ISSN 2986-8041
Noumerico Journal of Technology in Mathematics Education
Volume 3 Issue 2, 2025
https://ejournal.uit-lirboyo.ac.id/index.php/noumerico
https://doi.org/10.33367/jtme.v3i2.6861

Ethnomathematics of Apem Cake: Integrating Local Culture into Junior High School Mathematics Learning

Muhammad Ali Uday[1], Ucik Fitri Handayani[2*]
[1,2]Universitas Al-Qolam Malang
[1]muhammadaliuday22@alqolam.ac.id, [2]ucik@alqolam.ac.id
*Correspondence

Article Information:
Received January 19, 2025
Revised September 26, 2025
Accepted September 29, 2025

Keyword:
Ethnomathematics, Apem Cake, Mathematics Learning

Abstract

Learning mathematics at the junior high school level is often considered difficult and uninteresting because the material rarely relates to everyday life. This study explores the concept of ethnomathematics in traditional apem cakes as a source of contextualised teaching materials in mathematics. A descriptive, qualitative method was employed, utilizing observation, documentation, and interviews with two informants who were knowledgeable about the history and preparation of apem cakes to collect data. The results showed that apem cakes have geometric shapes, such as circles and cones, which can be used to teach geometric concepts, including area, circumference, and volume, as well as calculations and ingredient comparisons. Additionally, the cultural significance of apem cakes can enrich the learning experience and boost student engagement. The study concludes that apem cakes have the potential to serve as a meaningful and contextual learning medium. Practically, teachers can design lesson plans utilising apem cake-based calculation examples to make learning more active and relevant for students. However, this study is limited to two informants and has not yet been tested in the classroom, so the results remain descriptive. Further research is recommended to develop student worksheets based on apem cakes and test their effectiveness with junior high school students.

INTRODUCTION

Mathematics is a science that studies different forms, structures, and interrelated concepts (Anggraini et al., 2022). His mathematics learning must be taught at all levels of education, from basic education to higher education. In line with his opinion (Anderha & Maskar, 2021) who said that kindergarten and early childhood education began to guide students better in understanding mathematics through the learning process at school? This is done in the hope of equipping them with the ability to think critically, objectively, logically, and thoroughly.

Mathematics also plays a crucial role in human daily life and has a significant impact on the development of other sciences. This demonstrates that mathematics is essential for the development of knowledge and its practical application in everyday life. However, mathematics is often considered uninteresting by some students for various

 |

reasons. Some teachers still use the lecture method to teach mathematics (Hasanah et al., 2021).

Indonesia is a country rich in diversity, encompassing a wide range of cultures, regional languages, races, ethnicities, religions, and beliefs. With the motto "Bhinneka Tunggal Ika," which means that despite the differences, everything remains united (Warsino, 2017). The Ach region has a unique and special culture, which may be similar or very different from the culture in the other areas. Due to its nature, it is passed down from one generation to the next. In accordance with his opinion (Shofi & Maisaroh, 2020) This suggests that each region has a unique culture, distinguishing it from the other areas, which may share similarities or exhibit striking differences.

Epistemologically, tradition comes from the Latin "tradition," which means a habit that is passed on. Tradition has become an inseparable element in people's lives (Rofik, 2019). Tradition refers to activities that have existed for a long time and have become an integral part of a community's life, serving as a tangible manifestation of the Indonesian people's spirit of unity. The collection of traditions in a region forms a space or entity called culture, which encompasses all systems of ideas, actions, and human endeavors in social life acquired through the learning process.

Javanese society is renowned for its rich culture and traditions, as well as its diverse religious beliefs. In social life, people go through different experiences and traditions that teach that life cannot be done alone and always needs the presence of others (Inayah, 2022). From here, traditions, cultures, and customs have a role as a bond between community members and as an effort to maintain harmony. One of the traditions or cultures deeply embedded in the land of Java is Selametan, also known as Tahlilal. While in the terminological sense, tahlil refers to a gathering in which the phrase Laa ilaaha illallah, shalawat to the Prophet SAW, tasbih, and several verses of the Qur'an are recited, which then ends with a prayer that includes sending the rewards of these recitations to the deceased (Hatimah et al., 2021). Traditionally, selametan or tahlilan is a spiritual tradition performed by the community through communal prayer. The tahlilan tradition contains several deep values (Inayah, 2022). During the performance, the community sits cross-legged on a mat, surrounded by a circle of tumpeng rice and side dishes. This is usually accompanied by treats or snacks that have a deep ritual meaning, such as apem cakes.

