



## Relationship between Mathematics education philosophy and traditional Malay culture in Serampang 12

Nina Fadilah<sup>1</sup>, Izwita Dewi<sup>2</sup>, Faiz Ahyaningsih<sup>3</sup>

<sup>1</sup>Universitas Pembangunan Panca Budi, Medan, Indonesia

<sup>2,3</sup>Universitas Negeri Medan, Medan, Indonesia

[ninafadilah@dosen.pancabudi.ac.id](mailto:ninafadilah@dosen.pancabudi.ac.id)<sup>1</sup>, [izwitadewi@unimed.ac.id](mailto:izwitadewi@unimed.ac.id)<sup>2</sup>, [faizahyaningsih@unimed.ac.id](mailto:faizahyaningsih@unimed.ac.id)<sup>3</sup>

### ABSTRACT

Philosophy requires humans to think intelligently to develop towards the next thought of knowledge. The presence of ethnomathematics is not a new thing but has existed since the introduction of mathematics itself as a form of advanced knowledge thinking related to mathematics learning. Through the concept of ethnomathematics, cultural practices can be studied so that students will better understand how their culture is related to mathematics. This study uses a qualitative descriptive research method with a type of ethnographic research that analyzes the movement pattern of traditional Malay dance culture in Serampang 12. The results of the research findings are in the form of variations in mathematics learning, in the form of media associated in the context of traditional Malay culture, so that students who have been considering boring and rigid learning can have a fun lesson because it is associated with the value of the beauty of a Traditional Dance who have a philosophy of politeness, order, togetherness or positive association. The exploration of movement patterns in the traditional dance of Serampang 12 also aims to make it easier for students to build a learning experience that connected to the visual and kinesthetic experience of students.

### ARTICLE INFO

#### Article History:

Received: 7 Sep 2024

Revised: 24 Nov 2024

Accepted: 26 Nov 2024

Available online: 29 Nov 2024

Publish: 29 Nov 2024

#### Keyword:

culture; Mathematics;  
Mathematics education;  
philosophy

#### Open access

Inovasi Kurikulum is a peer-reviewed open-access journal.

### ABSTRAK

Filsafat menuntut manusia agar berpikir cerdas sehingga manusia tersebut dapat berkembang menuju pemikiran pengetahuan yang selanjutnya. Kehadiran etnomatematika bukan suatu hal yang baru melainkan sudah ada sejak diperkenalkan ilmu matematika itu sendiri sebagai bentuk pemikiran pengetahuan lanjutan terkait dengan pembelajaran matematika. Melalui konsep etnomatematika dapat dikaji praktik budaya sehingga peserta didik akan lebih memahami bagaimana budaya mereka terkait dengan matematika. Penelitian ini menggunakan metode penelitian deskriptif kualitatif dengan jenis penelitian etnografi yang menganalisis pola gerakan budaya tari tradisional Melayu Serampang 12. Hasil temuan penelitian berupa variasi dalam pembelajaran matematika dimana media dikaitkan dalam konteks budaya tradisional Melayu, sehingga peserta didik yang selama ini menganggap pembelajaran membosankan dan kaku bisa menjadi pelajaran yang menyenangkan karena bisa dihubungkan dengan nilai keindahan suatu tarian tradisional serampang 12 yang memiliki filosofi kesopanan, keteraturan, kebersamaan atau pergaulan yang positif. Eksplorasi pola gerakan pada tarian tradisional Serampang 12 juga bertujuan untuk memberikan kemudahan peserta didik dalam membangun pengalaman belajar yang terhubung dengan pengalaman visual dan kinestetik peserta didik.

**Kata Kunci:** budaya; filsafat; Matematika; pendidikan Matematika

### How to cite (APA 7)

Fadilah, N. Dewi, I., & Ahyaningsih, F. (2024). Relationship between Mathematics education philosophy and traditional Malay culture in Serampang 12. *Inovasi Kurikulum*, 21(4), 2331-2346.

### Peer review

This article has been peer-reviewed through the journal's standard double-blind peer review, where both the reviewers and authors are anonymised during review.



### Copyright

2024, Nina Fadilah, Izwita Dewi, Faiz Ahyaningsih. This an open-access is article distributed under the terms of the Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) <https://creativecommons.org/licenses/by-sa/4.0/>, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author, and source are credited. \*Corresponding author: [ninafadilah@dosen.pancabudi.ac.id](mailto:ninafadilah@dosen.pancabudi.ac.id)

## INTRODUCTION

Mathematics in formal education is known as a subject taught in a structured and systematic way. The important role of mathematics can be seen from the value of the application of Mathematics as a science used to solve real-life problems. This factor is one of the reasons why Mathematics needs to be taught in tiered school education, such as elementary, middle, and high school levels. Tiered education includes elementary, middle, and high school (Wirahayu, 2020). Students' learning process is influenced by the concept of basic material learned in class at the basic level related to the ability to count, write, and read (Teranikha et al., 2024). From the statement above, it can be concluded that mathematics learning plays an important role in teaching from elementary education, with the aim that students can count.

Mathematics learning begins with concrete material and progresses to an abstract level. Jean Piaget's cognitive theory of mathematics learning states that elementary school children, around 6 to 12 years old, are at the concrete operational stage in the context of thinking (Handika et al., 2022). At this stage, children can perform arithmetic operations on concrete objects. When a person is 7 years old, they are at a particular thinking stage. Ages 7-8, 9-10, and 11-12 have different levels of mathematical ability. Each age group requires an appropriate model and approach to Mathematics learning. Delivering material will be very easy if the teacher can be creative in providing mathematics teaching materials, which are generally abstract, to things that are concrete or real and can be found in everyday life. This is one way to make improving students' understanding of the material being taught easier. Various strategies for teaching Mathematics to achieve maximum learning outcomes have been carried out, including implementing traditional culture-based learning.

Culture can be defined as something complex because it covers various aspects of society. Linking cultural elements in learning will make learning interesting if applied to a contextual culture. This is in line with the view that the connection of learning materials that follow the real world will make it easier for students to improve their understanding of the material given, and make it easier for students to connect the material taught with real situations or circumstances (Naja et al., 2022). One way to relate mathematical material to everyday life is by examining or reviewing local culture, which has become a tradition passed down from generation to generation. Teachers should start learning by tracing students' initial informal mathematical knowledge from parents, friends, or relatives, including the community around their homes. That way, students can start learning about real life, which aligns with the opinion that concrete things related to everyday experiences can be used as interesting learning resources. One innovative way to develop learning is to connect learning with local culture. Mathematics learning related to culture is called ethnomathematics (Syarifudin & Setianingsih, 2023). Mathematics learning that is innovative and interactive can be carried out familiarly with a cultural approach called ethnomathematics (Zulaekhoh & Hakim, 2021).

