

## Research Article

# Gumpang Temple as a source of ethnomathematics learning

Sutrimeo<sup>1✉</sup>, Kamid<sup>2</sup>, Asrial<sup>2</sup> & Bambang Hariyadi<sup>2</sup>

<sup>1</sup> Student of Doctoral program in Mathematics and Science Education Universitas Jambi, Jambi, Indonesia

<sup>2</sup> Lecture of Department of Teaching and Education Universitas Jambi, Jambi, Indonesia

✉Corresponding Author: [sutrimeo621@gmail.com](mailto:sutrimeo621@gmail.com) | Phone Number: +6281263080269

Received: 15 December 2022

Revised: 21 February 2023

Accepted: 10 March 2023

Available online: 30 March 2023

## ABSTRACT

This study aims to explore the Gumpang Temple as a source of learning mathematics for geometry in junior high school. The form of learning that comes from nature is ethnomathematics. The researcher describes how the Gumpang Temple will be a fun and exciting source of learning. This study uses a qualitative approach. Data collection was obtained by observation and literature sources. The data findings were analyzed using qualitative data analysis with descriptive methods. The results of this study indicate that the wealth of ethnomatematic literature using Gumpang Temple is quite a lot. Various approaches and formulas can be applied to the teaching of geometry. These findings lead researchers to conduct further research to explore the manufacture of teaching materials using different research approaches.

**Keywords:** ethnomathematics; gumpang temple; mathematic learning

## 1. INTRODUCTION

The mathematical problem that is closely related to people's lives is geometry (Hwang et al., 2020; İbili et al., 2020). Geometry material continues at the lowest to the highest level of education. In the implementation of learning in the classroom, many students have difficulty solving problems in related daily life because students are used to only applying formulas. Therefore, teachers must link mathematical concepts and formulas in students' lives or knowledge that is commonly understood by students, such as culture (Anhalt et al., 2018; Hunter, 2021). As has been studied previously that the relationship between culture and mathematics is one of them in the Muaro Jambi Temple area, namely the concept of Bangun Datar in several parts of the temple. The forms of these temples can be used as innovations in learning mathematics so that students can be more interested and can preserve their culture (Carberry & Baker, 2018; Pokrovskaia et al., 2019; Surata & Vipriyanti NU, 2018). So, in this case the researcher uses Jambi culture as an integration in the implementation of learning on flat geometry material. Jambi culture is used at the beginning of learning and throughout the learning process so that students can learn using contextual objects and can preserve Jambi culture.

## Gumpang Temple

The temple is a cultural heritage that must be preserved (Brosius, 2021; Elfadaly et al., 2018). The resulting culture in the form of a temple is a relic of the old culture in the form of material. This proves that the culture of the past was true. Gumpang Temple is part of the temples in the Muaro Jambi Temple area (Hardiarti, 2017). In the Gumpang temple complex, a statue of Prajnyaparamita, aka the statue of the goddess of fertility, has many similarities to the statue of Prajnparamita in the era of the Singosari kingdom. In this complex not only found several temples but also there are ancient man-made ditches or canals. pools of water reservoirs and mounds of earth in which there are ancient brick structures. In the complex, there are at least 85 menopos which are still owned by local residents (Hardiarti, 2017). Gumpang Temple is a tourist attraction that describes Jambi's culture. In addition, the value of architecture provides a broad picture of how the Jambi community is familiar with solid building construction. Researchers try to analyze the outer structure of the building which is formed from flat shapes.