Ethnomathematics is a learning approach that links mathematical concepts with local culture, making it easier for students to understand the material. Ethnomathematics is an education that integrates mathematics with cultural diversity in the learning process (Ratriana et al., 2021). By applying ethnomathematics, students can understand mathematical concepts while also considering the cultural values associated with them. This approach involves the application of mathematical concepts in various activities, such as grouping, counting, measuring, designing buildings or tools, playing games, and locating places, all of which are related to culture. Therefore, it is necessary to create meaningful mathematics learning; one of these media is ethnomathematics, such as using traditional snacks.

Geometry is one of the most critical subjects in mathematics education. There are three reasons why this subject needs to be taught: Firstly, geometry is the only field of mathematics that can link mathematical concepts to physical forms in the real world. Secondly, geometry allows mathematical ideas to be visualised concretely. Thirdly, geometry can provide various examples of mathematical systems (Indrayany & Lestari, 2019).

Nevertheless, students often struggle to understand geometric concepts. A literature study by Amelia et al., (2021). The development of online junior high school geometry teaching materials using a software-assisted project-based learning approach revealed that geometry is a challenging and unpopular subject. Furthermore, the abstract nature of geometry makes it difficult for many students. This was also shown in Fitriyani et al., (2023) research, which found that students continue to struggle with understanding geometric concepts.

As a professional mathematics teacher, a teacher is not only responsible for teaching, but must also use various learning approaches that can enrich students' learning experiences. One way to do this is to connect the mathematical material being taught to everyday life situations, or a contextual approach. In a contextual approach, teachers present real-life situations in their teaching and encourage students to apply the knowledge they have acquired to everyday situations in family and community environments. This makes learning more meaningful for students (Nuha et al., 2024).

Teachers introduce culture to students indirectly by using traditional snacks as learning media and teaching aids in delivering material (Anggraini et al., 2022). One such traditional snack is kue apem. Kue apem, a conventional snack, has a connection to mathematical principles. This demonstrates that culture encompasses not only art and customs as a national identity, but also educational values that can be applied in the formal education setting.

Based on existing literature, an interesting topic in the field of mathematics education research is the study of ethnomathematics in traditional snacks. This approach is highly effective because it connects mathematical concepts with culture. Consequently, students learn mathematics and recognise and preserve existing cultures. Previous research on this topic has been conducted; for example, Apriliani et al., (2025) explored the mathematical concepts in abuq cake, a specialty of the Sasak tribe of Lombok. This study differs from previous studies in its focus. This study explores the application of ethnomathematics in traditional apem cakes, examining their potential as mathematics teaching materials for junior high school students.

This study proposes the application of ethnomathematics as a solution, using the exploration of mathematical concepts in apem cakes as a learning medium. By linking mathematical concepts such as geometry, area, volume, and comparison to the shape and process of making apem cakes, students can learn through real-life experiences that are relevant to their daily lives. This approach is expected to alter students' perception of mathematics as a complex subject while introducing them to local wisdom and the importance of preserving culture. This study aims to explore the potential of traditional

apem cakes as a source of mathematics teaching materials in junior high schools. Expected results include the provision of alternative, contextually relevant learning materials, increased student interest in and understanding of mathematical concepts, and the development of an appreciation for local culture.

Based on the above background, the researcher is interested in exploring ethnomathematics in traditional snacks, such as apem cake, as a source of mathematics teaching materials in junior high school.

METHOD

This study employed a descriptive qualitative method with an ethnographic approach to provide an in-depth description of cultural phenomena through field research (Yuliani, 2018; Yusanto, 2019). The research was conducted in Karangsuko Village, Pagelaran Subdistrict, Malang Regency, on 24 October 2024. Data were collected through direct observation of the apem cake-making process and its role in community life, as well as through documentation in the form of photographs, videos, and historical records. Semi-structured interviews were conducted with two key informants: Mrs Mas'udah and Mrs Sunia.

The data were analysed using the Miles and Huberman model, which involves data reduction, presentation, and conclusion (Fadli, 2021). Reduction involved summarising and selecting relevant data to identify themes and patterns; presentation took the form of narrative descriptions; and conclusions were drawn gradually from the outset of data collection. The analysis is expected to reveal new insights into the cultural significance and values embodied by apem cakes, offering a link to mathematics.

