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Epsipo Strategy: Character Strengthening through Cultural Project-Based Mathematics Learning

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Abstract

Mathematics learning must be oriented towards achieving mathematical skills and shaping students' character. The nature of mathematics as the highest form of rationality, often results in the teacher's view that mathematics is only intended for cognitive development, but it is difficult to develop students' character. For this reason, the purpose of this research is to develop mathematics learning to improve students' cognitive abilities and character. This study uses an integrative literature review method by integrating ethnomathematical theory and project-based learning to build a theoretical framework for the Epsipo Learning Strategy (Ethnomathematics-Project-based Learning). The epsipo strategy is basically an effort that can be made to teach mathematics through a project with a cultural context. The project-based learning model has contributed to realizing meaningful mathematics learning, but it lacks value instillation. The ethnomathematics initiated by D'Ambrosio is rich in moral and social values. The two theories complement each other with their own advantages. Through the implementation of the Epsipo strategy, it is hoped that students will have the knowledge and ability to think mathematically and develop their character. It is hoped that through this strategy, mathematics learning is not only oriented towards achieving cognitive aspects but also to strengthen students' character.

Keywords: project-based learning, ethnomathematics, character

INTRODUCTION

Mathematics as the highest form of rationality often causes most mathematics teachers to think that teaching mathematics is only to develop cognitive abilities, but it is difficult to develop students' character (Rosa & Shirley, 2007). Mathematics teachers have the responsibility not only for students to understand mathematics, but also to instill universal human values in students (D'Ambrosio, 1999). Furthermore, D'Ambrosio stated that mathematics should not be misused as an instrument in developing capitalism, a tool to satisfy greed in overexploiting nature, a tool to develop sophisticated weapons, and a tool to form intelligent but fragile human beings with moral and social values. Thus, teaching mathematics must be oriented towards the development of mathematical knowledge as well as instilling noble values to form students with character (Prahmana, 2022).

To achieve mathematical abilities while shaping students' character, the researcher proposes the Epsipo learning strategy (ethnomathematics in project-based learning). This strategy is an effort that can be made to teach mathematics through a project with a cultural context. This strategy is the result of the integration of project-based learning model theory and ethnomathematics. The two theories complement each other with their own advantages.

Philosophically, project-based learning departs from the concept of "*learning by doing*"Through the project so that meaningful knowledge is obtained (Thomas et al., 2015). Project-based learning can produce "smart" human beings in supporting mass industrialization and its efficiency by applying the principles of economics and capitalism. However, these competencies are not uncommon to be the cause of many socio-cultural problems such as large-scale exploitation of nature and humans, colonialism under the pretext of meeting industrial needs, injustice, and economic inequality. Of course, it is not expected to create such a human being, but what is expected is a human being who is intellectually intelligent and has character.

Ethnomathematics is a view that sees the learning of mathematics not as aimed at preserving mathematical knowledge or further encouraging existing knowledge, which will continue to exist, or be lost, but to encourage the creation of new mathematical knowledge (D'Ambrosio, 2007). Rosa and Shirley stated that ethnomathematics places mathematics in social, cultural, and historical contexts (Rosa & Shirley, 2007). Therefore, mathematics is not just a set of formal concepts and rules but also reflects culture and social contexts. Ethnomathematics teaches that mathematics can be understood and taught through the lens of cultural diversity, history, and life experience. Therefore, ethnomathematical ideas rich in sociocultural and ethical values have the potential for the formation of students' character (Prahmana & D'Ambrosio, 2020).

