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The Local Wisdom of Mathematical Language of Malay Community of Pangkalpinang: An Ethnographic Study

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Abstrak

Pangkalpinang merupakan Ibu Kota Provinsi Kepulauan Bangka Belitung yang ditempati oleh sebagian besar orang melayu dengan budayanya yang kaya. Terdapat beberapa budaya masyarakat Pangkalpinang yang berhubungan erat dengan konteks pembelajaran matematika. Tetapi, belum banyak pendidik di Pangkalpinang yang menerapkan budaya tersebut dalam pembelajaran matematika. Padahal budaya yang ada dapat dijadikan *starting point* (titik awal) dalam pembelajaran matematika. Sehingga tujuan penelitian ini untuk Mengeksplorasi Kearifan Lokal Bahasa Bilangan Matematis Masyarakat Melayu Pangkalpinang yang dapat digunakan sebagai titik awal (*starting point*) dalam pembelajaran matematika. Penelitian ini menggunakan metode eksploratif dengan pendekatan etnografi yang bersumber dari studi pustaka, observasi lapangan, dan wawancara dengan narasumber sesepuh atau pemangku adat yang tinggal didaerah tempat penelitian. Data dianalisis melalui reduksi data, penyajian data dan menarik kesimpulan. Tahapan penelitian diawali dengan pengamatan awal tentang konteks budaya masyarakat yang dijadikan titik awal pembelajaran, selanjutnya menentukan tema penelitian yang mengeksplor budaya bahasa melayu masyarakat Pangkalpinang berkaitan dengan ethnomathematics, dilanjutkan dengan menentukan sumber data, pengumpulan data, hasil data yang didapatkan dianalisis, dan terakhir penyusunan draf laporan dan refleksi. Hasil penelitian menunjukan bahwa terdapat bahasa bilangan matematis yang digunakan oleh masyarakat Pangkalpinang dan hal itu dapat menjadi titik awal dalam pembelajaran matematika. Bahasa bilangan tersebut meliputi bilangan satuan,belasan, puluhan, dua puluhan, ratusan, ribuan, puluh ribuan, ratus ribuan, jutaan, dan juga menghasilkan bilangan pecahan dan jumlah tak tentu.
Kata kunci: Bahasa Matematis; Bilangan; Etnografi; Pecahan.

Abstract

Pangkalpinang is the capital of Bangka Belitung Province by occupied most malay people with a rich culture. There are a number of cultures Pangkalpinang public relates to context learning mathematics. However, not many of the teachers in Pangkalpinang apply culture in learning mathematics. Whereas culture can be a starting point in learning mathematics. So the aim of the research for explore local wisdom quantity mathematics language public malay Pangkalpinang which can used starting point in learning mathematics. The research used an exploration method with an approach of ethnography sourced from a literature review, field observation, and interviews with elders or the public who live in the area research place. Analysis of data through reduction data, presentation data, and concluding. The stages of research with a beginning observation about the context of public culture who made starting point learning. The next is the research theme which explores the language culture malay Pangkalpinang public with related ethnomathematics, the next determine data source, data collection, analysis data, and drafting report and reflection. The result of the research shows that there is a quantity of language mathematics used by the Pangkalpinag public, and that matter can become a starting point in learning mathematics. Quantity language covers units, tens, twenties, hundreds, thousands, tens

of thousands, hundreds of thousands, and millions, and also produces fractional numbers and indefinite numbers.
Keyword: Language Mahematics, Fractions, Ethnography, Quantity.

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INTRODUCTION

Humans and culture are inextricably linked in daily life, and mathematics and culture are closely related since students must solve contextual problems in mathematics that take into account their surroundings and culture (Mulyani & Natalliasari, 2020; Latifah & Afriansyah, 2021). Thus, mathematical concepts have the potential to convey cultural messages to students.

The culture of a certain community is a complete and all-encompassing entity (Rachmawati, 2012). The way of life in a society is greatly influenced by culture. Besides, learning can occur through culture (Prasetiani, 2016). But in practise, students' experiences learning mathematics in school are frequently disconnected from culture (Nurhasanah et al., 2017). As a result, it is necessary to investigate cultural values in mathematics education.

Ethnomathematics, the study of mathematics based on culture, was first introduced in 1985 by D'Ambrosio, a Brazilian mathematician (Puspadewi & Putra, 2014). In short, the study of mathematics by integrating cultural values is known as ethnomathematics (Putri, 2017; Sirate, 2015). So that mathematics can be practised among community cultures in all fields including the language culture of the surrounding community.