Learning that has been carried out in formal education has not varied many techniques in the learning process, where learning too often depends on teachers without giving students or learners the freedom to build their knowledge and understanding, one of which is by linking it to the local traditional culture that has been known by students since childhood or from the family environment. By connecting it to a culture already known to students, the learning process can provide more optimal results. Culture can be defined as something complex because it includes various aspects of society, and by linking cultural elements in learning, learning will become interesting if applied to a contextual culture (Naja et al., 2022). Mathematics in schools must be used to develop intelligence and skills and shape students' personalities. One way is to use a traditional local cultural approach. Mathematics will be easier to teach when linked to local culture. Hence, mathematics becomes an interesting and easy-to-understand learning for students because it

contains cultural elements already known and passed down from generation to generation (Minawati, 2020).

One of the cultures that can be directly linked to Mathematics is the traditional Serampang 12 dance, an artistic dance from North Sumatra. Culture is known as an element or reflection of the life of a group of people in the form of norms and values that regulate the ethics of community life, which are passed down from generation to generation. Art is part of a culture that expresses the beauty felt within humans (Fadhilah, 2022). In addition, art also has other functions, such as myths that play a role in establishing rules for orderly behavior and continuing traditions and cultural values. Learning mathematics linked to traditional culture, one of which is through conventional dance, aims to facilitate understanding of Mathematics material and preserve traditional culture, which is the nation's wealth. Many local cultures from a region have been replaced by Western culture. Even many local Eastern cultures in various areas have begun to be forgotten and displaced by Western views. Sometimes, early childhood education institutions fail to teach children about their local culture. As a result, children often do not know their local culture when they grow up. Preservation of regional culture should be taught from an early age to ward off the negative influence of foreign cultures that damage the moral and ethical values of the nation's next generation (Fadhilah, 2022).

According to the official website of the Ministry of Education and Culture of the Republic of Indonesia, dance is defined as a form of art that has a medium of expression or substance of movement with human movement. The character of folk dances, in general, is spontaneous movements originating from each person's skills. Folk dances are usually named according to the title of the music or song used to accompany the dance. Culture and education have an interrelated relationship where educated people have culture in the sense that cultured students have knowledge and insight, without forgetting the moral and ethical values taught by culture. In line with the description that culture and education are interrelated, it can be concluded that through education, we can form cultured people or individuals. With culture, we can also guide people to live by following the rules and norms (Pratiwi & Mushlihuddin, 2021). Mathematics learning cannot be separated from the influence of the field of philosophy to shape the characteristics of students in learning Mathematics. Therefore, learning Mathematics with character can also be linked to the role of local traditional culture. Philosophy is an important thing to consider in education. The important role of philosophy in shaping the personality of students can help solve educational problems (Ismail et al., 2022). Based on the description above, ideal education is when education is linked to local cultural values, where culture is also related to the values of the philosophy of mathematics education. The relationship between the philosophy of education and culture can be seen from the two having a mutually influencing relationship in forming human character, thinking, and behavior. Teachers must choose the appropriate philosophical school of thought for education, especially in learning (Nerita et al., 2023).

This flow can help deliver material and teaching to students to achieve the final learning goal optimally. Culture related to philosophy has an important role in Mathematics education. All mathematical activities, ranging from counting, finding, drawing, measuring, designing, and playing, are developed during learning with cultural elements that aim to strengthen multiculturalism (Nerita et al., 2023). The importance of the philosophy of mathematics in mathematics education lies in the formation of student character in mathematics learning. The important role of the Philosophy of Mathematics Education in Mathematics Learning is to realize that character education is related to the cultural values that are owned and have become traditions passed down from generation to generation (Sukmawati et al., 2022).

However, in reality, education at the formal school level has not been maximally aware of the important role of the philosophy of Mathematics education related to traditional culture to be implemented in the teaching and learning process. Mathematics is still considered an abstract and complicated subject because most of it is related to calculations that make students not interested in the subject, art, and they prefer to wait for answers from the teacher, and are not interested in trying to find their solutions and have

a low level of understanding of mathematical concepts. This can be seen from the Ministry of Education and Culture page, the Programme for International Student Assessment (PISA) 2022 results, which show a decline in international learning outcomes, one of which is due to the COVID-19 pandemic. Globally, the PISA 2022 score, which was followed by 81 countries, decreased. Indonesia's PISA 2022 score decreased even though the ranking increased. The decline in Indonesia's PISA score is thought to be due to learning loss during the COVID-19 pandemic. Based on the PISA 2022 report from the Organization for Economic Cooperation and Development (OECD), the quality of Indonesian education has decreased. This can be seen from the three competency scores related to literacy, numeracy, and science, all lower than the assessment in the previous three-year period. Namely, in 2018, Indonesia had an average score of 359; in 2022, this figure decreased by 12 points compared to the 2018 period, with a score of 371. Then, Indonesia's mathematical calculation numeracy score was 366 points, 13 points lower than the 2018 value of 379 points. In addition, Indonesia's science assessment is 383 points. The figure also decreased from 2018, which was 396 points.

The presence of ethnomathematics can be a solution to overcome the gap in mathematical communication, numeracy, and mathematical literacy, as well as the difficulties students face in understanding and interpreting the application of mathematical concepts in real life. This is emphasized by the opinion that ethnomathematics is mathematics related to culture. The existence of mathematics with its culture significantly influences mathematics lessons. Mathematics is abstract knowledge that is based on consistent truth. This is arranged in a hierarchical concept, where each mathematics subject is sequential and interconnected. Ethnomathematics provides an understanding of the relationship between three components, namely mathematics, educational philosophy, and culture, which support each other and cannot be separated. Culture is the basis of academic philosophy, and education makes humans part of the culture (Ranali & Astuti, 2023).

Implementing ethnomathematics in learning aims to shift the understanding of mathematics as a rigid scientific field by linking mathematical material with traditional culture, making mathematics a flexible scientific field that can be connected to conventional culture, which is interesting to learn. Research that examines mathematics and culture has been carried out continuously, starting from the formal education level of elementary school, junior high school, and high school, and up to the University level, where the research is an effort to vary mathematics learning, which is known as a rigid and monotonous subject. Fascinating culture or art will make mathematics learning more enjoyable and meaningful for students. Integrating culture in mathematics learning will make mathematics more flexible and can be linked to elements of art or culture that are interesting to learn.