RESULTS

This study aimed to evaluate the effectiveness of using the Quizizz platform to improve the cognitive competence of fifth-grade students in mathematics at MI Tarbiyatul Khoiriyah Kediri. Data were collected through pretest and posttest assessments administered to 20 students and analyzed using both descriptive and inferential statistics to determine score differences and learning effectiveness.

Apem Kesesi or Cemol

Apem Kesesi is a traditional cake of Pekalongan, originating from Bantul village in Kesesi Regency. The taste of this Apem is sweet with a chewy texture. The basic ingredients of Apem are rice flour and palm sugar. This cake is typically served at various traditional events, such as weddings and prayer services (Ekarini et al., 2024). he shape of apem kesesi or comel cake is a circle, which has special characteristics, namely, this shape has only one surface, no corner points, and an infinite number of folding symmetries.

Figure 1. Apem Kesesi or Cemol

Apem Selong

Apem selong is a traditional cake that requires careful maintenance and preservation. Apem selong is made from rice flour and coconut. The manufacturing process involves pouring liquid dough into apem selong molds, which are then baked using a stove. The equipment needed for this process is a stove and an apem selong mold (Hikmah et al., 2024). The shape of the apem selong cake is a circle, which has special characteristics; this shape has only one surface, without any corners, and has an infinite number of folding symmetries.

Figure 2. Apem Selong

Tegal Typical Apem

Apem, a traditional food from Tegal, is made with rice flour as the main ingredient, added with brown sugar and cassava ribbon, and then formed using banana leaves in the shape of a cone (Paramita Resya & Nurnoviyati, 2022). A typical Tegal Apem cake has a cone shape with special characteristics. It consists of two main components: a flat, circular base and a curved surface that covers it like a blanket. The cone also features a circular base and an apex at the top.

Figure 3. Tegal Typical Apem

Mathematical concepts in Apem Kesesi

1. Geometry Concept of Apem Kesesi or Cemol

Typical pekalongan apem kesesi cake has a circular shape printed on a circular mold, which is in line with research conducted by Abdulah et al., (2023) On the Exploration of ethnomathematics in typical Pecalongan apem cakes as a mathematics learning medium, it is noted that apem cakes have a circular surface because the mold used is circular. In addition, the leaves used for the base of the apem cake also have a circular shape.

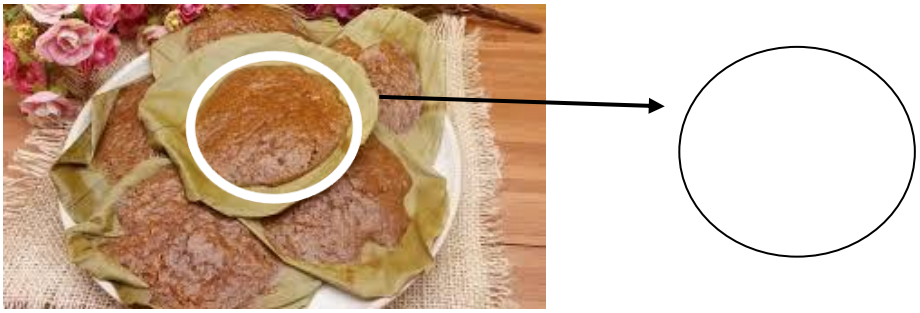


Figure 4. Geometry Concept of Apem Kesesi or Cemol

2. Geometric Concept of Apem Selong

The geometric shape of the apem selong cake, namely the circle, has special characteristics, including one side, no corner points, and an unlimited number of folding symmetries, as shown in the picture below.

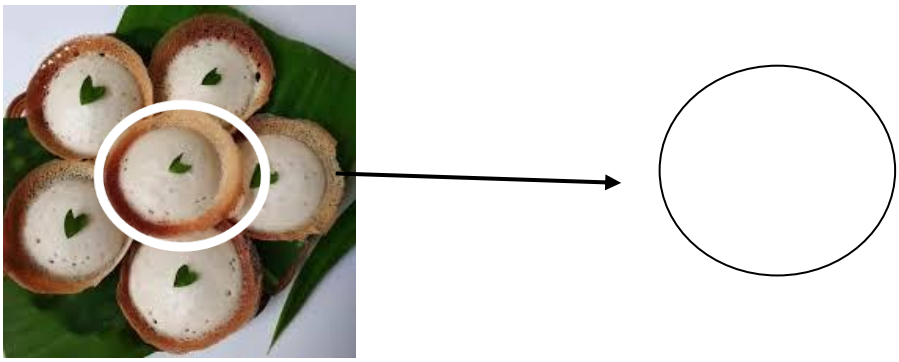


Figure 5. Geometric Concept of Apem Selong

3. Geometric Concept of Tegal Typical Apem

The concept of geometry on a typical tegal apem cake has a cone shape because it is printed with cone-shaped pisan leaves, which is in accordance with research conducted by Paramita Resya & Nurnoviyati, (2022). About exploring ethnomathematics in eating typical tegal as a source of literacy and mathematics learning resources.