Hoffert (2009) defines mathematics as a universal language. However, understanding the language of mathematics remains difficult for students since it is constrained by the language commonly used by students (Prahmana, 2020). Their language can be used to define a mathematical concept (Risdiyanti & Prahmana, 2018). Consequently, the use of language frequently utilised by students in mathematics learning has a positive influence on students' understanding of mathematical concepts.

Several researchers have studied the exploration of community culture related to local language culture with mathematical values that can be used as a starting point for learning mathematics. For instance, (Prahmana, 2020) investigated the Yogyakarta populace mathematical language culture in the mention of whole numbers, fractions, indeterminate numbers, length or width, area, height, volume, indeterminate units, mention of angles, and time descriptions. Furthermore, (Muhtadi et al., 2021) investigated the time of day and night according to Sundanese tradition, and their findings can be used as a reference point in mathematics learning. Meanwhile, (Hendrawati et al., 2019) investigated Ethnomathematics:

Numeracy Literacy Based on Language in the Kowai Tribe member of Kaimana Regency, obtaining numeracy literacy of the Koiwai group in the basic number subjects of units and tens.

Meanwhile, (Nuh & Dardiri, 2016) investigated ethnomathematics in the numbering system in the Malay community of Riau, with the findings examining the mention of numbers in the classical Malay language, the Indragiri Hilir Malay language, and the mention of numbers in the Malay language in several Riau cities/districts. This demonstrates how cultural values, particularly the language of the surrounding community, may qualify as applied as a foundation for learning mathematics. However, few researchers have investigated the local wisdom of the Pangkalpinang language culture as a starting point for learning mathematics. In fact, Pangkalpinang has a rich language culture, and the community still values these cultural values. Therefore, this research aims to comprehensively examine the Local Wisdom of Mathematical Language of Pangkalpinang Malay Community which is employed as a beginning point in mathematics learning.

Ethnomathematics, the etymological use of three Greek roots, namely ethno which refers to a natural group or socioculture, mathema which refers to explaining and learning and thic which refers to ways, arts and techniques (D'Ambrosio, 2016). Thus, Ethnomathematics is interpreted as a socioculture or group members in explaining and learning a way, art and technique of mathematics in their respective cultural groups.

Ethnomathematics may assist teachers and students to comprehend mathematics in the context of ideas, ways and practices applied in the context of daily life, which in turn will encourage the understanding of academic mathematics at school (Risdiyanti & Prahmana, 2018). So that learning mathematics at school should integrate the cultural values of the surrounding community. Since in everyday life one cannot be separated from the culture inherent in society. Therefore, it is time for us to realise that in fact, mathematics is inseparable from culture (Muzakkir, 2021).

It has been a popular discussion that ethnomathematics is suitable for application in the mathematics learning curriculum, so many researchers have explored ethnomathematics in various cultures of local communities. Among them are Exploration of Sidoarjo Community Ethnomathematics (Rakhmawati, 2016). The results of its exploration can be the referrals for compiling contextual mathematical problem solving questions. The Exploration of Ethnomathematics in the culture of the Dayak community on the Indonesia-Malaysia border of Sanggau Regency, West Kalimantan, which can be implemented in mathematical concepts (geometry) (Hartoyo, 2012); Toraja Ethnomathematics: Geometric Exploration of Toraja

Culture (Trandililing, 2015), where the exploration shows that the most common geometry concept and almost found in all Toraja carvings is triangle. Ethnomathematics in the numbering system in the Malay community of Riau (Nuh & Dardiri, 2016) which can be implemented in the numbering system; Ethnomathematics: application of quadrilateral flat shapes in the Muaro Jambi temple (Hardiarti, 2017), can be implemented in the concept of quadrilateral flat shapes. This shows that Indonesia has a variety of cultures that can be embedded in mathematics learning because they have mathematical elements. Therefore, Pangkalpinang needs more exploration of its cultural elements to find its mathematical ideas.

Pangkalpinang is the capital city of Bangka Belitung Province which has a variety of cultures, one of which is Malay language culture to be explored into a special mathematical language that can be disclosed in finding mathematical elements. This mathematical language is often also used in the daily activities of the community in buying and selling, social, work, and so on. Bangka Belitung Malay language consists of five dialects, namely (1) Ranggi Asam dialect spoken in Ranggi Asam Village, Jebus District, West Bangka Regency; (2) Tua Tunu dialect spoken in Tuatunu Village, Gerunggang District, Pangkalpinang City; (3) Jeriji dialect spoken in Jeriji Village, Toboali Sub-district, South Bangka Regency; (4) Tempilang dialect spoken in Tempilang Village, Tempilang Sub-district, West Bangka Regency; and (5) Mayang dialect spoken in Kelapa Kampit Sub-district, East Belitung Regency (Kantor Bahasa Kepulauan Bangka Belitung, 2018). However, only the dialect spoken in Tua Tunu Village was used in this study. The location was chosen based on the dialect language that the community still uses in everyday life.