Project-based learning theory and ethnomathematics depart from the same idea, namely both reject learning that provides explanations of ready-made/ready-to-use knowledge to students ((Kilpatrick, 1918), (D'Ambrosio, 2007)). Project-based learning requires students to construct knowledge through the projects they create ((Knoll, 1996), (Sutinen, 2013)). Ethnomathematics encourages creativity to create mathematical knowledge (D'Ambrosio, 2007). Both lead to meaningful learning. Project-based learning has a clear procedure or syntax ((Sutinen, 2013), (Kokotsaki et al., 2016)), but ethnomathematics does not have a clear procedure but has clear characteristics ((Rosa & Shirley, 2007), (Prahmana, 2022). From this gap, the researcher sees the possibility of placing ethnomathematics in a project-based learning model where the two complement and complement each other. Placing ethnomathematical theory in project-based learning will be a new way/strategy that teaches meaningful learning and contains meaningful values for students' lives.

In an ethnomathematical approach, mathematics can be taught with a variety of cultural and historical contexts. The culture that exists in every tribe in Indonesia is not only rich in culture that looks like a house, culinary, ceremonies, and others, but also rich in noble values. For example, in the Lampung tribe, they have a philosophy of life such as *Fi'il Pesanggiri, Bejuluk and Beadek, Nemui Nyimah, Nengah Nyappur, and Sakai Sambayan.* These kinds of cultural values are firmly held by the people of Lampung as an invisible culture that is reflected in various daily activities such as the value of *Sakai Sambayan* as the value of the necessity to live to be socially spirited, mutual cooperation, and do good to fellow human beings reflected in social activities such as building houses, preparing for wedding ceremonies and other activities. Noble values can be sourced from the nation's culture as well as the local wisdom of each culture (Hamid et al., 2023, (Abdullah et al., 2024). Bringing these noble values in mathematics learning through ethnomathematics in the form of instilling values in the learning process. The cultivation of values followed by the habituation of positive behavior significantly affects the development of students' character (Norlita et al., 2023). Considering that ethnomathematics uses a cultural context in learning, the characters that can be developed through this approach are characters that come from culture such as the character of mutual cooperation, independence, respect for others, creativity, concern for the environment and its sustainability, and other characters.

Through the implementation of the Epsipo strategy, it is hoped that students will have the knowledge and ability to think mathematically as well as develop their character. In developing this learning strategy, the researcher uses an integrative literature review. This method will result in a comprehensive theoretical framework of the Epsipo Strategy. In addition, through this method, it will also be possible to identify research limitations and recommendations for future research.

METHODS

This study uses an integrative literature review method to build a theoretical framework of the Epsipo Learning Strategy by integrating ethnomathematical theory and project-based learning. The combination of the two theories results in mathematics learning that makes it easier for students to understand mathematical concepts while building students' character from socio-cultural values through cultural projects. In this case, an integrative literature review is the only one that provides the basis for building a new conceptual model by comprehensively reviewing, critiquing, and synthesizing representative literature on a specific topic. Therefore, new theoretical frameworks and perspectives can be developed.

An integrative literature review provides a framework for forming theories ((Torraco, 2005);(Wong et al., 2013); (Liberati et al., 2009)). Integrative literature reviews can also contribute significantly to the reconceptualization of old topics. In addition, this research approach is used to create new frameworks and perspectives, not only providing an overview or description of research trends and influences ((Snyder, 2019); ((Torraco, 2005)). Therefore, this approach is appropriate and adequate to reconceptualize old but relevant and representative theories, namely project-based learning and ethnomathematics. And then develop a theoretical framework related to the Epsipo Strategy.

This research was carried out in four stages. It starts with designing a review, combining it, analyzing the results, and writing it ((Snyder, 2019);(Torraco, 2005)). In the first stage, designing the review, I determined some key points in this research that focused on Project-Based Learning and Ethnomathematics. Key points include such as implementation constraints, confirming the reasons and objectives, formulating specific research scope and questions, and gathering literature for review. The collection of literature began by using the keywords "Project based learning" and "Ethnomathematics". I looked for research that reviewed the theory, practice, and implementation results of these two approaches, either separately or together. The selected literature is the main literature that discusses the originators of project-based learning models and the originators of ethnomathematical theory. In addition, literature also comes from publications in the last 10 years (for example, 2014–2024). If there is any relevant classical or fundamental research, I will also include it as an important reference. I also add literature that reviews both theoretical and empirical contributions. Theoretical literature helps build a conceptual foundation, while empirical studies (especially case studies) provide insight into real practice in the field.

