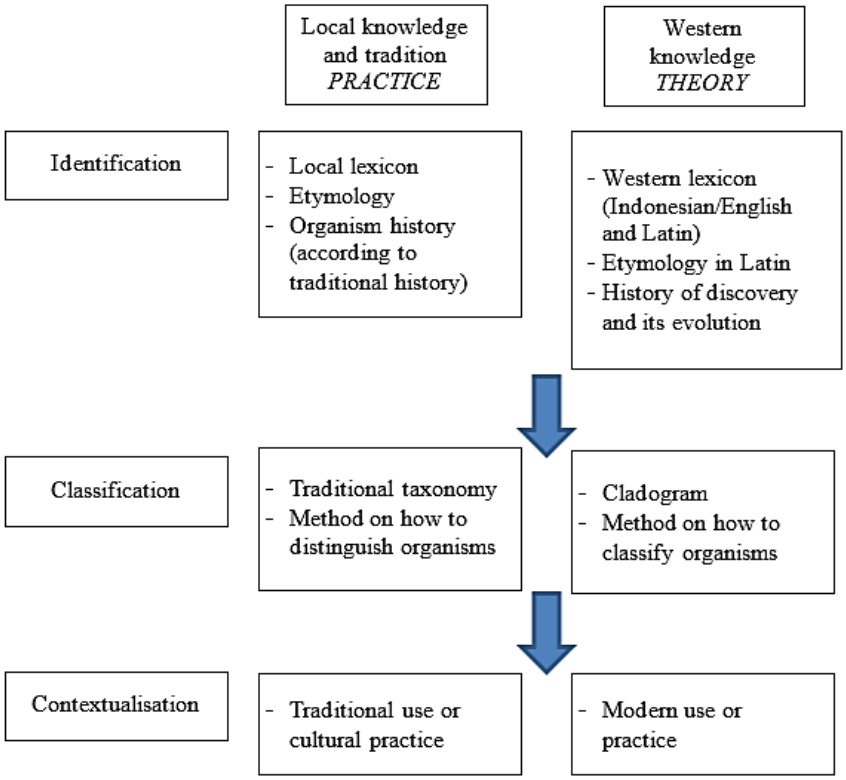


**Figure 1**. Example of implementing two-way pedagogy and IRT for biological identification and classification purposes. Source: The diagram is modified from the ones provided by Rioux *et al* https://eprints.qut.edu.au/119469/7/119469a.pdf [17]

*3.2. The Demonstration of Implying Two-Way Pedagogy: Cassumunar ginger and Marsh fleaban*
In this subsection we will first describe the etymological terms and the history of the two plants, as well as their use mentioned in the manuscript. We will try to implement the framework of two-way pedagogy using the plant.

*3.2.1. Cassumunar Ginger (Bangle).* As a plant, cassumunar ginger has long been known as a medicinal plant in Indonesia, particularly in Java. It referred as *Zingiber purpureum Rosx.* or *Zingiber cassumunar Roxb*. It is also named as benglé in Javanese [18]. Morphologically, it grows upright with a height ranging from 1 to 1.5 m, has pseudo trunk, and consists of leaf fronds at the edges with the hair like a brush [19]. In the Javanese manuscripts mentioned above, it was found that cassumunar ginger having mixed with other plants, could function as a traditional medicine for several diseases, such as bruises, skin diseases, cholera, unable to urinate and defecate, deaf, worm infestation etc. Etymologically, the word benglé or banglé is derivated from two Old Javanese words, namely bang and lé. Bang in Old Javanese word means 'red' [20], while lé probably comes from lahi or rahi which means 'head, highest point' [21]. The letter l and r in Javanese language, both written and oral, are often interchangeable, because they have phonetic similarities. This traditional identification is in accordance with the morphology of cassumunar ginger whose leaves petal are in red colour.

