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Implementation of Mathematics Philosophy In Multicultural Education

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ABSTRACT

The aim of this research is to explore the implementation of mathematical philosophy in multicultural education. The research method used is the library research method, namely by conducting studies related to multicultural education, philosophy of mathematics, and the implementation of philosophy of mathematics in multicultural education. The research results showed that mathematical philosophy can be implemented in multicultural education, namely in the field of epistemological studies. In the field of epistemological studies, the philosophy of mathematics talks about the origins of the formation of mathematics and the study of knowledge about mathematics. The study of knowledge about mathematics cannot be separated from the characteristics of certainty, truth, objectivity, universalism and rationality. These characteristics can ultimately become the forerunner in the implementation of multicultural education. So as to create multicultural education that upholds justice, equality and unity.
***Keywords**: multicultural education, philosophy of mathematics.*

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INTRODUCTION

Indonesians are spread across a diverse environment, starting from mountainous areas, coastal areas, and landlocked areas. This has led Indonesia to become a multicultural country that has a variety of religions, races, tribes, and cultural customs. Religions in Indonesia consist of six major religions: Islam, Christianity, Catholicism, Buddhism, Hinduism, and Konghucu. Indigenous Indonesians comprise more than 300 tribes with unique cultural identities and languages (Danoebroto 2012). This diversity can be a source of wealth but it can also be a trigger for the division of nations..

The Indonesian national motto, Bhineka Tunggal Ika, should incorporate concepts and practices of diversity and multiculturalism to strengthen the unity of the Indonesians. There are still many conflicts in Indonesia due to religious and cultural differences between Indonesian peoples, and this constrains the unification of Indonesia. A multicultural nation like Indonesia must look to the future and deal wisely with the phenomenon of cultural heterogeneity (Ghazi and Muthohar 2012).

As mentioned by Sirate (2015) on the positive side, the diversity of tribes, languages, and religions raises a peculiar pride in the cultural diversity characteristic of the Indonesian people that reflects the values and cultural character of the country and today is still well preserved. However, the preservation of cultural values, and cultural features cannot strengthen the collective consciousness of this nation, and such diversity is a common asset and property that must always be dug, developed, and built together (Sirate, 2015).

The attempt to counteract the negative impact of such diversity is to advance the concept of equality. In the field of education, cultural diversity often called multiculturalism also has a great influence. Many issues or phenomena state the injustice in obtaining the right to education. Many different treatments are given to majority groups with a particular minority group, thus creating disparities between majority and minority groups.

Multicultural education originally grew from the idea and awareness of the cultural diversity born after the outbreak of World War II. The emergence of multicultural education was linked to international political developments related to Human Rights and also related to freedom from colonialism, racial discrimination, and others. Moreover, multicultural education also looks at society as a whole by considering that a common attitude is based not only on social structural disparities but also on the presence of injustice, poverty, oppression, etc.

Multicultural education is a process that appreciates pluralism and heterogeneity due to the diversity of cultures, tribes, and beliefs (religions) and develops human potential to the maximum (Ibrahim 2015). Align with Amin (2018) mentions that multicultural education is an education that focuses on building a way of life that respects cultural diversity and lives honestly and tolerantly in a highly multicultural society.

One of the important purposes of the concept of multicultural education is to help students acquire knowledge and respect for others who have different ethnically, culturally, and individual values. By instilling a multicultural spirit in schools, we become a medium of education and awareness for young generations to accept cultural differences, religions, races, tribes, and needs and want to live together in

peace. For this process to proceed as expected, readiness to accept that multicultural education will be dissocialized and disseminated through educational institutions and, if possible, included as part of the curriculum at various levels in public and private education institutions.

The application of multicultural education in schools is also related to the knowledge acquired by students in the learning process. In the process of knowledge transfer can be given values that support the values of such multicultural education. Among the knowledge that exists is mathematics. Like an opinion, Sadewo et al., (2022) mention that mathematics belongs to science. The birth of mathematics aims to create ease and solve various problems in life. To clearly understand the position and role of mathematics, then philosophy is a process of thinking, revealing the meaning of the existence of math (Sinaga et al. 2021).