The cone has several characteristics, including a base that consists of a circular surface and a curved surface that forms the shell. Additionally, a cone features a circular ridge and an angle at its apex. These characteristics are illustrated in the following figure.

Figure 6. Geometric Concept of Tegal Typical Apem

4. Calculation Concept of Circular Apem Cake

The calculation concept of kue apem can be explained by the shape of the mold and the shape of the kue apem itself. Generally, an apem cake has a diameter of approximately 7 cm, while the wrapping sheet has a diameter of 7.5 cm. As shown in Figure 1, the kue apem illustrates the principle of a circle, which is a set of points that lie on a curved line at the same distance from the center of the circle. If we calculate using the area formula of a circle, we will get the area result for the kue apem, which is

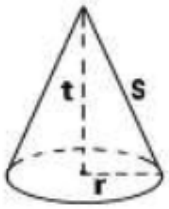
$$\text{Area of Kue Apem Kesesi} = \pi \times r^2$$
$$= \frac{22}{7} \times 3,5^2$$
$$= 38,5\ cm^2$$

If we calculate using the circumference of a circle formula, we get the circumference of the circle for the Apem cake, which is

$$\text{Circumference of Kue Apem Kesesi} = \pi \times d$$
$$= \frac{22}{7} \times 7$$
$$= 22cm$$

5. Calculation Concept of Cone-shaped Apem Cake

The cone-shaped apem cake can be calculated by using the mathematical formula for cones.



Cone Volume and Surface Area Formulas
Cone Volume : $\frac{1}{3} \times \pi \times r^2 \times t$
Surface Area : $\pi \times r \times (r + s)$

6. The Concept of Comparison

It is used in the manufacturing process. The proportions of each ingredient must be carefully considered to produce apem cakes that are the desired shape and taste. Based on interviews conducted by the researcher with Mrs Mas'udah and Mrs Sunia, the following information was obtained:

Researcher: “What ingredients are used to make apem cakes?”

Mrs M: “The ingredients used include rice flour, starch, sugar, and instant baking powder.'

Researcher: ‘Is there a specific ratio for these ingredients?”

Mrs S: “Yes, the ratio is 2 kg of rice flour, 0.5 kg of starch, 1 kg of sugar, and 10 g of instant baking powder.”

Based on this information, the ratio of ingredients for making apem cakes can be written as follows: rice flour, starch, sugar, and instant baking powder.

$$2\ Kg : 0,5\ Kg : 1\ Kg : 0,01\ Kg$$

DISCUSSION

In the Javanese slametan tradition, food often has deep symbolic meaning. One example is the apem cake. This traditional cake is still made today and is frequently featured at various ceremonies. Although it is not as soft as modern cakes such as sponge or cheesecake, the apem cake has an irreplaceable history and meaning. Its uniqueness lies in its sacred production process and its role in various rituals. Legend has it that Ki Ageng Gribig, a descendant of Prabu Brawijaya, is credited with introducing this cake. Upon returning from the Holy Land, he distributed apem cakes to the community. Over time, this cake has become a symbol of gratitude and appreciation. The word 'apem' is believed to come from the Arabic words 'afuan' or 'afuwwun', meaning 'forgiveness', which was then simplified due to differences in pronunciation between Arabic and Javanese (Shofi & Maisaroh, 2020). Similarly, in his lecture at the Nuzulul Qur'an commemoration at the Riadul Jannah Musholla in 2019, KH Anwar Zahid explained that apem cakes are usually available at slametan events or when someone dies, as a form of charity. The reward is then given to the deceased so that they may receive forgiveness from Allah SWT.