Despite, a number of researchers have documented the exploration of Bangka Belitung culture that has mathematical values. Some of them are (Nurdiani et al., 2020) who investigated the concept of ethnomathematics geometry in the traditional Bangka Belitung game caklingking. Ethnomathematic exploration of serving hoods as Bangka Belitung icons (Pririzki et al., 2020). Also, according to Bishop, there is an ethnomathematics study and analysis of fundamental mathematical activities within the Bangka Belitung cual cloth industry (Gunawan, 2019). There is even research on Belitung culture (Alghadari, 2017), which raises the nirok-nanggok tradition of the Belitung people: history and mathematical rules (Verlia et al., 2020).

However, no academics have investigated the language culture of the people of Bangka Belitung to discover the values of mathematical elements used as starting points in mathematics learning. Indeed, the language culture of the people of Bangka Belitung is one of the interesting cultures to explore because of the diversity of its people with diverse language

dialects, such as the special mathematical language for mentioning numbers, such as 1) single point, 2) fractional numbers, 3) indeterminate number. Therefore, more research is required to identify mathematical elements in the language culture of the people of Bangka Belitung.

METHOD

This study employs a qualitative research design with ethnographic methods. The ethnographic method is used in ethnomathematics research to understand a view of life from an indigenous perspective or members of a culture, their relationship to life, and their view of the world (Risdiyanti & Prahmana, 2018). Since ethnomathematics research examines the relationship of a particular culture to mathematical concepts in that culture, this method has become successful. Furthermore, (Koentjaraningrat, 2009) explains that in the ethnographic method, there are main descriptions that ethnographers will produce, which are based on seven elements, one of which is language. Thus, this study employs the ethnographic method by describing the study of mathematical objects in Bangka Belitung language elements. The research flow is presented in Figure 1.

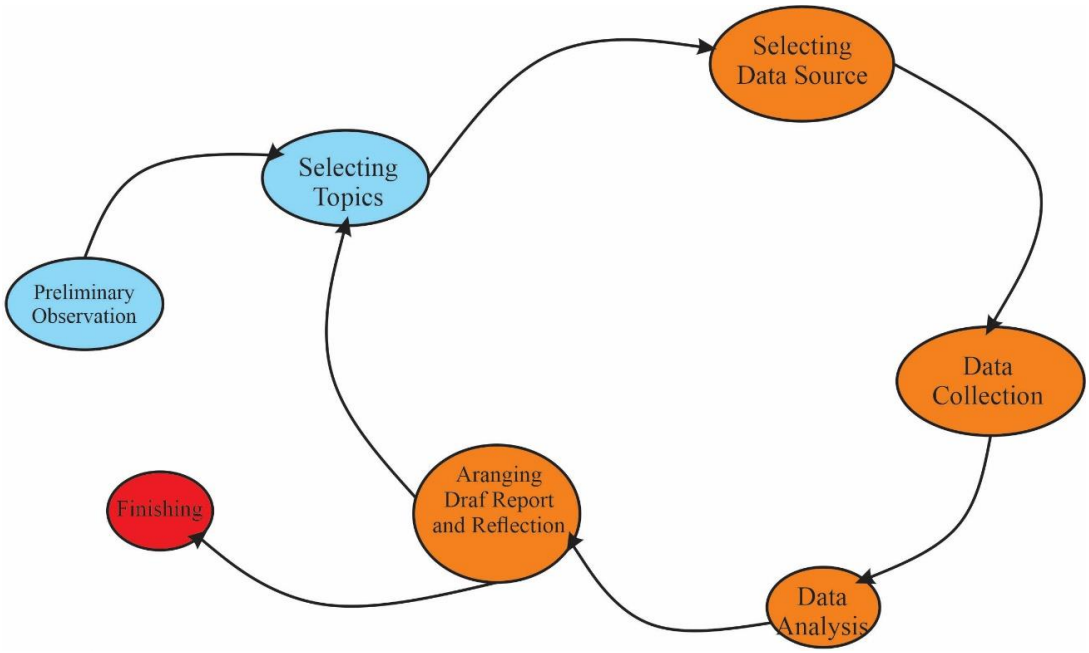

Figure 1. Steps by Research

The research flow is detailed below.

