Mathematics Number Patterns in Bima Traditional Songket

Nurnazmi[1(✉)], Syaifullah[1], Darwis[1], Irfan[1], Mikrayanti[2], and Ida Waluyati[1]

[1] Sociology Education, STKIP Bima, Bima, Indonesia
nurnazmi578@gmail.com
[2] Mathematics Education, STKIP Bima, Bima, Indonesia

Abstract. The motifs in Bima's traditional songket have three categories, namely *kasuri, tinti* and flowers. The studies analyzed the floral motifs. The floral motifs include tamarind seeds (*isi mangge*), green bitter melon seeds (*isi pria*), jinta, grass flower (*wunta mpori*), star (*ntara), smado to'i and smado na'e*, *smado na'e isi magge, kapi keu, koha keu.* The study used qualitative with a descriptive method. The sampling technique used is purposive sampling, with 13 main informants and three supporting informants. The data analysis used data reduction, data display, and data verification. The results showed that there were floral motifs on Bima's traditional songket, namely odd number patterns, triangular number patterns, Pascal's triangular number patterns, square number patterns, and rectangular number patterns.

Keywords: Mathematical Number Patterns · Motifs · Songket Woven Fabrics

1 Introduction

Mathematics is one of the sciences taught in schools at the elementary, middle and high levels. The school stages have been passed by individuals/groups who work as weavers. The data of weavers' education shows that the weavers have finished their school up to Elementary School or Middle School, and even some weavers finished the senior high school. Mathematics has an important role in life because it trains thinking skills in a logical and structured manner. According to Wahyuni (2016) in Aditya Juliant and Kurnia Noviartati (2016) [1], Mathematics is very important for science, especially in expressing the scientific models. Without Mathematics, knowledge will stop at a qualitative stage which does not allow to increase reasoning further. Therefore, it can be said that science without mathematics does not develop and almost all areas of life use the services of mathematics, including in daily life weavers also use design motifs that contain elements of mathematics, namely elements of number patterns.

Patterns with numbers provide an excellent opportunity for weavers to develop their understanding of mathematical patterns. Number patterns found in charts or sequences of numbers based on certain rules help individuals/groups of all levels to think algebraically. Discussing number patterns is not far from discussing the hundreds chart, where the hundreds chart is a very rich field for exploring number relationships and not only as a tool for teaching number [2]. In assessing or connecting the types of number patterns,

A. Amrullah et al. (Eds.): ACCESS 2021, ASSEHR 686, pp. 488–495, 2023.
https://doi.org/10.2991/978-2-494069-21-3_52

it is very difficult or never realized by individuals or groups, where the individuals or groups who work as weavers focus on their daily work.

The difficulty in understanding number patterns, especially in terms of mathematical modeling, naturally occurs because mathematics has an abstract object of study [3]. Overcoming the abstraction of mathematical objects, many researchers suggest using a cultural context, such as Bima songket woven fabric [3].

A study conducted by Tobo (2017) in Hermina Disnawati and Selestina Nahak (2019) revealed that in weaving activities there is an abstraction process related to making patterns on woven fabrics, both number patterns and geometric patterns such as even/odd or number factors, multiples contained in the pattern horizontally and longitudinally [4]. According to Sabilirrosyad (2016) in Yohanis Ndapa Deda and Hermina Disnawati (2017), that there are several geometric principles used in the manufacture of woven fabric motifs, namely there are many diagonal axes that emerge from the analysis of the symmetry and repetition of details in the overall fabric motif [5].