The results of the study showed that using apem cakes as a learning medium was more effective than using abstract or conventional media. Apem cakes provide a hands-on learning experience as they can be observed, touched, and measured directly by students. Their circular and conical shapes make it easier for students to understand concepts such as area, circumference, volume, and comparison in a contextual manner, rather than just looking at pictures in textbooks. Furthermore, using apem cakes to learn increases student motivation as they find it more enjoyable and relevant to their daily lives. This changes students' perception of mathematics as a complex and tedious subject.

This finding aligns with D'Ambrosio's ethnomathematics theory, which posits that ethnomathematics is the study of mathematics within the cultural context that gave rise to it (Nuh et al., 2021). By incorporating apem cakes into the learning process, students learn mathematical concepts and gain an understanding of cultural values, such as togetherness, cooperation, and religious significance in the Javanese tradition. This approach to mathematics learning is more holistic because it integrates cognitive knowledge with socio-cultural values.

Implementing a cake-based learning provides teachers with opportunities to create contextualised learning experiences, improve their students' understanding of mathematical concepts, and integrate character education and local cultural preservation. However, teachers face several challenges, including the availability of apem cakes during lessons, managing the classroom when students practise measurements, adjusting the basic competencies in the curriculum, and receiving training in how to apply the ethnomathematics approach effectively. With careful planning and support from the school, these challenges can be overcome to ensure that the apem cake-based learning runs effectively and provides students with meaningful learning experiences.

CONCLUSION

This study shows that apem cakes, a traditional Javanese snack, have great potential as teaching materials for secondary school mathematics lessons. The geometric shapes of apem cakes, such as the circles of Kesesi and Selong apem and the cones of Tegal apem, can be used to teach geometric concepts and calculations involving area, volume, and ingredient ratios. Additionally, the cultural significance of apem cakes makes them a relevant medium for connecting mathematics with everyday life and local wisdom. This study suggests that mathematics teachers can design a Contextual Approach-based Lesson Plan (RPP) using calculation examples from apem cakes, thereby making learning more meaningful and engaging, and fostering an appreciation for local culture. However, this study has limitations: it only involved two informants, and the findings have not yet been tested for effectiveness in the classroom. Therefore, further research is recommended to develop student worksheets based on the ethnomathematics of apem cakes, which can then be tested for effectiveness through direct implementation in junior high school classrooms. This will enable the research results to provide empirical contributions to improving the quality of culture-based mathematics learning.

REFERENCES

Abdulah, A., Ummaroh, A., Salmia, U., Fadlilah, R., & Sari, N. H. M. (2023). Eksplorasi Etnomatematika Pada Kue Tradisional Pekalongan Sebagai Media Belajar Matematika. *Prosiding Seminar Pendidikan Matematika Dan Matematika*, *8*(58). https://doi.org/10.21831/pspmm.v8i2.308

Amelia, R., Chotimah, S., & Putri, D. (2021). Pengembangan Bahan Ajar Daring Pada Materi Geometri SMP dengan Pendekatan Project Based Learning Berbantuan Software Wingeom. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(1). https://doi.org/10.31004/cendekia.v5i1.417

Anderha, R. R., & Maskar, S. (2021). Pengaruh Kemampuan Numerasi dalam Menyelesaikan Masalah Matematika Terhadap Prestasi Belajar Mahasiswa Pendidikan Matematika. *Jurnal Ilmiah Matematika Realistik*, *2*(1), 1–10. https://doi.org/http://jim.teknokrat.ac.id/index.php/pendidikanmatematika/index

Anggraini, T., Rusmana, I. M., & Retariandalas. (2022). Eksplorasi Etnomatematika Pada Jajanan Tradisional Khas Betawi Tia. *Diskusi Panel Nasional Pendidikan Matematika*, *8*.

Apriliani, M. A., Andini, A., Ilham, Z. T. rahayu, Aprilianti, M., & Salsabila, N. H. (2025). Eksplorasi Konsep Matematika Pada Kue Abuq Khas Suku Sasak Lombok. *Media Pendidikan Matematika*, *13*(1).

Ekarini, E. D., Fatra, M., & Dwirayahu, G. (2024). Etnomatematika : Bahan Ajar Digital Berbasis Budaya Pekalongan Pada Materi Bentuk Aljabar. *Polynom: Journal Mathematics Education*, *4*(1). https://doi.org/https://doi.org/10.14421/polynom.2024.41.1-11

Fadli, M. R. (2021). Memahami desain metode penelitian kualitatif. *Humanika, Kajian Ilmiah Mata Kuliah Umum*, *21*(1).