In the second stage, conducting a review, the researcher starts by determining when to conduct a review. Then, I tried the review process by criticizing and synthesizing literature. Critical criticism of literature is carried out by critical analysis, which involves carefully examining the main ideas and their relationship to the issue and criticizing the existing literature. Meanwhile, synthesis is carried out by integrating existing ideas with new ones to formulate discussion topics. The form of synthesis in this study is an alternative model or theoretical framework, a new way of thinking about the topic discussed by an integrative literature review. Alternative models and theoretical frameworks should be derived directly from critical analysis and synthesis. In the third stage, analyzing the reviews, I use logic and clear conceptual reasoning as the basis for arguments and explanations. These two are the most important features used to develop a proposed framework or model and allow the reader to see the relationship between the research problem, the literature criticism, and the theoretical outcome in a theoretical framework (Snyder, 2019).

Finally, the fourth stage is to write a review. At this stage, I immediately write the results of the review, clearly discuss the motivation and need for the review, and *trans-parently* describe the review process, starting with how the literature is identified, analyzed, synthesized, and reported. Reviews in integrative review studies were not assessed and evaluated as rigorously as in empirical studies.

RESULTS AND DISCUSSION

In this section, it is explained how to develop the theoretical framework of the Epsipo Learning Strategy, combining project-based learning model theory and Ethnomathematics. Furthermore, the researcher sees the urgency that in various countries, including Indonesia, mathematics learning is still influenced by the Western mathematical paradigm and advanced technology (Prahmana, 2022). Technological advances and capitalism have unwittingly led to many socio-cultural problems such as economic inequality, injustice, and large-scale exploitation of nature and humans. Therefore, it is necessary to have a strategy to teach mathematics correctly and usefully while instilling socio-cultural, character, and ethical values. The literature on project-based learning and ethnomathematics needs to be reviewed to establish the theoretical framework of the Epsipo Strategy. Here is a more detailed explanation of the literature review.

Project-Based Learning Ideas and Substance

It is not known who initiated project-based learning, but if traced this learning embryo has been raised by Confucius since 5 centuries BC. Confucius states "*I hear, and I forget. I see, and I remember. I do, and I understood*" (Vaillancourt, 2009). This means that learning by listening will make a lot of information forgotten, learning by seeing or watching will make many things remembered, and learning by doing/doing will make it more understandable/meaningful. Conficius' statement also means that learning by doing is the best way of learning compared to learning by only hearing or seeing.

Learn by doing or *learning by doing* Campaigned by American Educational philosopher John Dewey (Ansbacher, 1998). John Dewey is a believer in the philosophy of pragmatism. According to Dewey (1936), the task of philosophy is to provide direction for real deeds. Philosophy must not dissolve in metaphysical thoughts that are less practical, there is no benefit. Therefore, philosophy must be based on experience and process it critically. In general, pragmatism means that only practicable ideas are correct and useful. Ideas that exist only in ideas are also infatuated with the reality of the sensory objects, all of them *nonsense* for pragmatism. What is there is what is real.

He criticized the traditional education model that relies on listening and memorization skills in students (Dewey, 2004). He proposed learning that focuses more on developing creativity and involvement of students in various discussions and problem-solving. He disagrees with the concept of traditional education, which states that the center of attention of education is outside the child, whether it is teachers, books, infrastructure, or others. The traditional concept of education makes schools a formal place for listening, for mass instruction, and separate from life (Hasbullah, 2020).