2 BIMA Traditional Songket Patterns

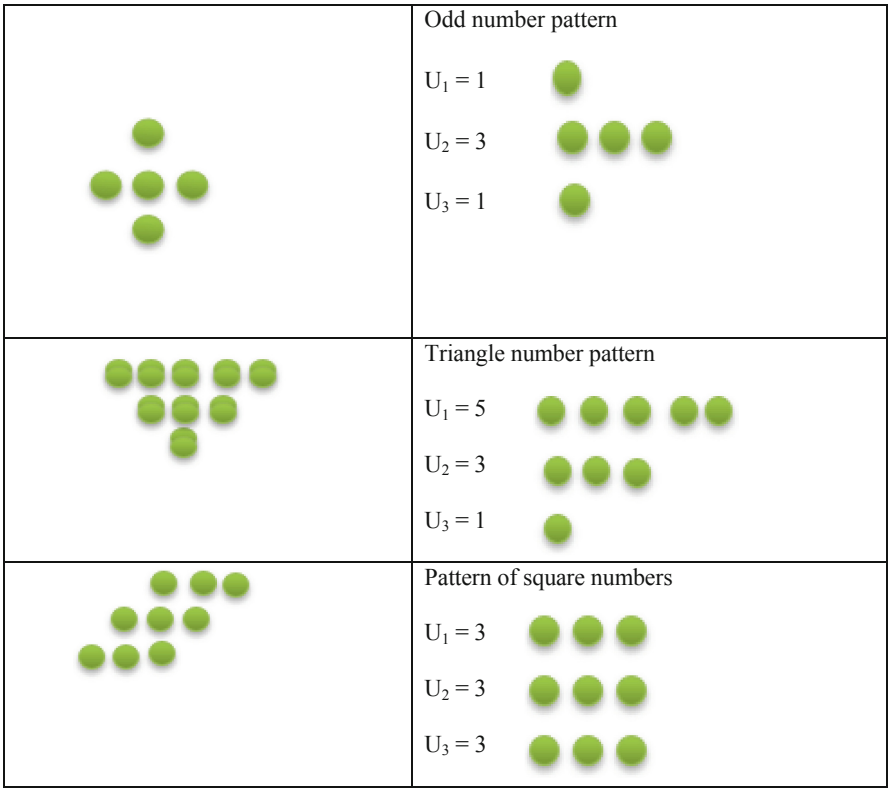
2.1 Tamarind Seed Motif (isi mangge)

The tamarind seed motif (*isi mangge*) is part of the floral motif in songket woven fabrics used in clothing made from galendo or mesrai. Tamarind is a typical plant of the Bima people (dou mbojo) besides kinca (kawi) (Figs. 1 and 2).

Fig. 1. The motif of the *isi mange* on the *mesrai* clothes

Fig. 2. Motif of tamarind seeds (*isi mangge*)

The pattern of numbers contained in the tamarind seed motif (*isi mangge*), namely the pattern of odd numbers, squares and triangles. The set of odd numbers is {1, 3, 5, 7, 9, …}. Odd numbers are also known as non-even integers. It is written as 2 n+1 or an integer which when divided by two always leaves 1 [6].



2.2 Green Bitter Melon Seed Motif (*isi pria*)

The green bitter melon seed motif (*isi pria*) is only used on the sarong (*tembe*) made from *mesrai,* which is a complementary ornament in the zig-zag motif. The green bitter melon seed motif (*isi pria*) is always paired with *smado na'e* in a *salungka mesrai* sarong (Figs. 3 and 4).

The mathematical number pattern contained in the green pare content motif (*isi* pria) is the Pascal triangle number pattern. Pascal's triangle number pattern is the sum of the numbers from each row in Pascal's triangle.

$$\begin{array}{lll} 3 & \longrightarrow & U_1 = 3 \\ 3\quad 3\quad 3 & \longrightarrow & U_2 = 9 \\ \mathbf{3\quad 4\quad 3\quad 4\quad 3} & \longrightarrow & \mathbf{U_3 = 15} \end{array}$$

Fig. 3. The zig-zag motif in the *salungka mesrai* sarong

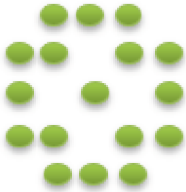


Fig. 4. The Green Bitter Melon Motif (*isi pria*)

Fig. 5. The motifs of grass flower (wunta mpori) and *smado na'e isi mangge* in a *salungka mesrai* sarong

2.3 The Grass Flower Motif (wunta mpori)

The grass flower motif (wunta mpori) is one of the motifs that is paired with the smado na'e *isi mangge* motif (which has a minimum sakaju of 7 to a maximum of 9) which is used on clothes or sarongs with mesrai or galendo material (Figs. 5 and 6).