## Ethnomathematics and Gumpang temple

Mathematics is the science of quantity, shape, arrangement, and measure, the main thing being the methods and processes for discovering with precise concepts and consistent symbols, the properties and relationships between quantities and sizes, either in abstract, pure mathematics or in relation to the benefits of mathematics applied (Kontratjeva, 2021; Lin et al., 2020; Zhao et al., 2021). If we talk about mathematics and temples, we mean we are talking about mathematics and culture. Mathematics and culture are something that cannot be avoided in everyday life, because culture is a unified whole and comprehensive, applicable in a society while mathematics is knowledge used by humans in solving everyday problems

(Acharya, 2019). But sometimes mathematics and culture are seen as separate and unrelated. Mathematics as a form of culture has actually been integrated in all aspects of people's lives. In essence, mathematics is a symbolic technology that grows on skills or environmental activities that are cultural. Thus a person's mathematics is influenced by their cultural background, because what they do is based on what they see and feel (Fouze & Amit, 2017; Rodriguez et al., 2017). Culture will influence individual behavior and have a major role in the development of individual understanding, including learning mathematics (Eccles & Wigfield, 2020; Huang et al., 2019). The relationship between culture and mathematics is what researchers term ethnomathematics.

Ethnomathematics can be divided into six basic activities that can always be found in a number of cultural groups (Albanese, 2021; Muhtadi & Prahmana, 2017). The six mathematical activities are activities: counting/counting, determining location, measuring, designing, playing and explaining. Ethnomathematics objects are cultural objects that contain mathematical concepts in a particular society (Hariastuti & Budiarto, 2019; Prahmana & D'Ambrosio, 2020). As Bishop argued, ethnomathematical objects are used for mathematical activities such as counting activities, determining locations, measuring, designing, playing and explaining. The ethnomathematical objects can be in the form of traditional games, traditional crafts, artifacts, and activities (actions) in the form of culture (Octizasari & Haji, 2019). Furthermore, the focus in this study is to determine what kind of learning method is suitable for ethnomathematics learning with the Muaro Jambi temple as a source of learning geometry material. It is hoped that by using this Jambi culture, a modification of the learning model will be produced that adds to the variety of learning models that are the choice of teaching teachers in increasing student interest in learning and increasing students' creative thinking skills in mathematics. The formulation of the problem in this research is how can Gumpang Temple become a source of ethnomathematics learning on flat geometry material?.

## 2. RESEARCH METHOD

This study uses a qualitative approach. Qualitative approach is a research approach that wants to know the general problems in detail by using narrative language that explains (Ngozswana, 2018). Researchers used descriptive and ethnographic methods to formulate the problems expressed in the research. Researchers want to construct a learning model that has the potential to be used as a forum for developing Jambi cultural ethnomathematics learning on geometry material. The research findings were analyzed using descriptive analysis. The framework of this research model is as follows;

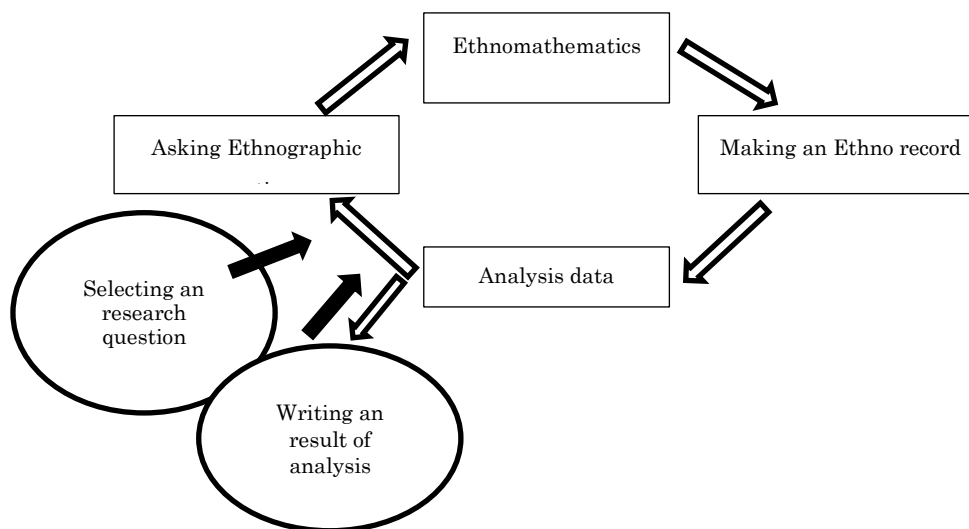


Figure 1. procedure and analysis data

The picture of the research model is the flow of this research. This research is more of an ethno study so that the researcher will analyze it with descriptive analysis. The relationship between ethno and mathematics will be an inseparable part in analyzing the Gumpang temple as a learning resource for junior high school students.