Several studies have been conducted on implementing culture-based Mathematics learning as a form of effort to make Mathematics learning more meaningful. The Gobag Sodor culture can be developed into a medium in Mathematics learning where the rules of playing Gobag Sodor can be linked to the learning material for adding integers at the elementary school level. The study's results revealed the importance of the Gobag Sodor game as a learning medium for the material on adding integers (Sumiyati & Purwati, 2022). In addition, there is also a Tulungagung culture that can be used as a contextual mathematics learning tool that can help teachers provide understanding to students through local cultural elements. Furthermore, the results of the study stated that exploring basic universal mathematics activities in Tulungagung culture, such as counting, calculating, and forming shapes, can identify three cultural elements that contain the concept of Mathematics: Klethek, Anyaman Crafirafi, and Reyog Tulangagung (Wardani & Budiarto, 2022). Mathematics learning with the ethnomathematics concept found in Semarang lumpia food can be associated with spatial objects such as tubes with a composition consisting of vegetables, rice flour, egg white, and others with different weight sizes (weight units) (Anjarwati *et al.*, 2021).

Mathematics learning based on traditional culture can make the learning experience process meaningful for students by introducing the concept of Mathematics subject matter related to local or traditional culture. Suppose previous research linked mathematics learning with conventional culture in the form of Gobag Sodor, Tulangagung culture in the form of Klethek, Anyaman Crafirafi, Reyog Tulangagung, and traditional food from the Semarang Lumpia area. In that case, this study will examine the relationship between the philosophy of Mathematics education and traditional Malay culture by exploring the concept of geometric transformation in Mathematics lessons contained in the Serampang 12 Dance movements of North Sumatra. It is hoped that this research in the future can be used as a basis for varying the planning of mathematics learning that is fun to learn and becomes an attraction for students to have awareness in following the mathematics learning process to be able to interpret the philosophy of traditional cultural values as a cultural heritage of the nation.

## LITERATURE REVIEW

### Philosophy of Mathematics Education

Philosophy and education are closely related, where education must be based on the realization of philosophy, which is a view or thought about the values of knowledge. The relationship between philosophy and education is like two sides, namely two aspects of one essence, because education is a practical application of philosophy (Afifuddin & Ishak, 2022). The philosophy of education studies educational problems, which are divided into three issues, namely ontological, epistemological, and axiological. Knowledge of reality is studied by metaphysics or ontology, knowledge of knowledge is learned by epistemology, and knowledge of values is studied by axiology, including ethics and aesthetics. The existence of philosophy in education will provide moral values for the development of knowledge, where knowledge is not only studied theoretically, but there are practical aspects that can be related to everyday life. Philosophical methods are important in understanding how knowledge is acquired and developed. Philosophical ideologies such as coherence theory and pragmatism indicate that expertise must be theoretically correct and can be applied in everyday life (Oktavia, 2024).

Mathematics in learning, which has been known as a rigid subject only related to formula calculations with definite results, often makes mathematics viewed as a rigid or inflexible science. For this reason, the presence of philosophy in mathematics education enriches the development of mathematics. It ensures that this discipline consists of formulas and numbers and is rooted in broader human thought. The Philosophy of Mathematics aims to provide a record of the nature and methodology of Mathematics and to understand the position of mathematics in human life. Furthermore, the relationship between mathematics and the philosophy of education is interrelated (Sari & Armanto, 2021). Mathematics and the philosophy of education discuss knowledge based on reason and rationality. Seeking truth in the field of education and discussing educational phenomena together. The results of the conclusions of this study can support the relationship between the philosophy of mathematics education, which is interrelated to discuss various phenomena of Mathematics education in life, meaning that Mathematics can be considered a flexible science and related to everyday life, not only as a science that has been deemed abstract and rigid (Sari & Armanto, 2021).

Mathematics learning based on the philosophy of Mathematics education focuses on how to teach and understand Mathematics and how to convey basic concepts and principles of Mathematics to students. The way teachers teach and the ability to understand the material presented are two interrelated actions when the learning process is carried out. For this reason, the philosophy of mathematics education plays a significant role in shaping teacher creativity in delivering an effective learning process. The philosophy of mathematics influences how teachers understand mathematics, which then influences how teachers teach mathematics in schools (Isnaintri et al., 2023). If a teacher thinks that mathematics is only about



numbers and formulas, then he or she belongs to the formalist group. Suppose mathematics teaching only relies on logic or common sense, and finds it challenging to accept mathematical truths that contradict common sense. In that case, the teacher can be categorized as a supporter of the logical school. In addition, if a teacher does not understand the structure of mathematics well, it means that he or she belongs to the category of teachers who misunderstand or are mistaken in concepts (Isnaintri et al., 2023).

Mathematics learning aligned with educational philosophy will provide added value, as it offers meaningful learning experiences to students during the learning process. With the educational philosophy that underlies learning, students will be aware of contributing and interested in following the learning process from the teacher's perspective. They will also have the awareness to be creative in planning learning so that learning objectives can be achieved optimally. The mathematics learning process requires a connection between the Mathematics learning taught by teachers in class and the Mathematics problems encountered in the real world. Various traditions and human behaviors within a culture can serve as a link between Mathematics learning and the real world (Dewi & Simamora, 2023).

The application of mathematics in community culture is known as ethnomathematics. Formal mathematics taught in class by teachers will be easier for students to understand if applied to real-life conditions. The philosophical meaning embedded in culture can also add value to studying materials associated with traditional cultural elements, such as dance, conventional musical instruments, regional houses, and regional specialties. This aligns with the research; the philosophy theory of values discusses ethics and aesthetics. Ethics are the rules of human behavior, which study human behavior from both good and bad sides in normative conditions involving rules (Mytra et al., 2023). The philosophy of mathematics education in mathematics learning also aims to help students behave well according to the rules and norms that exist in society by linking mathematical material with local traditional culture.

## **Ethnomathematics**

Mathematics is a field of science that may seem monotonous and rigid. However, the concepts it encompasses are present in everyday life, where mathematics is often used as a solution to overcome problems. For this reason, mathematics is not inherently foreign and can always be applied to the context of real life. Human behavior and procedures that are normatively structured, including those in the culture that applies in society, have been passed down from generation to generation. For this reason, mathematics and culture are both found in everyday life. Ethnomathematics is a form of mathematics influenced by or based on cultural perspectives. In simple terms, ethnomathematics is the study of mathematics concerning culture, focusing on ethnomathematical objects (Sartika et al., 2023). Furthermore, ethnomathematics is a form of contextual learning that links mathematics to traditional cultural values (Turmuzi et al., 2022). The application of ethnomathematics in schools aims to enhance students' understanding and provide meaningful learning that is accessible to them by linking it to cultural elements that are already familiar, such as hereditary traditions.