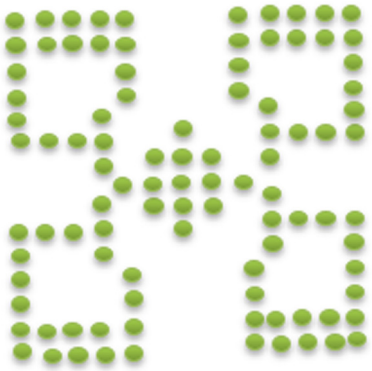
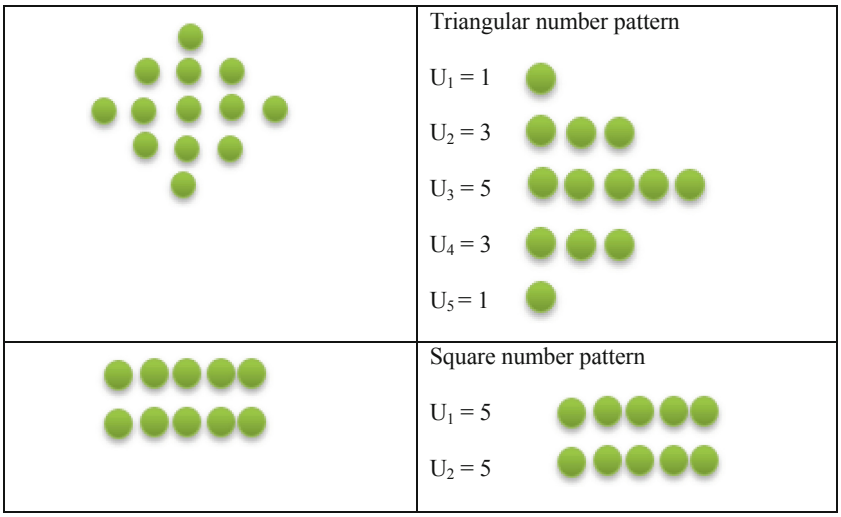


Fig. 6. The Grass Flower Motif (*wunta mpori*)

The pattern of mathematical numbers in the grass flower motif (wunta mpori) is a triangular number pattern and a square number pattern. The square number pattern has the same pattern as the power number of two. The number sequence that composes the square number pattern is also a power of two. The triangular number pattern is a number sequence that has a circle that can form a triangle.



2.4 Star Motif (ntara)

The star motif (ntara) is often found on galendo or mesrai clothing or sarongs and it is found in zig-zag *mesrai* sarongs (Figs. 7 and 8).

The pattern of mathematical numbers in the star motif (*ntara*) is a rectangular number pattern. A rectangular number pattern is a series of numbers that form a rectangular pattern.