## 3. RESULTS AND DISCUSSION

Ethnomathematics is an interesting study to be developed in learning mathematics. Ethnomathematics is a form of learning that is able to provide contextual experiences to students so that mathematics is felt close to students (Hartinah et al., 2019; Noviyana et al., 2020). In addition to students studying mathematics and its arithmetic concepts, students also study the history and culture of its community. The ethnomathematics discussion on Gumpang Temple will provide a description of the historical side and its people. Gumpang Temple is an interesting object to be explored from its historical, cultural and mathematical elements. Gumpang Temple is located in Nuaro Jambi Village, Muaro Sebo District, Muaro Jambi Regency, Jambi Province, Indonesia. Through this ethnomathematical study of Gumpang Temple, it is hoped that students can get to know the culture around the temple and the temple buildings and expect motivation and results.

## Gumpang temple from the history side

The existence of the Muara Jambi Temple site was first known from the report of a British officer named S.C. Crooks. In 1820, Crooke was assigned to visit inland areas along the Batanghari River which is the longest river on the island of Sumatra. Crooke's account explains that there was an assumption among the settlers that Muaro Jambi was once the capital of an ancient kingdom. Crooke even had time to see the ruins of brick buildings and areas among the thick forest near the village (Firsty & Suryasih, 2019).

Furthermore, Muarajambi Temple Sites began to be mentioned again when T. Adams published his notes in the *Oudheidkundig Verslag Magazine* in 1921 and 1922. The information was more complete after F.M. Schnitger conducted a series of studies on this site from 1935 to 1936. Schnitger noted that there were seven temples he mentioned, one of which was the Gumpang Temple. Several subsequent studies found four other temples, bringing the total number of temples to 11 (Syaputra et al., 2020). Gumpang temple was renovated from 1982 to 1988. During the restoration process, inscriptions were found on gold plates. The writing used in the inscriptions is the Kawi or Old Javanese script. The contents of the inscription are the mantras/names used in the Vajradhātu-Mandala. The indications can be seen from the characteristics of the letters that tend to form round, and the presence of pigtails on certain letters. Based on this paleographic study, Boechari in his 1985 research report argued that Gumpang Temple was founded in the mid-9th century to the early 10th century (Pamungkas & Agustiningih, 2018).

At Gumpang Temple, a statue without a head and both arms was found. Based on gender and hand posture (mudra), this statue is thought to be a statue of Prajnaparamita (Goddess of Knowledge in the Buddhist pantheon system). This statue is similar to a similar statue found in Java in the Singhasari style dating from around the 13th century AD. Furthermore, the discovery of letters on gold paper is estimated to date from around the 9th-10th century AD. Meanwhile, around the temple area, many Chinese ceramic shards were found, most of which came from the Song-Yuan Dynasty (11th-14th century AD), in addition to an older period, namely from the Tang Dynasty (century AD). 8-9 AD (Indrayani, 2021). Meanwhile, in relation to functions, it is known that the Muarajambi area contains various interesting indicators. For example, during the demolition of the base of the Gumpang Temple building, 13 holes were found in the middle with a rectangular layout containing items in the form of gold paper, precious stones, gold paper inscribed with Old Javanese script, and gold cepuk. The constellation of these holes obeys the eight cardinal directions. The inscription on the gold paper mentions Buddhist mantras according to their placement in the cardinal directions. These discoveries add to historical knowledge that there was a big event in Muaro Jambi, in this case the public and students are expected to appreciate history.