The *Serat Primbon*, a manuscript from Sanabudaya Museum of Yogyakarta, with code PR 81/PBE 35, mentions one of the uses of the cassumunar ginger, that is a remedy for cholera. The following is the recipe written in this manuscript:

> *Jorahab, lempuyang sairis, sunthi sairis, dringo,* ***benglé*** *kang akèh, sintok, masoyi, klembak, jinten ireng, cabé siji, bawang sabungkul, brambang sabungkul, adas pulasari, manis jangan, mrica, malam putih, kunir, murda sari, katumbar, mungsi, kapipis uyupna* [22].
>
> Translation:
> *Jorahab* (unknown), a slice of *lempuyang* (*Zingiber zerumbet*), a slice of *sunti* ginger (*Zingiber officinale*), sweet flag (*Acorus calamus*), a lot of **cassumunar ginger** (*Zingiber cassumunar*), sintok (*Persea sintoc*), massoy (*Cryptocarya massoy*), medicinal rhubarb (*Rheum spp.*), black caraway (*Nigella sativa*), one Javanese long pepper (*Piper retrofractum*), one garlic (*Allium schoenoprasum*), one shallot (*Allium cepa*), fennel (*Foeniculum vulgare*), maile (*Alyxia stellata*), common liquorice (*Glycyrrhiza glabra*), black pepper (*Piper nigrum*), day jasmine (*Cestrum spp.*), curcuma (*Curcuma longa*), *murdasari* (?), cellender (*Coriandrum sativum*), stinking sharewort (*Eryngium foetidum*), are pounded and then drunk.

In accordance with the figure 1 above, we will try to demonstrate how exactly *benglé* could be identified using the two-way pedagogy framework. We have started with the traditional lexicon (*benglé, banglé*), and its etymology (red, highest point). The etymology description matches to the physical description of the plant itself, as the result, student could relate the name with the physical description. The latter will also be used as the identification during direct observation, thus students (hopefully) now have the competence to identify the *benglé* in real-life events. The description of the plant serves as the method of traditional classification, as mentioned by Tjitrosoepomo [23].

Other lexicon from different languages such as in English (*Cassumunar ginger*) and in Latin (*Zingiber purpureum Rosx.* or *Zingiber cassumunar Roxb*) will be introduced as well so that students now could have another perspective from the Western knowledge. In this part, teachers could also present the etymology terms in Latin and their evolution history so students could make Western-type classification.

The last section is the part where these theories will be contextualized for the use of daily life. Taken from the example above, *benglé* functions as one of the ingredients to cure cholera. Experimenting this traditional prescription could be one of the ways to implement the use of the plants. In addition to this, it should be noted that the manuscripts did not mention the dosage of each plants used, thus this could be a chance to create a scientific experiment in order to determine the used dosage.

*3.2.2. Marsh fleaban (Beluntas)*. Marsh fleabean mentionned here is *Pluchea indica* (L.) Less or in Javanese, people call it *beluntas*. This plant is morphologically shaped upright shrub with a height of 1.5–3 m, having many branches and trunked round logs [24]. In the Javanese manuscripts mentioned above, there is an information that marsh fleaben mixed with the other plants, could function as antidote of black magic effect. Nowadays, it is useful for treating various diseases such as high blood pressure, cholesterol, irregular menstruation, eliminating body odor, fever, rheumatism and vaginal discharge [24]. Etimologically, the word *beluntas* is derived from two Old Javanese word, that is welu and *entas*. The word welu means ‘pale’ [25], while entas is ‘free’ [26]. This traditional naming relates to its color leaves which are pale green and its growth which is ‘free’, meaning that it can be planted anywhere.