The idea of "*learning by doing"* by John Dewey inspired his student William Heard Kilpatrick who came up with the idea of a project-based learning model (Kilpatrick, 1918). Through an article entitled "Project Method" published in 1918 which was successful and welcomed by the public, all the glory of the "inventor" of the project-based learning model fell to William Heard Kilpatrick (Pomelov, 2021)

Like his teacher, William Heard Kilpatrick also criticized traditional learning based on the "*Transfer of Knowledge*" or providing explanations of ready-to-use/ready-to-use knowledge to students. A kid should not be filled with such knowledge as feeding a goose with grain. Students should be motivated to develop initiative, creativity, and participation in a wide variety of activities. Teachers must do everything so that learning pays attention to students as social beings who are best learned when they are in real conditions (Kilpatrick, 1918).

An important idea in Kilpatrick's work on the project method is that the implementation of the project in the project method must pay attention to the student's desire, motivation, and ability to carry out the project (Kilpatrick, 1918). Kilpatrick said that the project method must also pay attention to satisfaction (or disappointment) with the project actions that have been implemented. If the behavior results in satisfaction (or disappointment), the activity will have an impact on the individual. This behavior will strengthen the individual's mental strength and capacity along with the achievement of continuous goals as a demand of needs and environment (Sutinen, 2013). In determining the objectives, Kilpatrick explained the importance of democratic principles being applied in project determination/planning (Knoll, 1996).

Kilpatrick explained that project-based learning offers more meaningful and in-depth learning for students. Students have freedom and responsibility for what they learn. maintain interest and motivate learners to take more responsibility for their learning. learners "shape" their projects to suit their interests and abilities (Kilpatrick, 1918).

According to Grant (2002), implementing project-based learning in the classroom may be daunting for experienced teachers and even more remarkable for beginners. PjBL Barriers (Grant, 2002) that is:

1. Because project-based learning focuses on in-depth investigation while building a personally meaningful product, the classroom atmosphere can change. This may be inconvenient for students and teachers.
2. Students who are inexperienced with working in groups may have difficulty negotiating compromises. If this method has never been used before, then it may be necessary to teach learners how to interact in groups and manage conflicts in groups.
3. The class time required by project-based learning forces discussions about breadth versus depth to resurface. In-depth investigation takes more time, so less time can be spent on other content in the curriculum.
4. The resources required to carry out the project must be sufficient

Types of Projects in Project-Based Learning

Projects in project-based learning can be divided into several types. Kilpatrick stated that there are several classifications of project types, namely 1) projects that aim to create ideas such as building boats, writing letters, and presenting plays. 2) Projects that aim to enjoy aesthetic experiences such as listening to stories, hearing symphonies, and appreciating images, 3) Projects that aim to solve problems (intellectual difficulties) such as why the dew does not fall, How the city of New York can grow bigger than Philadelphia and others. 4) to gain skills/knowledge such as learning to write, and writing in irregular verbs.

Edward Colling, a Kilpatrick colleague, implements and develops Kilpatrick project-based learning. He believes that project-based programs should be a series of interconnected experiences to develop and enrich subsequent experiences (Pomelov, 2021). This can only be achieved by relating project activities to the reality around the child. Furthermore, Edward Colling like Kilpatrick classifies 4 types of projects, namely (1) play projects, which are children's activities, whose direct purpose is the participation of children in various types of groups (games, folk dances, dramatizations, and various types of entertainment). (2) sightseeing, this type involves the proper study of issues related to the environment and social life. (3) Narrative projects, children enjoy stories in various forms: oral writing, vocal (song), artistic (painting), musical (playing the piano), and others. (4) Constructive projects that aim to create specific and useful products.

Project-Based Learning Steps

Kilpatrick stated that there are four steps in project learning, namely "goal setting, planning, implementation, and assessment". For project-based learning to be carried out properly, there are at least five (5) characteristics that must be present in learning (Sutinen, 2013). *First*, A student must be motivated for a project. Students are voluntarily willing to achieve specific goals through project activities. *Second* To achieve this goal, students realize that they can consciously plan their activities. *Third* The plan that has been made is an activity or activity that is possible to be carried out by students. *Fourth* the results of the activities or activities carried out by the students have an impact on student satisfaction from the projects that have been made. *Fifth*, Students can reflect on what has been done, and what has been done so that the results are satisfactory (or may not be satisfactory).