Fitriyani, I., Astuti, E. P., & Nugraheni, P. (2023). Analisis Kesulitan Belajar Geometri Materi Bangun Datar Pada Siswa SMP. *Jurnal Pendidikan Sultan Agung*, *3*(2). https://doi.org/10.34123/semnasoffstat.v2022i1.1287

Hasanah, A., Susanto, & Trapsilasiwi, D. (2021). Etnomatematika pada Bentuk Jajanan Tradisional di Desa Kemiren Banyuwangi Khas Suku Osing sebagai Bahan Pembelajaran Matematika. *Jurnal Matematika Dan Sains*, *9*(2).

Hatimah, H., Emawati, & Husni, M. (2021). Tradisi Tahlilan Masyarakat Banjar di Kecamatan Pahandut Kota Palangka Raya. *Syaams: Jurnal Studi Keislaman*, *2*(1), 8.

Hikmah, H., Suprapti, S., Juniarto, G., Widayati, T., & Ghozali, I. (2024). PELATIHAN DIVERSIFIKASI PRODUK OLAHAN DARI BAHAN TEPUNG UNTUK MENUMBUHKAN WIRAUSAHA IBU RUMAH TANGGA. *Jurnal Pengabdian Mandiri*, *3*(4).

Inayah, F. (2022). *Resepsi Sedekah Berupa Kue Apem dalam Tradisi Tahlilan di Dusun Demungan Kecamatan Maduran Kabupaten Lamongan (Studi Living Hadis)*. Universitas Islam Negri sunan Kalijaga Yogyakarta.

Indrayany, E. S., & Lestari, F. (2019). Analisis kesulitan siswa SMP dalam memecahkan masalah geometri dan faktor penyebab kesulitan siswa ditinjau dari teori van hiele. *Jurnal Math Educator Nusantara*, *5*(1). https://doi.org/10.29407/jmen.v5i2.13729

Nuh, Z. M., Hasanah, N., & Hanafi, I. (2021). Kontruksi Matematika Berbasis Budaya Melayu Sebuah Pendekatan Etnomatematika. *NUSANTARA; Journal for Southeast Asian Islamic Studies*, *17*(2).

Nuha, N. T., Putri, S. A., & Azzunkha, P. L. (2024). Kajian Teori : Pendekatan Pembelajaran Kontekstual Guna Meningkatkan Kemampuan Pemecahan Masalah Matematis. *PRISMA, Prosiding Seminar Nasional Matematika*, *4*, 324–327.

Paramita Resya, K. N., & Nurnoviyati, I. (2022). Eksplorasi Etnomatematika Pada Makan Khas Tegal Sebagai Sumber Literasi dan Sumber Belajar Matematika. *Jurnal Ilmiah Wahana Pendidikan*, *8*(7). https://doi.org/10.5281/zenodo.6579079

Ratriana, D., Purwoko, R. Y., & Yuzianah, D. (2021). Pengembangan E-modul Berbasis Etnomatematika yang Mengeksplorasi Nilai dan Budaya Islam untuk Siswa SMP. *AlphaMath : Journal of Mathematics Education*, *7*(1). https://doi.org/10.30595/alphamath.v7i1.8498

Rofik, A. (2019). Tradisi Slametan Dalam Perpektif Pendidikan Islam. *Attagwa: Jurnal Pendidikan Islam*, *15*.

Shofi, M. Q., & Maisaroh, S. (2020). Kajian Antropolinguistik Kue Apem Dalam Ritual Kematian (Tahlilan) Di Lingkungan Masyarakat Desa Tambakberas Jombang. *SASTRANESIA: Jurnal Program Studi Pendidikan Bahasa Dan Sastra Indonesia*, *8*(4). https://doi.org/10.32682/sastranesia.v8i4.1772

Warsino, A. (2017). Tradisi Tahlilan Upaya Menyambung Silaturahmi. *Ri"Ayah: Jurnal Sosial Dan Keagamaan*, *2*(2).

Yuliani, W. (2018). METODE PENELITIAN DESKRIPTIF KUALITATIF DALAM PERSPEKTIF BIMBINGAN DAN KONSELING. *QUANTA: Jurnal Kajian Bimbingan Dan Konseling Dalam Pendidikan*, *2*(2).

Yusanto, Y. (2019). Ragam pendekatan penelitian kualitatif. *Journal of Scientific Communication (Jsc)*, *1*(1).