The varying levels of students' understanding in a class require teachers to be creative and innovative in structuring the learning process in the classroom so that meaningful learning can be achieved and students do not easily forget the material they have learned. The presence of ethnomathematics will provide a solution for mathematics learning, which has seemed rigid and inflexible. With ethnomathematics, which bridges mathematics and culture, the view of mathematics as a complicated and uninteresting subject can shift to a more popular one, as it incorporates cultural elements, one of which can be linked to traditional dance and art culture. In mathematics lessons, the relationship between the jaipong dance and the concept of a traditional dance can be better understood by students. This makes the learning material the teacher teaches interesting and gives the impression that mathematics is not only studied academically but is also very relevant to students' lives (Hartanti & Ramla, 2021).

There have been many previous studies related to ethnomathematics, which, in general, when mathematics is associated with culture, one of which is traditional dance, it will provide a new nuance to the unique subject of mathematics. Students are interested in teaching it because there is flexibility and flexible values that are linked to the field of traditional arts. Ethnomathematics is a concept in mathematics learning connected to dance, traditional houses, traditional foods, and objects that incorporate elements of traditional culture, among others. The content of ethnomathematics is in the form of activities and mathematical aspects related to traditional dance, especially in dance movements. The most common element of mathematics found is the concept of geometry, especially in the material of angles, lines, flat shapes, spatial shapes, and geometric transformations. The results of this study can alter the perception that mathematics can be learned in a fun and engaging way through cultural exploration (Hartanti & Ramlah, 2021).

## **Malay Traditional Culture Serampang Dance 12**

Education and culture are two interrelated elements. Education can shape humans into cultured and ethical people who uphold the principles of moral values and applicable rules. Difficulties in learning Mathematics can be associated with cultural elements, including traditional Malay culture. To overcome the difficulties students face in learning geometry material, it can be connected to conventional Malay cultural arts in the form of the Serampang dance. The Serampang Dance 12, created by O.K. Adram, has been reduced to patterns and symbols. Then, Guru Sauti, a relative of O.K. Adram, studied this dance and, with his permission, composed a new version by assigning meanings to each type of dance. Guru Sauti's goal is for this dance to be readily accepted by the general public and universally recognized (Pratiwi, 2022). The Serampang Dance 12 is accepted by the people of East Sumatra, the Indonesian nation, and the international world (Syauqii, 2021). Serampang 12 Dance has many types of movements that can be associated with material in mathematics subjects, one of which is the Serampang 12 Dance movement, which can be associated with geometric transformations to stimulate students to study Mathematics and consciously carry out Mathematical literacy by listening to and paying attention to the movement patterns in the traditional dance. The movement pattern of the Serampang 12 Dance demonstrates polite movements following the noble values of Malay cultural customs, where women and men are expected to maintain a respectful distance and avoid physical contact. This dance emerged during the time of President Soekarno as a means to reject Western culture, and it remains a part of the younger generation's cultural heritage. It is still studied today (Syauqii, 2021).

## **METHODS**

This study uses a descriptive qualitative method with an ethnographic approach. The quantitative approach is based on specific reasons, including problems related to collecting primary data in real life. According to Sugiyono in his book *"Quantitative and Qualitative Research Methods and R&D"*, qualitative research is typically used by researchers to understand various phenomena in depth, using data collected in non-numerical form through interviews, observation, and documentation techniques. The qualitative approach focuses on narrative, and a descriptive account of the phenomenon being studied can also be employed in an exploratory study to find a solution. Ethnographic and qualitative research have a close relationship, with ethnography being one of the methods found in qualitative research. Qualitative research typically studies a phenomenon, whereas ethnography is more specific in examining culture, habits, and social relations within social groups in society, according to Hadi et al. (2021) in their book, *"Qualitative Research on Phenomenological Studies, Case Studies, Grounded Theory, Ethnography, Biography"*. Meanwhile, the ethnographic approach is generally used to depict, explain, and analyze the cultural

elements of a community or ethnic group, specifically in this article, which relates to Mathematics (Pathuddin & Nawawi, 2021).

The focus of this study on ethnomathematics is the exploration of ethnomathematics in the Serampang 12 dance. The data collection methods used by researchers include library research, observation, and interviews. The library data researchers use is obtained by exploring previous research publications related to the traditional Malay dance of Serampang 12. Observations have been made by examining the form of dance movements and analyzing them directly and through related literature. Meanwhile, interviews were conducted with one of the traditional dance trainers, a dance teacher at a private high school, and a traditional dance studio trainer with extensive experience in training and teaching traditional dance in Medan City. The data analysis technique employed is the Miles and Huberman Model, specifically focusing on data reduction, data display, and conclusion drawing. Data reduction is selecting and focusing on simplifying, abstracting, and transforming raw data from field notes. Data presentation is an activity in which information is organized, allowing the opportunity to draw conclusions and take action.

## **RESULTS AND DISCUSSION**

### **Basic Assumptions in the Philosophy of Mathematics**

In learning Mathematics, there are fundamental concepts related to the philosophy of Mathematics, which are basic questions concerning the nature, truth, and concepts of Mathematics. Some basic assumptions in the philosophy of Mathematics related to learning Mathematics can be summarized as follows: Mathematics is an abstract science not bound by space and time, yet it has an objective reality that follows human logic and thought. In teaching materials related to Mathematics, teachers face several difficulties because they struggle to find the right approach to apply abstract mathematical concepts to real-life situations, making it difficult for students to understand what is being taught by the teacher (Ismail et al., 2022). Based on the results of interviews with subject teachers at a private vocational school in Saentis Percut Sei Tuan, it was stated that the difficulties experienced while being a Mathematics subject teacher were when the Mathematics material to be taught had an abstract concept so that students tended to find it difficult to accept the material and did not enjoy the learning process carried out, learning seemed rigid because the material was only related to the context of numbers and Mathematical formulas which made students lazy to play an active role in learning that took place in class.

Students not interested in participating in the learning process from the start will hinder the achievement of meaningful learning. Learning is no longer a need or a form of awareness of the importance of science, but rather a compulsion that is made into a form of necessity. Whether they want to or not, they must still be studied. The role of students as active learners in learning has shifted because there is no opportunity to participate and a lack of interest in participating in the learning process, based on the results of interviews with Mathematics teachers that teachers in private vocational schools have so far only provided classical material in one direction so that students tend to become passive learners and will slowly become comfortable with these conditions not interested in finding solutions to the problems presented because the difficulty in finding solutions to a problem makes students prefer to wait for answers from the teacher.

The difficulties in this learning process can be overcome if teachers understand the relationship between philosophy and the Mathematics learning process. Mathematics is viewed as an abstract structure or reality in mathematical platonism, where the object of mathematics is considered the same as a physical object related to ideas or concepts. Platonism has a specific view regarding the object of Mathematics, where Mathematics is traced through the stages of searching and proving. Platonist philosophers have a special view of Mathematics, relating it to the measurement and proof of real objects (Wahyuni et al., 2022). Furthermore, based on the results of an interview with one of the students who was a student at a vocational school in the Percut Sei Tuan area, it was stated that learning Mathematics is a subject that is



very feared because of its level of difficulty and rigid material, primarily when associated with abstract calculations related to formulas, these students are not interested in participating in learning because the material studied only comes from a theoretical context, not associated with things that can increase interest in learning, one of which is elements found in traditional culture.