Furthermore, project-based learning steps are further developed by (*The George Lucas Educational Foundation*). The syntax consists of:

1. *Start With the Essential Question*
2. *Design a Plan for the Project*
3. *Create a Schedule*
4. *Monitor the Students and the Progress of the Project*
5. *Assess the Outcome*
6. *Evaluate the Experience*

(Papandreou, 1994) stated that there are six steps in project-based learning. The six steps are, namely,

Step 1: Preparation, In this period, the teacher introduces the topic to the students and asks them to discuss and ask questions.

Step 2: Planning, in this period, teachers and students determine how to collect and analyze information, and different jobs are assigned.

Step 3: Research, in this section students work individually or in groups gathering information from various sources.

Step 4: Conclusion: The students conclude based on their analysis of the data collected.

Step 5: Presentation, the students are expected to present their final product to the entire class.

Step 6: Evaluation, in this section, the teacher gives comments on the student's efforts.

Furthermore, a synthesis was carried out to accommodate *the project-based learning* steps from the opinions of the three experts. The synthesis of the steps of *the project-based learning* model can be seen in Table 1.

Table 1. Syntax Synthesis *of Project-Based Learning Model*

Kilpatrick	(The George Lucas Educational Foundation, 2007)	(Papandreou, 1994)	Synthesis
1. Goal Determination 2. Planning 3. Implementation 4. Valuation	1. *Start With the Essential Question,* 2. *Design a Plan for the Project,* 3. *Create* a *Schedule,* 4. *Monitor the Students and the Progress of the Project,* 5. *Assess the Outcome* *6. Evaluate the Experience*	1. Preparation 2. Planning 3. Research 4. Conclusion 5. Presentation 6. Evaluation	1. Goal Determination 2. Planning 3. Implementation 4. Valuation

Based on the syntax of Kilpatrick, (The George Lucas Educational Foundation, 2007)*,* and (Papandreou, 1994), syntax can be synthesized from the project-based learning model, which is as follows.

Step 1. Goal Determination.

Step 2. Planning.

Step 3. Implementation.

Step 4. Evaluation and Reflection.

Contribution of Project-Based Learning in Mathematics Learning

Project-based learning has made a significant contribution to realizing meaningful mathematics learning ((Thomas et al., 2015), (Parno et al., 2022), (Situmorang et al., 2022). The results of Boaler's research explained that there are at least three project-based learning contributions to improving student mathematics learning outcomes. *First*, students' perceptions of mathematics. The results of the study revealed that students in traditional classes gave the same response as reported, namely "The majority of students reported that they found the work boring and boring". In addition, "the students consider mathematics to be a rule-bound subject and they think that the success of mathematics lies in the ability to remember and use rules". In contrast, students on the project learning consider mathematics to be "a dynamic and flexible subject that involves exploration and thinking". The results of this study show that project-based learning contributes to developing students' positive and progressive attitudes/perceptions/mindsets toward mathematics.

Second, the effectiveness of project-based learning. The results of the study showed that there was a difference between the two groups in their ability to answer mathematical questions. The mathematical questions in the study are divided into two, namely procedural and conceptual questions. Procedural questions are questions that are answered by remembering rules, methods, or formulas. An example of a procedural question is "Calculate the average of a number". Conceptual questions cannot be answered by relying solely on the memory of formulas. Answering this question requires thinking, even creative thinking, and a combination of mathematical concepts. An example of a conceptual question is "Imagine a scenario where you have a set or group of data. Is there a situation where the mean, median, and mode all have the same value? Explain why this can happen or why it is difficult to happen". Students in project-based schools outperform students in traditional schools on conceptual questions. According to (Thomas et al., 2015) Both types of learning have resulted in different levels of mathematics learning outcomes.