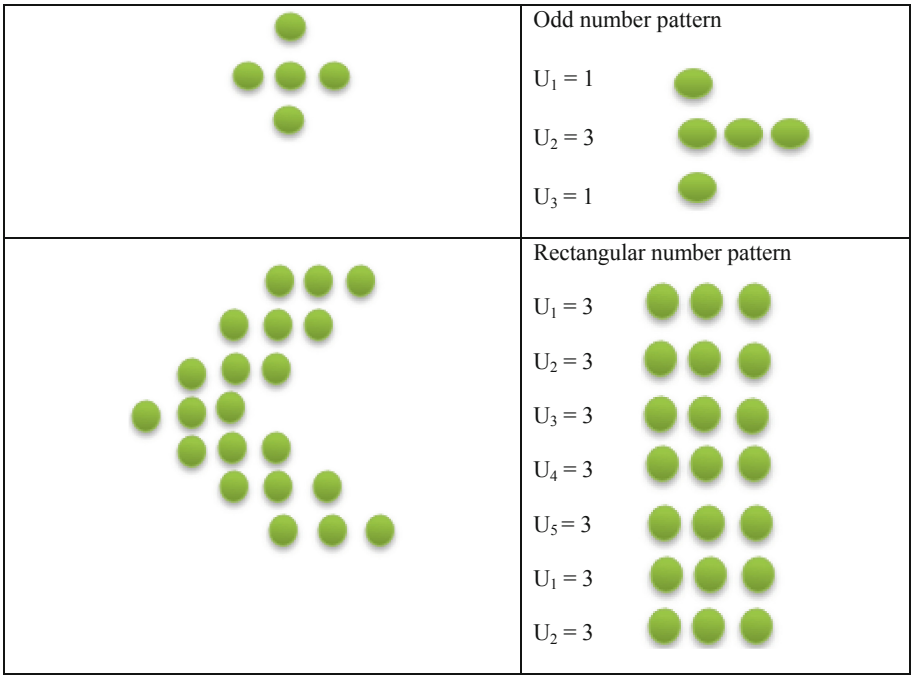


Fig. 7. The Star (*ntara*) *in tembe salungka*

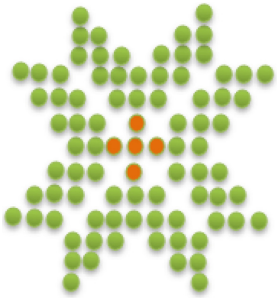


Fig. 8. The Star Motif (*ntara)*

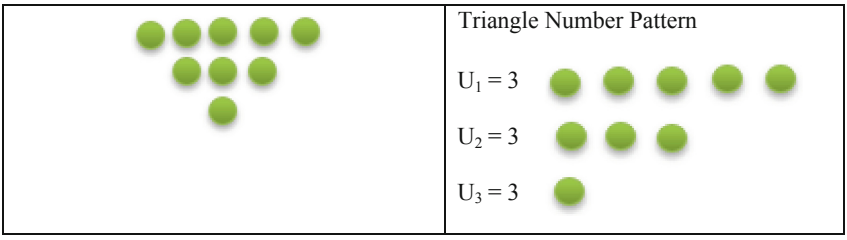
Fig. 9. The *smado na'e* and *smado to'I Motifs*

Fig. 10. The *smado to'I motif*

2.5 The Smado TAo'I Motif

Smado to'i is a form of *smado* that has a unified whole that is shaped together without any spreading motif (*amu na*), which has *kaju* motifs (maximum 6 *sakaju* and minimum 4 *sakaju*) (Figs. 9 and 10).

The number pattern in *smado to'i* motif is a triangular mathematical number pattern.



3 Conclusion

The traditional Bima songket motif consists of tamarind seeds (*isi mangge*), green bitter melon seeds (*isi pria*), grass flower (*wunta mpori),* star *(ntara*), *smado to'i.* In the floral motifs in Bima's traditional songket cloth showed the odd number patterns, triangular number patterns, Pascal's triangular number patterns, square number patterns, and rectangular number patterns.

Acknowledgments. Thank you to the Ministry of Research, Technology and Higher Education for providing the National Competitive Research Grant for Beginner Lecturers in 2019.

References

1. Juliant, A., & Noviartati, K. (2016). Analisis Kesalahan Siswa dalam Menyelesaikan Soal pada Materi Pola Bilangan Ditinjau dari Kemampuan Matematika Siswa. *Jurnal Riset Pendidikan, 2*(2). ISSN: 2460-1470.
2. Van De Walle, J. A. (2012). *Sekolah Dasar dan Menengah Matematika Pengembangan Pengajaran.* Erlangga.
3. Marion, M., Zulkardi, Z., & Somakim, S. (2015). Desain Pembelajaran Pola Bilangan Menggunakan Model Jaring Laba-Laba di SMP. *Jurnal Kependidikan, 45*(1).
4. Disnawati, H., & Nahak, S. (2019). Pengembangan Lembar Kerja Siswa Berbasis Etnomatematika Tenun Timor pada Materi Pola Bilangan. *Jurnal Elemen, 5*(1). eISSN 2442-4226
5. Deda, Y. N., & Disnawati, H. (2017). *Hubungan Motif Kain Tenun Masyarakat Suku Dawan – Timor dengan Matematika Sekolah*, Prosiding Konferensi Nasional Penelitian Matematika dan Pembelajaran II (KNMP II) Universitas Muhammadiyah Surakarta, 18 Maret 2017. ISSN: 2502-6526.
6. Negoro, S. T., & Harahap, B. (2010). *Ensiklopedia Matematika.* Bogor Selatan: Ghalia Indonesia.