Mathematical philosophy reflects mathematical science itself, and at the same time emphasizes the importance of truth in mathematics (Sadewo et al. 2022). This exhibition divides the scope of mathematical philosophy into several sections, showing the roles and positions of each field of research as well as its relationship with mathematics itself.

In the context of education, mathematical philosophy has its own role, and each field of science in mathematics philosophies makes its own contribution to learning. From the point of view of mathematical philosophy, many mathematics concepts are found that relate to values that can be applied in multicultural education.

There are several writings related to multicultural education and its application to mathematical learning, including research by (Danoebroto, 2012) about a mathematical learning model based on multicultural education, (Sirate 2015) about fostering multicultural integration of mathematical learning, and (Masykur, 2023) about a mathematical learning model based on multicultural education. As far as the author finds, studies related to the implementation of mathematical philosophy in multicultural education have yet to be commented on. This is what makes the writer interested in discussing this topic.

METHOD

This research uses library research methods. Library research is research that collects research data from various sources of library information related to the topic being researched, through research abstracts, indexes, journals, reference books, reviews, etc. The approach used in this research is a descriptive approach, namely research that aims to provide an explanation of a particular topic.

The data used in this research is secondary data, namely data originating from accredited journal articles both nationally and internationally, books from philosophers both at home and abroad, and books about multicultural education. In supporting literature, it is also obtained from various studies of the philosophy of mathematics, philosophy of mathematics education, and multicultural education.

Tabel 1. Data Sources

Types of Secondary Data Sources	Amount
Accredited Journal Articles Nationally	8
Accredited Journal Articles Internationally	2
Books from Philosophers at Home	2
Books from Philosophers at Abroad	1
Books about Multicultural Education	2

The stages carried out in library research include: 1) determining the research topic, in this case the researcher chose the topic of the implications of mathematical philosophy for multicultural education; 2) Looking for supporting information, in this stage the researcher looks for and collects data in the form of articles from accredited journals and books related to the topic; 3) Grouping reference materials, in this case the researcher selects and sorts references that are truly related and support the research topic; 4) Read references and make research notes, in this case the researcher makes notes from each reference to later be included in the research results; 5) Compile articles related to the research topic, in this case the researcher focuses on looking at the implementation of mathematical philosophy in multicultural education.

RESULTS AND DISCUSSION

Multicultural Education Concept

Multicultural education is a type of education that prioritizes the importance of respecting diversity in ethnicity, culture, race, ethnicity, religion and others. Multicultural education is one solution that can be applied in learning considering the very diverse cultural conditions in Indonesia. Multicultural education upholds equality and equality in terms of providing education and in the learning process. (Amin, 2018) states that multicultural education is education that includes all students without distinguishing between groups such as gender, race, ethnicity, religion, social strata and culture.

Banks (1993) stated that multicultural education is one of the reforms in the field of education which has several objectives including: 1) assisting in efforts to understand individuals better from the views of other cultures, 2) providing services to students who have cultural and ethnic diversity , 3) provide services to students so that they can develop the talents, skills and knowledge needed and can contribute to a multicultural society. So multicultural education will really help students if it can be implemented in schools.

In implementing multicultural education in schools, it consists of five categories, including unifying content, building knowledge, reducing prejudice, and managing school culture (Banks 1993). In the content unification category, teachers can include material content or examples about various cultures so as to provide an overview of diversity. In the knowledge building category, teachers can help students understand that cultural assumptions in a scientific discipline can build knowledge through inquiry. In the prejudice reduction category, it can reduce suspicion between groups of students. This can be achieved by focusing on students who tend to be racist and looking for solutions to eliminate these characteristics through methods or subject matter taught in class. In the category of school culture management, schools as miniature communities can empower students

from various ethnicities, races and genders, so that they can form a diverse culture at school.

These five categories can influence teacher behavior, including selecting multicultural material content, implementing learning that is a multicultural solution, and creating a multicultural-based classroom management context. When these five categories can be implemented in classroom teaching practice, students can be helped to improve their skills, knowledge, ability to make decisions, and ability to face social influences and political change. In applying these five categories, it will produce at least three student orientations towards multicultural education, namely the development of ethnic identity, interpersonal relationships, and self-control. This will greatly influence students' cognitive and social development (Danoebroto 2012).