1. Initial Observation

This preliminary observation was carried out by conducting a literature review on the relationship between the cultural context of the Pangkalpinang community in Bangka Belitung Province, which can be used as a starting point for mathematics learning. The

observations generated a research topic related to the exploration of the local wisdom of the mathematical language of the Malay community of Pangkalpinang.

2. Determining the Theme

The results of the observation revealed that mathematical language local wisdom of the Malay community of Pangkalpinang can be explored in mathematics learning as a starting point in learning.

3. Determining the Data Source

Interviews with elders or customary leaders who live in the research area have been consulted as a data source. The interviews aimed to discuss and clarify the language dialects discovered through documentation from the literature study and field observations. Furthermore, documentation was obtained through a review of several books, journal articles, and relevant sources related to the Tua Tunu community's language in Gerunggang Sub-district, Pangkalpinang City. At this stage, interview sheets, observation sheets, and research literature emerged.

4. Data Collection

Data collection was in accordance with the research focus on the specific mathematical language used by the Pangkalpinang Malay community, namely the Tua Tunu dialect spoken in Tuatunu Village, Gerunggang District, Pangkalpinang City. The selection of the site was based on the dialect of the Pangkalpinang Malay language. Documentation, field observations, and interviews were used as data collection techniques. Besides, field observations were conducted to collect information about the community's mathematical language. In addition, documentation is obtained through a review of a number of books, journal articles, and relevant sources related to community language with mathematical elements. One of the elders or customary leaders in Tua Tunu Village who understands the Tua Tunu dialect was interviewed for this study. The elder is liable for clarifying and defining the terms discovered during the literature review and field observations.

5. Data Analyzing

Data analysis was based on the qualitative approach developed by Creswell (2015). Data analysis was carried out by continuous reflection on the data, asking analytical questions and writing important notes during the research. The steps of data analysis in this study are 1) transcribing the collected data; 2) reviewing the available data, such as the review of

observation data, documentation, and interview transcripts; 3) data reduction is conducted by selecting, adding, focusing, and classifying similar data regarding mathematical language analysis; 5) describing in detail about mathematical language according to language dialects; 6) analysing other interesting things; and 7) drawing conclusions.

6. Draft Reporting and Reflecting

The draught report is compiled in accordance with the data obtained and reflects on the research that has been conducted. If there are data/topics that have not been researched or that are interesting to be studied again, the research theme will be re-determined while remaining focused on the research that has been established. The research is finished when it is determined that sufficient research findings have been obtained.

RESULTS AND DISCUSSION

The findings in this study resulted in the mathematical language of the Pangkalpinang Malay community. The language explored in this research is the language of the community in Tua Tunu which is based on the dialect language that is still often used by the community in everyday life. The mention of numbers in Tua Tunu community is divided into several classifications, namely the mention of single numbers and compound numbers. Furthermore, the Tua Tunu community uses a number of special terms in mentioning compound main numbers which are divided into unit numbers, dozens numbers, tens numbers, twenties numbers, hundreds numbers, thousands numbers, tens numbers, thousands numbers, hundreds numbers, fractions numbers, and indeterminate numbers. The description of the mathematical language of the Tua Tunu community in mentioning these numbers is as follows:

1. ***Bilangan Satau-Satau*** **(Basic Numbers)**
   a. ***Satau***, this term is used to refer to the number one.
   b. ***Dui***, this term is used to refer to the number two.
   c. ***Tigei,*** this term is used to refer to the number three.
   d. ***Empat***, this term is used to refer to the number four.
   e. ***Lima***, this term is used to refer to the number five.
   f. ***Enem***, this term is used to refer to the number six.
   g. ***Tujeuh***, this term is used to refer to the number seven.
   h. ***Lapen,*** this term is used to refer to the number eight.
   i. ***Sembilen***, this term is used to refer to the number nine.
   j. ***Sepuloh***, this term is used to refer to the number ten.
2. ***Bilangan Beles-Beles*** **(Dozens Numbers)**
   a. ***Sebeles***, this term is used to refer to the number eleven.
   b. ***Dui beles***, this term is used to refer to the number twelve.
   c. ***Tigei beles***, this term is used to refer to the number thirteen
   d. ***Empat beles***, this term is used to refer to the number fourteen.

e. ***Lima beles***, this term is used to refer to the number fifteen.
f. ***Enem beles***, this term is used to refer to the number sixteen.
g. ***Tujeuh beles***, this term is used to refer to the number seventeen.
h. ***Lapen beles***, this term is used to refer to the number eighteen.
i. ***Sembilen beles***, this term is used to refer to the number nineteen.