For this reason, a solution is needed when there are problems in this learning, namely by linking abstract concepts contained in Mathematics lessons with fundamental concepts or real life so that Mathematics material is not rigid and more flexible, one of which is by linking Mathematics with the idea of traditional dance, in exploration related to Mathematics, with the philosophy of Mathematics, an investigation will be carried out to find out whether Mathematics is a collection of conventional rules or an entity whose existence in nature was discovered initially by humans. The philosophy of mathematics also plays a role in the development of mathematics by examining the origins of mathematics and enabling an understanding of the nature and structure of mathematics related to the objects being investigated. This allows for consideration of whether the object truly exists as an entity or is merely a mental construction. With the philosophy of mathematics, students will, in practice, be led to understand mathematical proof both formally and informally, as well as develop mathematical understanding and visualization of mathematical objects (Hamami & Morris, 2020).

The Philosophy of Mathematics also plays a role in connecting Mathematics with real-world concepts. The question arises whether mathematics is merely a descriptive tool for narrating calculations related to data in the real world or whether mathematics is indeed a real entity in the universe. The Philosophy of mathematics plays a crucial role in helping to study Mathematics not only as an abstract object but also in its connection to the real world. The Philosophy of Mathematics is not to contemplate or reflect on questions related to mathematics, but rather to make a full contribution to connecting mathematics with real-world concepts. This has been done since ancient times, as evidenced by ancient buildings that can be studied philosophically and mathematically (Blåsjö, 2022). A basic understanding of the philosophy of Mathematics will make it easier for teachers to be creative in developing a more effective and efficient learning method. Teachers who already understand the basic assumptions and role of the philosophy of Mathematics will have no difficulty teaching abstract Mathematics material. Teachers can connect abstract Mathematics concepts with real or real life, making it easier for students to understand the idea and achieve goals in a meaningful learning process closely related to the surrounding environment (Permita et al., 2022).

### **Exploration of the Concept of Geometric Transformation Material**

Teachers who have a basic understanding of the philosophy of mathematics will find it easy to relate abstract concepts from the mathematics subject matter to real life. One way to relate mathematical concepts to real life is through culture or traditional customs that are upheld and passed down from generation to generation. This can be achieved by incorporating learning related to geometric transformation materials into the context of real-life traditional culture. The role of culture is highly influential in the concept of learning mathematics, where a familiar cultural context can make it easier for students to learn Mathematical material (Turmuzi et al., 2022). Traditional Malay culture can be explored to improve students' understanding, one of which is by conducting learning using videos that stimulate students' Mathematical literacy in listening to and paying attention to movement patterns in traditional Malay dances can be in the form of the Persembahan Dance, Zapin Dance, Mak Inang Dance, Serampang 12 Dance, and so on.

Traditional dance art can be utilized as a medium to facilitate a meaningful learning process. Dance can teach mathematics more engagingly and realistically, allowing students to develop creative thinking and hone their critical and logical thinking skills (Ranali & Astuti, 2023). In line with the description above

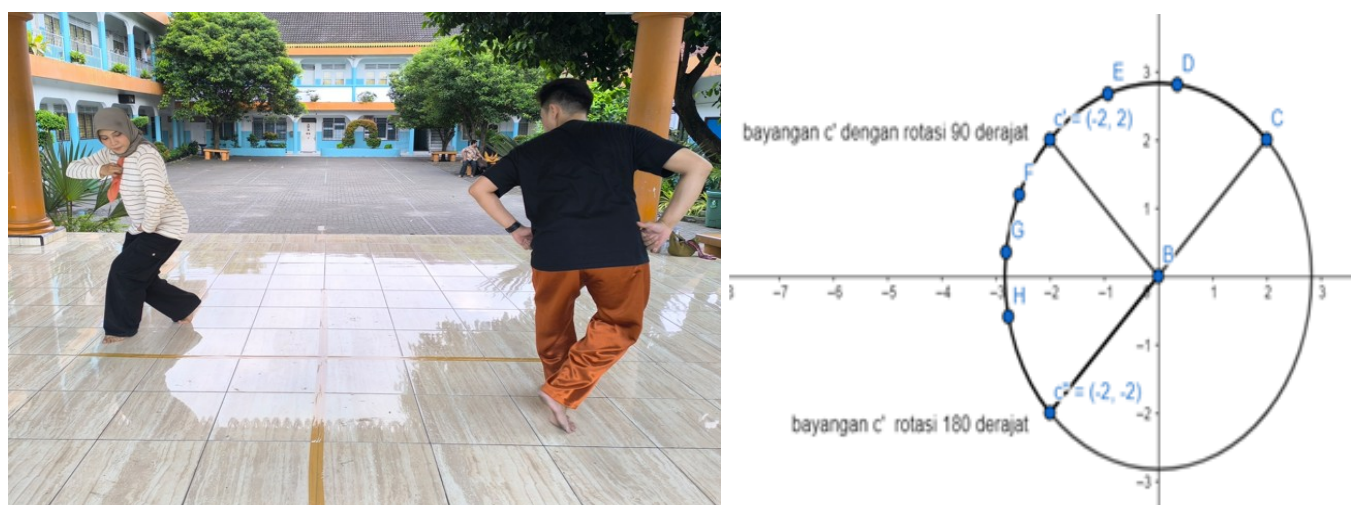
regarding the role of dance in facilitating the meaningful learning process for mathematics subjects, in this study, the author attempts to explore several patterns of Serampang 12 Dance movements to make it easier for students to understand mathematical concepts related to geometric transformation material consisting of reflection, rotation, transformation and dilation. The exploration of the Serampang 12 Dance movement pattern aims to provide students with an understanding of geometric transformation materials, including reflection, transformation, rotation, and dilation.

**Reflection**, namely the mapping of an object to the reflection axis, creates a shadow with the same distance from the axis but is on the opposite side. This reflection movement is evident at the beginning of the Serampang 12 Dance, as depicted in **Figure 1**.