## Gumpang temple from the society side

Muaro Jambi Temple Complex is the largest Buddhist temple complex in Southeast Asia, which stretches from west to east on the banks of the Batanghari river with a length of 7.5 km and an area of 260 hectares. This temple complex is located in Muaro Jambi Village, Maro Sebo District, Muaro Jambi Regency, Jambi Province, which can be reached by land about 30 kilometers from Jambi City. Muaro Jambi Temple is thought to have been a complex of worship or Buddhist education complex so that many Buddhist statues and artifacts were found. In particular, Gumpang Temple is the second largest temple after the Kedaton temple in the Muaro Jambi temple complex. Junus Satrio Admodjo stated that the area was once inhabited and became a meeting point for various cultures. It is proven by finding beads from Persia, China and India. Meanwhile, Mahayana Tantrayana Buddhism is suspected to be the majority religion with evidence of the discovery of plates bearing the words "wajra" on several temples in the form of Mandalas (Marmoah & Kasiono, 2017).

In addition, Gumpang Temple and other temples have different styles and materials from the existing temples on the island of Java. When viewed in terms of the architectural style of this temple, some of the temple complexes are dominated by the distinctive features of the Buddhist heritage, especially the Buddhist Tantarayana, although there are several buildings that have been inspired by Hindu teachings. In the Gumpang temple complex, a statue of Prajnyaparamita, aka the symbol of the goddess of fertility, was found, which has many similarities with the Prajnaparamita statue in the era of the Singosari kingdom. In this complex not only found several temples but also there are ancient man-made ditches or canals, pools of water reservoirs and mounds of earth in which there are ancient brick structures. In the complex, there are at least 85 menops which are still owned by local residents. Furthermore, with the existence of the Gumpang Temple and the temple complex, it forms a new culture in the community around the temple. The Malay culture, the majority of which are fishermen, are currently turning to tourism, bicycle rental, trading and service providers. From the economic side, the community also increases, the cultural impact of the community increases. In addition, the growth of a culture of tolerance (Aradea & Mustikawan, 2018). Where the community around the temple is currently Muslim, but when at the moment of celebration of life and culture, people respect the existence of Hindu and Buddhist religions that celebrate in the temple environment.

## Gumpang temple from the mathematics side

Gumpang temple and various other interesting discoveries. Gumpang temple besides having many cultural and historical values, Gumpang temple also has a unique mathematical element. Here is a picture of the gumpang temple;

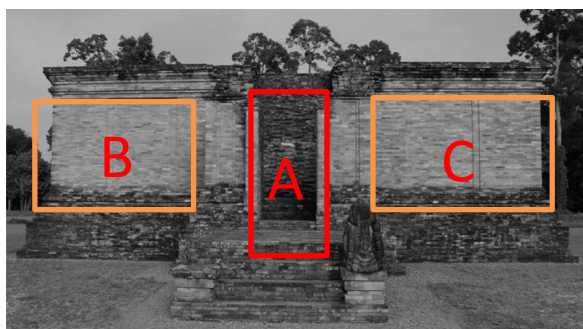


Figure 2. Gumpang Temple

Figure 2 is the gumpang temple on the side is the original picture that looks very sturdy. Figure 2 shows the gumpang temple from the front view. There is a door leading to the room in a rectangular shape. In addition, there are left and right sides of the door which are also rectangular in shape. In general, to find the area of a rectangle analysis of the area of part A. To analyze the area of the door (A) there is a rectangular formula. To make it easier to analyze, the researcher added points a, b, c, and d in part A.