Third, students' attitudes towards mathematics. According to (Thomas et al., 2015) The difference in learning outcomes between project and traditional learning classes is inseparable from students' attitudes towards mathematics. Furthermore, he revealed that "students who are taught with a didactic and formal learning model claim that mathematics is useless for them in the real world". On the other hand, students who are taught using a project model are more progressive and open, develop flexible and useful forms of knowledge, and can use their knowledge in various problems.

Ideas and Substance of Ethnomathematics

Ethnomathematics was introduced by D'Ambrosio, a Brazilian mathematician in 1977. D'Ambrosio explained that the word ethnomathematics is rooted in the Greek word which consists of three words, namely: *ethno* (refers to a group of people in a certain area with the same socioculture, or a group of people who exhibit compatible behavior), *Mathema* (to understand, explain, and learn), and *Techne* (for how-tos, art, and technique) (D'Ambrosio, 2007). The combination of these three words results in mathematical techniques in a tribe (*Etno*). The word Ethnomathematics is considered quite appropriate, as D'Ambrosio's reflection on the evolutionary origins of knowledge about the human species is more acceptable to reveal the reality of indigenous cultures and the fantasy of mythological legends.

D'Ambrosio sees each culture developing ways, styles, and techniques in doing things in response to every search for explanation, understanding, and learning from a phenomenon (D'Ambrosio, 2007). At first, the inability of humans to try to understand and explain an extraordinary phenomenon that occurs around them leads to myths (Suriasumantri, 2017). He considers the forces of nature to be extraordinary and associates them with extraordinary beings (such as Gods and Goddesses). As time goes by, every culture begins to study nature, the nature of its existence, and develop its knowledge. This further creates a system of knowledge and religion.

In these developments, humans make various efforts to understand and explain through observation, comparison, classification, evaluation, quantification, measurement, counting, representation, and inference (D'Ambrosio, 2007) These efforts are essentially close to the way of thinking about mathematics that is known today. Of course, each culture uses a different way of doing this depending on the environment in which it is located. D'Ambrosio further stated that all the different systems of mathematical knowledge resulting from human invention in each culture in response to the environment should be called Ethnomathematics (D'Ambrosio, 2007).

Ethnomathematics contains the application of mathematical ideas, procedures, and practices developed and applied by members of a particular cultural group in different contexts, which are often used in today's contexts (D'Ambrosio, 1997). Therefore one of the objectives of ethnomathematics is the study of the history of mathematics which attempts to identify the cultural and mathematical contributions of different cultures around the world (Rosa & Shirley, 2007).

Modern mathematics that is studied today was raised by Europeans to solve problems related to colonization, trade, art, religion, exploration, communication, development, data, space travel, and other problem-solving techniques, which are taken from other communities outside the European nations (Rosa & Shirley, 2007). For example, the number zero and the value of the position found by the Arabs. This knowledge was then transmitted to the West through his encounter with Islam.

The main goal of ethnomathematics is to build a civilization free from rudeness, arrogance, intolerance, discrimination, injustice, bigotry, and hatred of others (D'ambrosio. U, 1985). This goal is motivated by D'Ambrosio's study which sees that in the development of mathematics, western countries seek to hegemonize knowledge, including mathematics, and become an instrument for the development of capitalism in the process of colonization and conquest of other civilizations. As explained earlier, mathematics grew and was nurtured by many contributions from non-western or non-European civilizations. However, many of these contributions were deliberately omitted or hidden due to ego so that other civilizations could not be aligned with Western civilizations and imposed the truth of colonialization and imperialism. Mathematics became a political tool for the benefit of Western civilization in its efforts to conquer other civilizations (Prahmana, 2022).

Melin-Olsen (Prahmana, 2022) stated that the mathematics curriculum needs to understand the politics of mathematics education because the process of forming mathematical knowledge and teaching mathematics education has inherently had a political dimension. This is what makes D'Ambrosio pull himself out and let go of what has been built from his current mathematical knowledge (D'Ambrossio, 2007). Subsequently, D'Ambrosio initiated the Ethnomathematics Movement. Ethnomathematics is an idea that aims to find mathematical knowledge from diverse cultural backgrounds. (Prahmana, 2022).