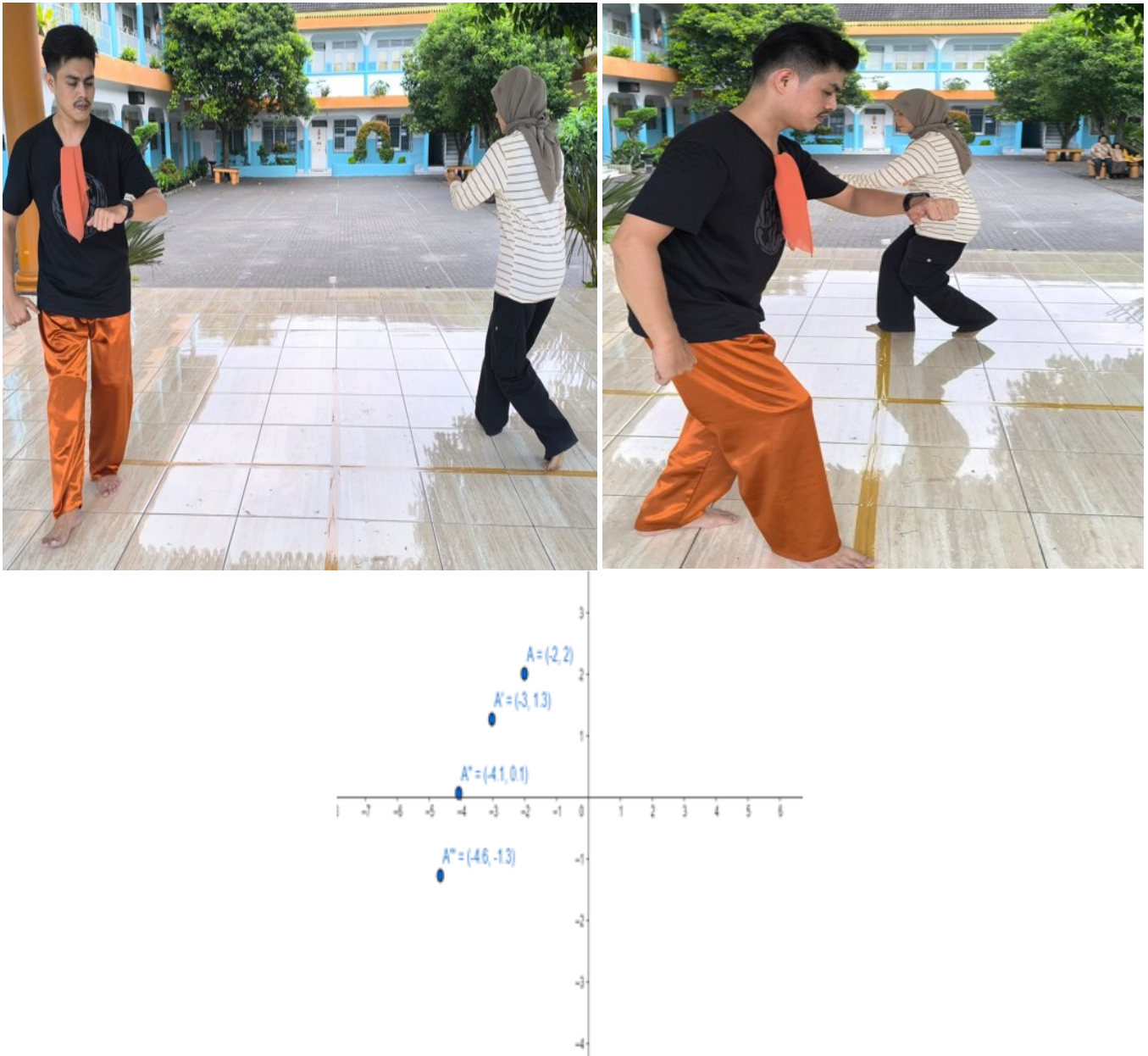
**Figure 1.** Reflection on the initial dance movement  
*Source: Researcher 2024*

**Rotation** is a type of transformation that rotates an object or point around a certain point (the center of rotation) by a certain angle and in a specific direction (clockwise or counterclockwise). This rotational movement is evident in the dizzying movement of the Serampang 12 Dance, as depicted in **Figure 2**.



**Figure 2.** Rotation in the dizzy dance movement  
*Source: Researcher 2024*

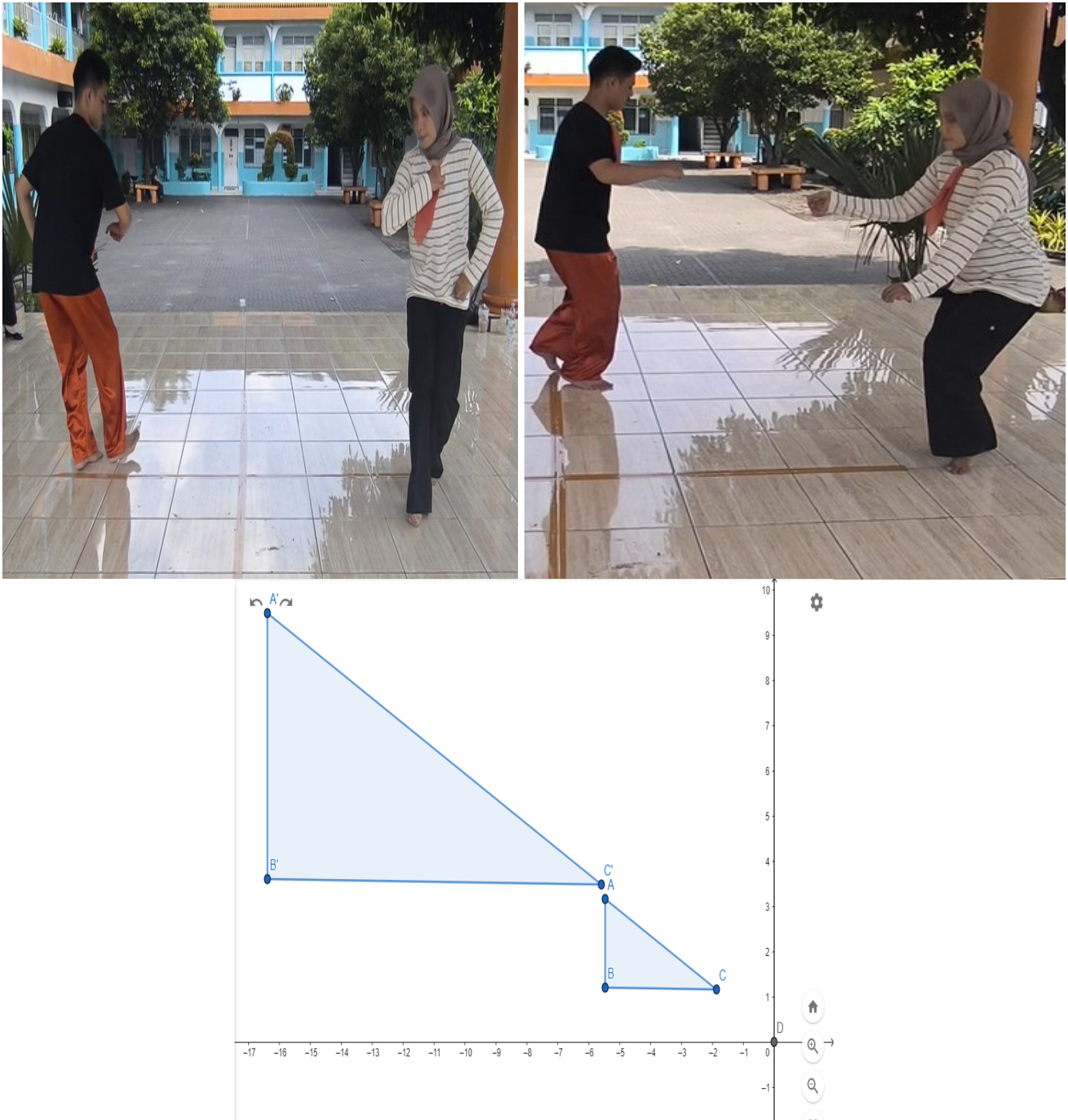
**Translation** is a transformation that shifts each point on an object by a certain distance and direction. The translated object retains its original size, shape, and orientation; only its position changes. This translation movement is evident in the walking movement of the Serampang 12 Dance, as depicted in **Figure 3**.