Multicultural education will appear in the diversity of learning activities, educational programs and practices in schools. Thus, the school must pay attention to the needs and input of various groups. The groups in question include groups of girls, ethnic minorities, weak socio-economic groups, religious minorities, and groups with disabilities. With the hope, it can help students from various groups adapt to the environment at home and their home communities and the culture at school. So that the expected competencies can be achieved, they can communicate, interact and participate actively with different cultures both in their country and with the world community.

In addition, by recognizing and understanding the role of students in the learning process, teachers will be helped to improve their pedagogical skills, help in evaluating the integration of culture with the curriculum and the effectiveness of their teaching methods in building their role, status and identity in a multicultural classroom. So that it can result in student success in the academic field, students' cultural heritage can be maintained, increased ethnic identity, and healthy social interactions.

Philosophy of Mathematics

Mathematics is a part of science that has certain specific characteristics so that mathematics can be an inspiration in developing basic thinking (Haryono 2014). Mathematics according to several figures, including Boole, Whitehead, Neumann, Riemann, Kaplansky, and Hibert, gave opinions about mathematics according to their respective scientific knowledge. Boole said that mathematics is a collection of ideas related to quantity. Whitehead as a logician stated that mathematics is a formal form of all deductive knowledge. Newmann believes that mathematics is a combination of reason assisted by experience. Riemann stated that mathematics is theorems which are related to proof, while Kaplansky stated that mathematics is not only proving theorems but there must be the discovery of new concepts. Hibert stated that mathematics is a science that has consistent characteristics (Parnabhakti and Ulfa 2020).

Apart from these figures, there are many other mathematical figures who reveal the definition of mathematics. Even though the opinions of figures have differences in defining mathematics, there are similarities underlying the definition of mathematics, namely that mathematics is a science that has various ideas, some of which require proof and some do not. These ideas will be used by other figures to build other new concepts

(Sadewo et al. 2022).

Apart from mathematics, philosophy is also related to science. Philosophy can create a balance of knowledge, attitudes, skills and socialization abilities. So philosophy can make humans not only cognitively smart but also have good attitudes (Fairus et al., 2023). All human activities are related to philosophy. Many events that occur in human life are extraordinary and cause both admiration and disappointment. Philosophy teaches humans about love and wisdom (Istikhomah and Bs 2021).

Basically, science such as mathematics was created to make it easier for humans to live their lives. The birth of mathematics is one solution to solving problems in life. To understand the role and position of mathematics requires a thought process that can clarify the meaning of mathematics itself. Philosophy of mathematics is a branch of philosophy with the aim of clarifying and emphasizing the meaning and nature of mathematics (Ernest 2004).

Sinaga et al. (2021) stated that the philosophy of mathematics is a reflection of the science of mathematics which can clarify the meaning of mathematics. Sadewo et al. (2022) also added that the philosophy of mathematics is an effort or way to explore the position of mathematics. Basically, the philosophy of mathematics is not related to the addition and subtraction of existing concepts in mathematics but only provides an overview of the position of mathematics.

The philosophy of mathematics as part of science has a scope of study. According to Gie (1999) the field of study in the philosophy of mathematics includes mathematical epistemology, mathematical ontology, mathematical methodology, logical structure of mathematics, ethical implications of mathematics. In the field of mathematical epistemology, it includes discussions about the origins of mathematics, the nature of mathematics, and theories of mathematical knowledge. The field of mathematical ontology talks about what is in mathematics, the investigation of the nature of mathematics, as well as real views about mathematics. The field of mathematical methodology talks about the study of special methods regarding mathematics such as the axiom method and the deductive hypothetical method. In the field of ethical implications of mathematics, it tells about the broad influence of mathematics in social life, for example the development of technology and statistical science which has an influence on human life.

Implementation of Mathematical Philosophy in Multicultural Education

The breadth of the field of study of the philosophy of mathematics shows that the philosophy of mathematics has a deep role. However, sometimes the presence of mathematical philosophy is not realized and is considered something separate from the field of study of mathematics and other sciences. As a result of the lack of studies on the scope of the philosophy of mathematics, references regarding the role of the philosophy of mathematics in life are still very lacking, especially in the field of education. The field of education is one of the fields that greatly influences human life. With education, human life can improve and develop.