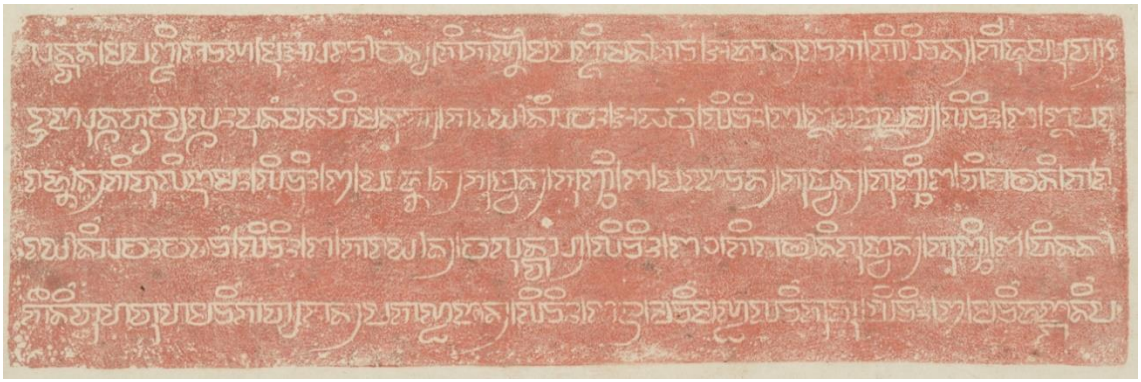

**Figure 2.** The Bendosari inscription from Majapahit Era, dated in 1360 AD. Source: https://socrates.leidenuniv.nl.

This plant has a special position in its history, because this plant was once mentioned in a Majapahit coper plate inscription which was a judge's decision. The inscription mentioned is Bendosari inscription whose datation is 1360 AD, being founded in Bendosari hamlet, Jambu village, Trenggalek in 1896 AD [27]. In the text of plate 4b, the 4th line has been transliterated as follows [28]:

*...[Ka]yoning sawah warèng, lirih, 1, kayon* ***waluntas****, lirih, 10…*

Translation:
…there is 1 *lirih* (particular size of amount) of *wareng* (?) plant in fields, and also 10 *lirih* **marsh fleabean** …

The citation above shows one of the judge's decisions about the size of certain fields and plantations determined for the officials in dispute. It is said that some portion (10 lirih) of the fields is planted by marsh fleabean. It shows that marsh fleabean had been cultivated by Javanese people since the Majapahit era –or maybe older– and had an important position in the development of our culture. Therefore, it is not surprising if in the later Javanese manuscript, marsh fleabean is believed to be one of the plants that can ward off witchcraft. As an information, here is one of the texts in the *Serat Primbon Jawi* manuscript with code PR 54 (SK 118) from Sanabudaya Museum, Yogyakarta, as one of the plants to ward off black magic effect:

*tuju manèh: klapa, ron cukilan, ron landed, ron gondarasa, ron jrampesel, ron cabé, ron* ***luntas****, lampes sembukan, empon-empon sathithik, sawang, temu lawak, temu giring, lempuyang, kunci, brambang, uyah, kriad, kayu kang ginawé lawang sapruntu, ketumbar, mungsi, janur klapa, dringo, benglé, arenging wulu landhak, kriad gandhen, pinipisa semburna ing papaès, turahané semburna ing cecengel* [29].

Translation:
Still being affected by black magic: coconut palm (*Cocos nucifera*) and its leaf, *landed* (?) leaf, *gondarusa* (*Gendarussa vulgaris*) leaf, sour orange (*Citrus aurantifolia*) leaf, Javanese long pepper (*Piper retrofractum*) leaf, **marsh fleabean** (*Pluchea indica*) leaf, holy bassil (*Ocimun tenuiflorum*) and *sembukan* (*Paederia foetida*). Spices: palm lily (*Cordyline fructicosa*), *temu lawak* (*Curcuma xanthorrhiza*), *temu giring* (*Curcuma heyneana*), *lempuyang* (*Zingiber zerumbet*), Chinesse ginger (*Boesenbergia rotunda*), shallot (*Allium cepa*), salt, any wood, wooden dorr, cellender (*Coriandrum sativum*), stinking sharewort

(*Eryngium foetidum*), vetiver (*Vetiveria zizanioides*), sweet flag (*Acorus calamus*), cassumunar ginger (*Zingiber cassumunar*), charcoal from porcupine feathers, wooden hammer. They are mashed and then sprayed on the forehead, and the rest is sprayed on the shoulders.

## 4. Conclusion

This introductory paper tries to propose a solution for different objectives and difficulties in two subjects at the same time. The Indigenist Research Framework (IRF) and two-way pedagogy was already implemented in Australia which showed a significant and positive trend towards the students' understanding and comprehension in classification and identification. Regarding Australia and Indonesia's similar history in being colonized by Western countries that affected on the perspective of local knowledge and heritage, authors are optimist that this framework and approach could have the same benefit if applied in Indonesia, where each region and province could use their own local language and knowledge. This way, teachers could find means to implement the local language use whilst introducing the cultural aspect for the students. For students, they could learn about their local heritage and give them the pride of being a part of the community. Nonetheless, this research is still limited as it only explores a small part of plant kingdom and could only be implemented in the plant and animal kingdom.

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