**Figure 3.** Walking dance movement, translation in geometric transformation  
*Source: Researcher 2024*

**Datasi** is a type of transformation that shifts each point on an object by a certain distance and direction. The translated object retains its original size, shape, and orientation; only its position changes. This datation movement can be seen in the movement of the legs, opening and elbowing of the Serampang Dance 12 as depicted in **Figure 4**.





**Figure 4.** Dilatation with the movement of the legs opening and the elbows in the Serampang 12 dance  
 Source: Researcher 2024

### Philosophical Values of Serampang Malay Traditional Dance 12

This movement's ethical and polite values are that social relations and ethics are still upheld through polite values maintained in dress and behavior, thereby creating positive values in social interactions based on national morals and Eastern traditional ethics. Students can also interpret the movements in the Serampang 12 Malay traditional dance in the form of ethical values that are maintained by women where their movements do not show contortions, do not look at the opposite sex, mostly look down with a shy attitude and keep a smile that is not excessive in movement, do not touch or be close together, which indicates that it is a form of social interaction that should not be too loose or free between men and women. Polite behavior must be maintained following customs and traditions, as well as religious values, which

dictate that women should not accentuate their curves excessively in dress and behavior, upholding the values of politeness when socializing with the opposite sex (Nasution *et al.*, 2023).

This dance's delivery of politeness and ethical values is necessary when linking it to learning at the formal school level of Vocational High School. At this level, students have begun to get to know the opposite sex. Introducing traditional Malay customs will raise awareness of the importance of preserving the concept of conventional culture, which is rich in traditional customs, to fortify itself from the influence of Western culture, which can damage the moral values of the nation's children if Western culture as a whole is absorbed without a filtering process. In addition, this art is also intended to express cultural values, ethics, aesthetics, and other aspects of Malay civilization, as stated by Takari in his work entitled "Ronggeng and Serampang 12". In line with this, in the context of the world of education, Serampang 12 Dance is preserved to raise awareness among young people to maintain healthy relationships and avoid what is known as free association. According to Islamic law, there are boundaries between women and men who are not mahram, and this ethic must be instilled in the family, social environment, and school. By upholding the values of politeness, a generation of successors to the nation will be born who are moral and have high integrity.

## CONCLUSION

Based on the discussion results, it can be concluded that the movement pattern of the Serampang 12 Dance in North Sumatra possesses aesthetic value related to Malay culture. In addition to having aesthetic value, the movement pattern of the Serampang 12 Dance also contains Mathematical values, such as in the concept of geometry, namely reflection, rotation, translation, and dilation. The philosophical values contained in the Serampang 12 Dance movement can also provide students with positive moral values to maintain social interactions and uphold the values or norms of politeness, thereby receiving character education. The connection between Mathematics learning and the culture known to students will increase interest in understanding the material contained in the dance movements displayed, thus creating a flexible impression of the geometric transformation material contained in the Mathematics subject. Geometric transformation is one of the materials associated with the traditional dance culture of Serampang 12. By listening to and visually observing dance movements, either directly or through YouTube videos, one can deepen one's appreciation for the nuances of local culture in the North Sumatra area and gain a more comprehensive understanding of the surrounding culture. Teachers are expected to be aware and willing to apply the philosophy of Mathematics education in relation to the culture in the student environment, making it easier for students to understand the Mathematics problems that will be presented, thereby facilitating a meaningful learning process. For formal school educational institutions, they should encourage the use of culture in the learning process. This is done to further introduce the attitude of love and respect for culture to students; in addition, using culture in the learning process will make it easier for students to understand the subject matter, especially in Mathematics subjects.

## AUTHOR'S NOTE

The author declares that there is no conflict of interest related to the publication of this article and confirms that the data and content of the article are free from plagiarism. The author would like to express his deepest gratitude to Mrs. Izwita Dewi and Mrs. Faiz Ahyaningsih, lecturers in the Philosophy of Mathematics Education course, who provided materials related to the article's title and offered positive suggestions during the review process.