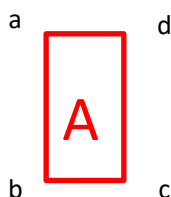


Figure 3. Building A

Figure 3 there are points a, b, c, and d. To find out the area of building A, we use the rectangular equation, namely;

$$\text{Area A} = \text{length ab} \times \text{length bd} \dots (1)$$

Furthermore, the C and D buildings also have the same characteristics, namely the rectangular shape. It can be seen that the C and D buildings have the same size, this shows the regularity of the gumpang temple building. The regularity of the building structure is the most important thing in the construction of the temple to strengthen the building. So that researchers can draw a conclusion by calculating the sides of the shape C or shape D. Mathematically the area of the C or D shape can be calculated using the following equation;

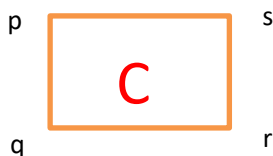


Figure 4. Building C

Figure 4 the researcher gives the points o, p, q, and r in the hope of making it easier to write the rectangular equation, namely;

$$\text{Area C} = \text{length of op} \times \text{length of pr} \dots (2)$$

From the two equations and analysis given, the front of the temple is a rectangular side. Next, the researcher will analyze on the other side.



Figure 5. The Gumpang temple, left side view



Figure 6. The Gumpang temple, right side view

Figures 5 and 6 are pictures of the side of the temple gumpang which depict the whole rectangle. So the gumpang temple is an example of rectangular geometry. Therefore, the researcher will conclude that the Gumpang Temple is a learning resource for rectangular geometry.

#### 4. CONCLUSION

Based on the findings and analysis, culture and mathematics have a close relationship and researchers term it ethnomathematics. One of the historical products that can be seen is the Gumpang Temple which is located in Muaro Jambi, Jambi, Indonesia. Based on a literature review, it was found that Boechari in his research report in 1985 argued that Gumpang Temple was founded in the mid 9th to early 10th centuries. This was reinforced by the findings of Chinese ceramic shards, most of which came from the Song-Yuan Dynasty (11th-14th centuries). AD, in addition to the older period, namely from the T'ang Dynasty (8th-9th century AD). The existence of Gumpang Temple and this temple complex has formed a new culture in the community around the temple. The Malay culture, the majority of which are fishermen, are currently turning to tourism, bicycle rental, trading and service providers. In addition, the temple community is currently Muslim, but when at the moment of celebration of life and buddha, people respect the existence of religion and culture that celebrates in the temple environment. From the temple building, it was found that each side of the gumpang temple depicts a whole rectangle. So the gumpang temple is an example of rectangular geometry.

#### AUTHOR'S CONTRIBUTIONS

The authors discussed the results and contributed to from the start to final manuscript.

#### CONFLICT OF INTEREST

There are no conflicts of interest declared by the authors.