One of the educational issues that greatly influences the progress of the educational process is the multicultural issue. Multicultural means consisting of

various tribes, religions, races, ethnicities, backgrounds, and others. Because of these diverse circumstances, inequality, injustice and disparities often occur between majority groups and minority groups in education. This causes the educational process to be hampered and not as expected. In this case, it is necessary to apply a method in education that can eliminate the gaps that occur, namely multicultural education. This multicultural education is closely related to the philosophy of mathematics, namely in the field of epistemological studies.

In the field of epistemological studies, the philosophy of mathematics talks about the origins of the formation of mathematics and the study of knowledge about mathematics. The study of knowledge about mathematics cannot be separated from the characteristics of certainty, truth, objectivity, universalism and rationality (Sadewo et al. 2022). These characteristics can ultimately become the forerunner in the implementation of multicultural education.

The nature of certainty is related to the exact science of mathematics, so that no one can deny its theories and concepts. This is related to the implementation of multicultural education which must guarantee certainty that teachers will educate in accordance with applicable regulations in achieving the learning objectives that have been set. There is no doubt that can divert the learning process outside of the established rules. All students will receive teaching and education in accordance with the provisions without any omissions.

The nature of truth is related to mathematics which always has a truth value. Every problem in mathematics will definitely produce a correct solution. This is related to the implementation of multicultural education which educates and assesses according to the results obtained by students. It is not permissible to give an assessment that is not in accordance with the supposed truth value. So that students will understand the truth about a concept being taught.

The nature of objectivity is related to the nature of mathematics which always corresponds to the object being studied. This is related to the application of multicultural education which must always be objective without looking or distinguishing between who is answering, but what is seen is who answered correctly or incorrectly. Students will feel justice and equality because the teacher assesses according to the answers they answer.

The nature of universalism is related to mathematics which covers all problems in life. There is no problem in life that is separated from mathematics. This is related to the implementation of multicultural education which must provide comprehensive education to all students without choosing or taking sides. It must be ensured that all students who come from different backgrounds, ethnicities, races, social statuses and religions still receive the same treatment and educational services.

The nature of rationality is related to mathematics which is always rational and reasonable. This is related to the implementation of multicultural education which must always educate and assess rationally, not based on feelings or aspects of the teacher's closeness to students. So as to guarantee justice, equality and equity for students in obtaining education.

The implementation of mathematical philosophy, especially in the field of epistemological studies in multicultural education, can be applied

to the implementation of education and teaching in the classroom so that an atmosphere of justice, equity and equality is created so that the expected educational goals can be achieved.

CONCLUSION

Multicultural education is one of the types of education that emphasizes the importance of appreciating the diversity of tribes, cultures, races, ethnicities, religions and others. Multicultural education is a solution that can be applied in learning given the very diverse cultural conditions in Indonesia. One of the important purposes of the concept of multicultural education is to help students acquire knowledge and respect for others who are different ethnically, culturally, and individual values. By instilling a multicultural spirit in schools, we become a medium of education and awareness for young generations to accept cultural differences, religions, races, tribes and needs and want to live together in peace.

Mathematical philosophy is an attempt or way of digging into the position of mathematical science. Basically, mathematics is not associated with the addition or reduction of the concepts in math, but only provides an overview of the position. Mathematics as a part of science has the scope of the field of study. The fields of study in mathematical philosophy include the epistemology of mathematics, the ontology of maths, the methodologies of mathematicians, the logical structures of mathems, the ethical implications of Mathematicians.

In the field of epistemology, mathematical philosophy speaks about the origins of mathematics and the study of knowledge about math. The study of mathematical knowledge is not independent of the nature of certainty, truth, objectivity, universalism, and rationality. Implementation of mathematical philosophy in particular in the field of epistemological studies in multicultural education can be applied to the implementation of education and teaching in the classroom so as to create an atmosphere of justice, equality, and equality so that the educational goals that have been expected can be achieved.

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