3. *Bilangan Puloh-Puloh* (Tens Numbers)
a. ***Sepuloh***, this term is used to refer to the number ten.
b. ***Dui puloh***, this term is used to refer to the number twenty.
c. ***Tigei puloh***, this term is used to refer to the number thirty.
d. ***Empat puloh***, this term is used to refer to the number fourty.
e. ***Lima Puloh***, this term is used to refer to the number fivety.
f. ***Enem Puloh,*** this term is used to refer to the number sixty.
g. ***Tujeuh Puloh***, this term is used to refer to the number seventy.
h. ***Lapen Puloh***, this term is used to refer to the number eighty.
i. ***Sembilen Puloh***, this term is used to refer to the number ninety.

4. *Bilangan Dui Puloh Lebaih* (Twenty Numbers)
a. ***Dui Puloh Satau***, this term is used to refer to the number twenty one.
b. ***Dui Puloh Dui***, this term is used to refer to the number twenty two.
c. ***Dui Puloh Tigei,*** this term is used to refer to the number twenty three.
d. ***Dui Puloh Empat***, this term is used to refer to the number twenty four.
e. ***Dui Puloh Lima***, this term is used to refer to the number twenty five.
f. **Dui Puloh Enem**, this term is used to refer to the number twenty six.
g. ***Dui Puloh Tujeuh***, this term is used to refer to the number twenty seven.
h. ***Dui Puloh Lapen***, this term is used to refer to the number twenty eight.
i. ***Dui Puloh Sembilen***, this term is used to refer to the number twenty nine.

5. *Bilangan Ratos-Ratos* (Hundreds Numbers)
a. ***Seratos***, this term is used to refer to the number one hundred.
b. ***Dui ratos***, this term is used to refer to the number two hundred.
c. ***Tigei ratos,*** this term is used to refer to the number three hundred.
d. ***Empat ratos***, this term is used to refer to the number four hundred.
e. ***Lima ratos***, this term is used to refer to the number five hundred.
f. ***Enem ratos***, this term is used to refer to the number six hundred.
g. ***Tujeuh ratos***, this term is used to refer to the number seven hundred.
h. ***Lapen ratos***, this term is used to refer to the number eight hundred.
i. ***Sembilen ratos***, this term is used to refer to the number nine hundred.

6. *Bilangan Ribau-Ribau* (Thousands Numbers)
a. ***Seribeu***, this term is used to refer to the number one thousand.
b. ***Dui ribeu***, this term is used to refer to the number two thousand.
c. ***Tigei ribeu***, this term is used to refer to the number three thousand.
d. ***Empat ribeu***, this term is used to refer to the number four thousand.
e. ***Lima ribeu***, this term is used to refer to the number five thousand.
f. ***Enem ribeu***, this term is used to refer to the number six thousand.
g. ***Tujeuh ribeu***, this term is used to refer to the number seven thousand.
h. ***Lapen ribeu***, this term is used to refer to the number n eight thousand.
i. ***Sembilen ribeu***, this term is used to refer to the number nine thousand.

7. *Bilangan Bepuloh-Puloh Ribeu (*Tens of Thousands Number)
a. ***Sepuloh Ribeu***, this term is used to refer to the number ten thousand.
b. ***Dui Puloh Ribeu***, this term is used to refer to the number twenty thousand ribu.

c. ***Tigei Puloh Ribeu***, this term is used to refer to the number tiga puluh ribu.
d. ***Empat Puloh Ribeu***, this term is used to refer to the number empat puluh ribu.
e. ***Lima Puloh Ribeu,*** this term is used to refer to the number lima puluh ribu.
f. ***Enem Puloh Ribeu***, this term is used to refer to the number enam puluh ribu.
g. ***Tujeuh Puloh Ribeu,*** this term is used to refer to the number tujuh puluh ribu.
h. ***Lapen Puloh Ribeu,*** this term is used to refer to the number delapan puluh ribu.
i. ***Sembilen Puloh Ribeu***, this term is used to refer to the number sembilan puluh ribu.