#### REFERENCES

- Acharya, R. B. (2019). *Relevance of primary level mathematics education in Nepal: A cultural perspective*. <http://103.69.125.248:8080/jspui/handle/123456789/155>
- Albanese, V. (2021). Bundles of Ethnomathematical Expertise Residing with Handicrafts, Occupations, and Other Activities Across Cultures. *Springer*, 1–34. [https://link.springer.com/content/pdf/10.1007/978-3-030-44982-7\\_2-1.pdf](https://link.springer.com/content/pdf/10.1007/978-3-030-44982-7_2-1.pdf)
- Anhalt, C. O., Staats, S., Cortez, R., & Cognition, M. C. (2018). Mathematical modeling and culturally relevant pedagogy. *Springer*, 307–330. [https://doi.org/10.1007/978-3-319-66659-4\\_5](https://doi.org/10.1007/978-3-319-66659-4_5)
- Aradea, M. A., & Mustikawan, A. (2018). Perancangan Typeface Berbasis Aksara Pallawa Sebagai Media Promosi Situs Candi Muaro Jambi. *EProceedings of Art & Design*. <https://openlibrarypublications.telkomuniversity.ac.id/index.php/artdesign/article/view/6135>
- Brosius, C. (2021). The Cultural Politics of Transnational Heritage Rituals. *Ritual, Heritage and Identity*, 97–125. <https://doi.org/10.4324/9780367818005-8/CULTURAL-POLITICS-TRANSNATIONAL-HERITAGE-RITUALS-CHRISTIANE-BROSIUS>
- Carberry, A., & Baker, D. R. (2018). The impact of culture on engineering and engineering education. *Springer*, 217–239. [https://doi.org/10.1007/978-3-319-66659-4\\_5](https://doi.org/10.1007/978-3-319-66659-4_5)
- Eccles, J. S., & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. *Elsevier*. <https://www.sciencedirect.com/science/article/pii/S0361476X20300242>
- Elfadaly, A., Attia, W., & Lasaponara, R. (2018). Monitoring the Environmental Risks Around Medinet Habu and Ramesseum Temple at West Luxor, Egypt, Using Remote Sensing and GIS Techniques. *Journal of Archaeological Method and Theory*, 25(2), 587–610. <https://doi.org/10.1007/S10816-017-9347-X>
- Firsty, O., & Suryasih, I. A. (2019). Strategi pengembangan candi muaro jambi sebagai wisata religi. *Jurnal Destinasi Pariwisata*, 7(1). <https://ojs.unud.ac.id/index.php/destinasipar/article/download/53217/31485>
- Fouze, A., & Amit, M. (2017). Development of mathematical thinking through integration of ethnomathematic folklore game in math instruction. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(2), 617–630. <https://www.ejmste.com/article/development-of-mathematical-thinking-through-integration-of-ethnomathematic-folklore-game-in-math-5289>
- Hardiarti, S. (2017). Etnomatematika: Aplikasi Bangun Datar Segiempat pada Candi Muaro Jambi. *Jurnal Aksioma*, 8(2). <http://103.98.176.9/index.php/aksioma/article/view/1707>
- Hariastuti, R., & Budiarto, M. T. (2019). From culture to classroom: study ethnomathematics in house of using banyuwangi. *International Journal of Trends in Mathematics Education Research*, 2(2), 76–80. <https://doi.org/10.33122/ijtmer.v2i2.60>