## REFERENCES

- Afifuddin, A., & Ishak, I. (2022). Landasan filosofis pendidikan Islam: Konstruksi tipologis pendidikan Islam di era modern. *Al-Musannif*, 4(2), 119-134.
- Anjarwati, S., Aryani, A. E., Azizah, F. F., & Abdullah, A. A. (2021). Eksplorasi etnomatsains pada lumpia Semarang serta implikasi dalam pembelajaran Matematika dan Sains. *Pendipa: Journal of Science Education*, 6(1), 183-192.
- Blåsjö, V. (2022). Operationalism: An interpretation of the philosophy of ancient Greek geometry. *Foundations of Science*, 27(2), 587-708.
- Dewi, I., & Simamora, E. (2023). Perspektif filsafat pendidikan Matematika tokoh masyarakat Aceh Utara dalam praktik perhitungan faraid. *Axiom: Jurnal Pendidikan dan Matematika*, 12(2), 189-202.
- Fadhilah, M. N. (2022). Nilai-nilai budaya lokal dalam pengembangan karakter anak usia dini pendahuluan. *Jurnal Tunas Siliwangi*, 8(1), 41-51.
- Hamami, Y., & Morris, R. L. (2020). Philosophy of mathematical practice: A primer for Mathematics educators. *ZDM*, 52(6), 1113-1126.
- Handika, H. H., Zubaidah, T., & Witarsa, R. (2022). Analisis teori perkembangan kognitif Jean Piaget dan implikasinya dalam pembelajaran Matematika di sekolah dasar. *Didaktis: Jurnal Pendidikan dan Ilmu Pengetahuan*, 22(2), 124-140.
- Hartanti, S., & Ramlah, R. (2021). Etnomatematika: Melestarikan kesenian dengan pembelajaran Matematika. *Ideas: Jurnal Pendidikan, Sosial, dan Budaya*, 7(2), 33-42.
- Ismail, H. H., Dewi, I., & Simamora, E. (2022). Keterkaitan antara filsafat Matematika dengan model pembelajaran berbasis budaya. *Paradikma Jurnal Pendidikan Matematika*, 15(2), 39-46.
- Isnaintri, E., Faidhotuniam, I., & Yuhana, Y. (2023). Filsafat realisme Aristoteles: Mengungkap kearifan kuno dalam implementasi pembelajaran Matematika. *Teorema: Teori dan Riset Matematika*, 8(2), 247-256.
- Minawati, M. (2020). Potensi penerapan nilai-nilai budaya lokal pada pembelajaran Matematika di sekolah dasar. *Jurnal Math-UMB.edu*, 7(2), 24-29.
- Mytra, P., Kaharuddin, A., Fatimah, F., & Fitriani, F. (2023). Filsafat pendidikan Matematika (Matematika sebagai alat pikir dan bahasa ilmu). *Al Jabar: Jurnal Pendidikan dan Pembelajaran Matematika*, 2(2), 60-71.
- Naja, F. Y., Mei, A., & Sa'o, S. (2022). Pembelajaran kontekstual berbasis etnomatematika dalam meningkatkan hasil belajar siswa ditinjau dari kemampuan matematis. *Jupika: Jurnal Pendidikan Matematika*, 5(1), 38-45.
- Nasution, A. G. J., Syahfitri, A., Muatika, N., Lubis, P. R., & Ritonga, W. R. (2023). Tari Serampang Dua Belas: Analisis pertunjukan dan pemaknaan tari di Kota Medan. *At-Tadris: Journal of Islamic Education*, 2(2), 164-179.
- Nerita, S., Ananda, A., & Mukhaiyar, M. (2023). Pemikiran konstruktivisme dan implementasinya dalam pembelajaran. *Jurnal Education and Development*, 11(2), 292-297.

- Oktavia, Y. T. N. (2024). Pendekatan filsafat dalam integrasi pendidikan formal, non-formal, dan informal di Indonesia. *Konstruksi Sosial: Jurnal Penelitian Ilmu Sosial Informal di Indonesia*, 4(2), 65-71.
- Pathuddin, H., & Nawawi, M. I. (2021). Buginese ethnomathematics: Barongko cake. *Journal on Mathematics Education*, 12(2), 295-312.
- Permita, A. I., Nguyen, T. T., & Prahmana, R. C. I. (2022). Ethnomathematics on the Gringsing batik motifs in Javanese culture. *Journal of Honai Math*, 5(2), 95-108.
- Pratiwi, S. A. (2022). Pengembangan Tari Serampang 12 sebagai media pembelajaran berbasis etnomatematika materi geometri transformasi. *Jurnal Ilmiah Mahasiswa Pendidikan*, 2(1), 1-13.
- Pratiwi, S. A., & Mushlihuiddin, R. (2021). Desain pengembangan Tari Serampang 12 sebagai media pembelajaran etnomatematika materi geometri transformasi. *Edumatika: Jurnal MIPA*, 1(1), 11-16.
- Ranali, R., & Astuti, H. P. (2023). Etnomatematika pada gerak Tari Kembang Tanjung. *Omega: Jurnal Keilmuan Pendidikan Matematika*, 2(3), 111-121.
- Sari, D. N., & Armanto, D. (2021). Matematika dalam filsafat. *Jurnal Pendidikan dan Matematika*, 10(2), 202-209.
- Sartika, B., Litik, Y., Argarini, D. F., & Utomo, I. B. (2023). Eksplorasi etnomatematika pada artefak peninggalan sejarah di kota NTT. *Jurnal Ilmiah Matematika Realistik (JI-MR)*, 4(1), 79-88.
- Sukmawati, S., Jamaluddin, J., Yasinta, Y., Tantri, T., Sisi, S., Wahyuni, S., ... & Bela, B. (2022). Penerapan media monopoli Pancasila untuk meningkatkan hasil belajar siswa pada mata pelajaran PPKN. *Jurnal Kewarganegaraan*, 6(1), 720-724..
- Sumiyati, S. & Purwati, P. (2022). Implementasi etnomatematika melalui permainan tradisional “gobag sodor” pada materi bilangan bulat. *Jurnal Lensa Pendas*, 7(2), 77-84.
- Syarifudin, A., & Setianingsih, S. (2023). Meningkatkan hasil belajar siswa pada mata pelajaran IPS pokok bahasan potensi ekonomi lingkungan melalui pembelajaran Contextual Teaching and Learning (CTL) di kelas VII MTs Tarbiyah Islamiah Kecamatan Beji Kota Depok. *Jurnal Tunas Aswaja*, 2(1), 60-71.
- Syauqii, F. (2021). Tari Serampang Dua Belas: Sejarah dan eksistensinya hingga kini. *Local History and Heritage*, 1(1), 1-5.
- Teranikha, E., Fatonah, S., & Saputro, S. A. (2024). Penggunaan model teams games tournament untuk meningkatkan keaktifan siswa pada mata pelajaran matematika. *Jurnal Inovasi, Evaluasi dan Pengembangan Pembelajaran (JIEPP)*, 4(1), 24-29.
- Turmuzi, M., Sudiarta, I. G. P., & Suharta, I. G. P. (2022). Systematic literature review: Etnomatematika kearifan lokal budaya sasak. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 6(1), 397-413.
- Wahyuni, A., Rochmad, Isnarto, & Hidayati, D. W. (2022). Aliran-aliran pada periode krisis dalam filsafat matematika: Sebuah kajian teori. *Seminar Nasional Matematika dan Pendidikan Matematika*, 7(1), 25-28.

- Wardani, G. V., & Budiarto, M. T. (2022). Etnomatematika: Konsep Matematika pada budaya Tulungagung. *MATHEdunesa*, 11(1), 210-218.
- Wirahayu, S. (2020). Upaya meningkatkan hasil belajar matematika materi pemangkatan dan penarikan akar bilangan cacah pada siswa kelas V SD Negeri Paya Bili I dengan menerapkan model pembelajaran problem solving di semester ganjil tahun pelajaran 2019/2020. *Serambi Konstruktivis*, 2(1), 1-10.
- Zulaekhoh, D., & Hakim, A. R. (2021). Analisis kajian etnomatematika pada pembelajaran matematika merujuk budaya Jawa. *JPT: Jurnal Pendidikan Tematik*, 2(2), 216-226.