8. ***Bilangan Ratos-Ratos Ribeu*** **(Hundreds of Thousands Number)**
a. ***Seratos Ribeu***, this term is used to refer to the number one hundred thousand.
b. ***Dui Ratos Ribeu***, this term is used to refer to the number two hundred thousand.
c. ***Tigei Ratos Ribeu***, this term is used to refer to the number three hundred thousand.
d. ***Empat Ratos Ribeu,*** this term is used to refer to the number four hundred thousand.
e. ***Lima Ratos Ribeu***, this term is used to refer to the number five hundred thousand.
f. ***Enem Ratos Ribeu***, this term is used to refer to the number six hundred thousand.
g. ***Tujeuh Ratos Ribeu,*** this term is used to refer to the number seven hundred thousand.
h. ***Lapen Ratos Ribeu***, this term is used to refer to the number eight hundred thousand.
i. ***Sembilen Ratos Ribeu***, this term is used to refer to the number nine hundred thousand.

9. ***Bilangan Bejute-Jute*** **(Millions Numbers)**
a. ***Sejute,*** this term is used to refer to the number one million.
b. ***Dui jute***, this term is used to refer to the number two million.
c. ***Tigei jute***, this term is used to refer to the number three million.
d. ***Empat jute***, this term is used to refer to the number four million.
e. ***Lima jute***, this term is used to refer to the number five million.
f. ***Enem jute***, this term is used to refer to the number six million.
g. ***Tujeuh jute***, this term is used to refer to the number seven million.
h. ***Lapen jute***, this term is used to refer to the number eight million.
i. ***Sembilen jute***, this term is used to refer to the number nine million

10. ***Bilangan Per-Per*** **(Fraction Numbers)**
a. ***Satau Per Dui***, The number one is divided by two.
b. ***Dui Per Tigei***, The number two is divided by three
c. ***Tigei Per Empat***, The number three is divided by four.
d. ***Empat Per Lima***, The number four is divided by five.
e. ***Lima Per Enem,*** The number five is divided by six.
f. ***Enem Per Tujeuh,*** The number six is divided by seven.
g. ***Enem per lapen,*** The number six is divided by eight.
h. ***Tujauh per Lapen,*** The number seven is divided by eight.
i. ***Lima Per Lapen***, The number five is divided by eight.
j. ***Lima Per Sembilen***, The number five is divided by nine.
k. ***Tujeuh Per Sembilen***, The number seven is divided by nine.
l. ***Sembilen per Sepuloh,*** The number nine is divided by ten

11. ***Bilangan*** **Dengan Jumlah Tak Tentu (*Indefinite Number)***
a. Angga bought too much rice: expresses the size of a certain object in quantity ***(Angga banyak igek melei beres).***
b. Delia has several types of cars in her house: they reveal the size of a certain object in number ***(Delia ade berape macem mobil pek umahnya).***

c. In 2022, the price of palm fruit will increase slightly compared to the previous year: revealing the size of a particular object in quantity ***(Taon 2022 harge bueih sawit sikit ngenat di banden taon sebelum ae)***
d. You give dozens of other blessings: revealing the size of a certain object in number ***(Keu meraik bepuloh-puloh nikmat laen ae).***
e. Elven chased by hundreds of people in Tuatunu village: reveals the size of a certain number of objects ***(Elven diusek beratus-ratus keik urang pek kampung tua tunu).***
f. I would like to say a thousand thanks to the teachers for helping me: express the size of a certain object in terms of numbers ***(kou ngucap beribau-ribau banyak makaseh kek bapak/ibuk guru la nulong kou).***
g. Rudi won two million in a sack jumping competition: revealing the size of a certain object in numbers ***(Rudi dapet duit dui jute lomba lumpat karong)***
h. The event on campus saw tens of thousands of people watching the festival activities: revealing the size of a particular object in numbers ***(Acara pek kampus bepuloh-puloh ribeu urang nunton kegiatan festival).***
i. The audience in the Gor stadium was in the hundreds of thousands: revealing the size of a certain object in number ***(Penunton pek dalemstadion Gor sebanyek beratus-ratus ribeu).***

CONCLUSION

The community of Pangkalpinang possess special terms in the language of mathematical numbers. It is used in their daily activities in mentioning language related to mathematical numbers. The results of this study can be used as a starting point in learning mathematics, especially related to number lessons. So that students might better understand mathematical number lesson that is integrated in daily activities. However, this research is still limited to an ethnographic study of the local wisdom of the mathematical language of the Pangkalpinang Malay community, thus it is recommended for further research to integrate the local wisdom of the Pangkalpinang community in developing learning tools.

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