- Hartinah, S., Suherman, S., & Syazali, M. (2019). Probing-prompting based on ethnomathematics learning model: The effect on mathematical communication skill. *Journal for the Education of Gifted Young Scientists*, 7(4), 799–814. <https://dergipark.org.tr/en/pub/jegys/article/574275>
- Huang, F., Teo, T., Carlos Sánchez-Prieto, J., García-Peñalvo, F. J., & Olmos-Migueláñez, S. (2019). Cultural values and technology adoption: A model comparison with university teachers from China and Spain. *Computers & Education*, 133, 69–81. <https://doi.org/10.1016/j.compedu.2019.01.012>
- Hunter, J. (2021). An intersection of mathematics educational values and cultural values: Pāsifika students' understanding and explanation of their mathematics educational values. *ECNU Review of Education*, 4(2), 307–326. <https://doi.org/10.1177/2096531120931106>
- Hwang, W., Hoang, A., Researcher, Y. T.-T. A.-P. E., & 2020, U. (2020). Exploring authentic contexts with ubiquitous geometry to facilitate elementary school students' geometry learning. *Springer*, 68(3). <https://link.springer.com/article/10.1007/s40299-019-00476-y>
- İbili, E., Çat, M., Resnyansky, D., Şahin, S., & Billinghamurst, M. (2020). An assessment of geometry teaching supported with augmented reality teaching materials to enhance students' 3D geometry thinking skills. *International Journal of Mathematical Education in Science and Technology*, 51(2), 224–246. <https://doi.org/10.1080/0020739X.2019.1583382>
- Indrayani, N. (2021). DAMPAK SOSIAL EKONOMI SITUS CAGAR BUDAYA CANDI MUARO JAMBI TAHUN 1976-2013. In *Seminar Nasional Humaniora*, 1(1), 134–152. <http://www.conference.unja.ac.id/SNH/article/view/125>
- Kondratieva, M. (2021). Trusting Your Own Eyes: Visual Constructions, Proofs, and Fallacies in Mathematics. *Springer*, 1–37. [https://link.springer.com/content/pdf/10.1007/978-3-030-44982-7\\_38-1.pdf](https://link.springer.com/content/pdf/10.1007/978-3-030-44982-7_38-1.pdf)
- Lin, S., Zhou, Y., & Wijaya, T. T. (2020). Using hawgent dynamic mathematics software in teaching arithmetic operation. *International Journal of Education and Learning*, 2(1), 25–31. <https://doi.org/10.31763/IJELE.V2I1.97>
- Marmoah, S., & Kasiono, S. (2017). Ipteks Bagi Masyarakat (Ibm) Klaster Industri Kecil Makanan Khas di Candi Muaro Jambi. *Jurnal Ilmiah Universitas Batanghari Jambi*, 15(4), 63–74. <http://ji.unbari.ac.id/index.php/ilmiah/article/view/126>
- Muhtadi, D., & Prahmana. (2017). Sundanese Ethnomathematics: Mathematical Activities in Estimating, Measuring, and Making Patterns. *Journal on Mathematics Education*, 8(2), 185–198. <https://doi.org/10.22342/jme.8.2.4055.185-198>
- Ngozwana, N. (2018). Ethical dilemmas in qualitative research methodology: Researcher's reflections. *International Journal of Educational Methodology*, 4(1), 19–28. <https://doi.org/10.12973/ijem.4.1.19>
- Noviyana, I., Rochmad, R., & Dewi, N. R. (2020). Student Mathematical Communication Ability Viewed from Self-Confidence in the ARIAS Model Nuanced Ethnomathematics. *Unnes Journal of Mathematics Education Research*, 9(1), 2020–2106. <https://journal.unnes.ac.id/sju/index.php/ujmer/article/view/32070>
- Octizasari, G., & Haji, S. (2019). Ethnomatematics of South Bengkulu in Mathematical Learning Community. *Nternational Journal of Trends in Mathematics Education Research*, 2(2), 81–85. <https://doi.org/10.33122/ijtmer.v2i2.111>
- Pamungkas, S., & Agustiningsih, N. (2018). Candi Muaro Jambi: Kajian Cerita Rakyat, Arkeologi, Dan Pariwisata. *Jurnal Ilmiah Pendidikan Sejarah Universitas Batanghari*, 2(2), 49–62. <http://historia.unbari.ac.id/index.php/OJSISTORIA/article/view/40/0>
- Pokrovskaja, N., Ababkova, M., & Fedorov, D. (2019). Educational services for intellectual capital growth or transmission of culture for transfer of knowledge—consumer satisfaction at St. Petersburg universities. *Education Sciences*, 183. <https://doi.org/10.3390/educsci9030183>
- Prahmana, R., & D'Ambrosio, U. (2020). Learning Geometry and Values from Patterns: Ethnomathematics on the Batik Patterns of Yogyakarta, Indonesia. *Journal on Mathematics Education*, 11(3), 439–456. <https://doi.org/10.22342/jme.11.3.12949.439-456>
- Rodriguez, S., Cunningham, K., & Jordan, A. (2017). STEM identity development for Latinas: The role of self-and outside recognition. *Journal of Hispanic Higher Education*, 18(3), 254–272. <https://doi.org/10.1177/1538192717739958>
- Surata, S., & Vipriyanti NU. (2018). The subak cultural landscape as environmental education: Knowledge, attitudes, and experiences of Balinese teachers, student teachers, and students. *The Journal of Environmental Education*, 49(1), 59–70. <https://doi.org/10.1080/00958964.2017.1406890>
- Syaputra, M., Sariyatun, S., & Ardianto, D. (2020). Pemanfaatan situs purbakala candi muaro jambi sebagai objek pembelajaran sejarah lokal di era digital. *Jurnal Pendidikan Sejarah Indonesia*, 3(1), 87. <https://core.ac.uk/download/pdf/328160812.pdf>
- Zhao, H., Alexander, P. A., & Yuting, S. (2021). Relational reasoning's contributions to mathematical thinking and performance in Chinese elementary and middle-school students. *Journal of Educational Psychology*, 113(2), 279–303. <https://doi.org/10.1037/EDU0000595>