Ethnomathematics encourages the creation of a critical, democratic, and tolerant society to become a strategic force against hegemony and colonialism. The moral values that can be explored and reflected from the culture raised in ethnomathematics can maintain the ethics of using mathematics to uphold humanism and not use mathematics as a fundamental instrument to develop Capitalism (D'Ambrossio, 2007).

Rosa and Orey (2011) stated that ethnomathematics places mathematics in a social, cultural, and historical context. Therefore, mathematics is not just a set of formal concepts and rules but also reflects culture and social contexts. Ethnomathematics teaches that mathematics can be understood and taught through the lens of cultural diversity, history, and life experience. Prahmana (2022) stated that Ethnomathematics cuts three disciplines; mathematics, cultural anthropology, and Mathematical modeling, as illustrated in Figure 1.

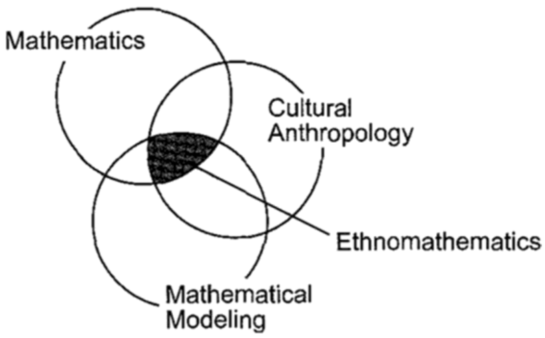

Figure 1. Ethnomathematics as a slice of 3 disciplines

Ethnomathematics in Mathematics Learning

Mathematics education aims not to preserve mathematical knowledge or to further encourage existing knowledge, which will continue to exist, or to be lost, but to encourage the creation of new mathematical knowledge (D'Ambrosio, 2007) (Bishop, 1988). This suggests that learning mathematics is not just about transferring mathematical knowledge (*Transfer of Knowledge*), but it encourages creativity to create mathematical knowledge. To achieve this goal, D'Ambrosio initiated ethnomathematics and its integration into mathematics learning.

D'Ambrosio (2016) stated that the most important goal in teaching mathematics is to develop mathematical capacity in all students. In addition to teaching students techniques and tools to solve math problems, they need to learn more than just basic mathematical algorithms (Lipka & Andrew-irhke, 2005), (Gerdes, 1988). All students need to broaden their understanding to include how mathematics is connected to other disciplines, to problems that exist in society and the environment, and to how diverse people around the world use mathematics. The integration of ethnomathematics into mathematics learning allows students to reason better sequentially and holistically to enable them to appreciate the differences in the various forms of mathematics. Ethnomathematics in mathematics learning is seen as one of the strategic steps to create social change (Prahmana, 2022).

Mathematics educators, according to D'Ambrosio (1999), have a global responsibility related to universal human values. Mathematics is not only placed as the highest form of rationality, which is detached from values and becomes an instrument in developing capitalism, a tool to satisfy greed in overexploiting nature, a tool to develop sophisticated weaponry, and a tool to form intelligent but fragile human beings with moral and social values. But more than that, mathematics educators must also be committed to instilling moral values, democracy, equality, peace, and social justice. Ethnomathematics helps in integrating moral and social values into mathematics learning, which is reflected and applied in their lives (Prahmana, 2021).

Ethnomathematics is a pedagogical tool that helps teachers and students understand the influence of culture on mathematics and how this influence results in the diverse ways in which mathematics is used and communicated (D'Ambrosio, 2006) (Achor et al., 2009), (Zaenuri et al., 2018). Thus, mathematics learning needs to start by using the context of socio-cultural reality around students. The ethnomathematical perspective in mathematics education allows students to rethink their mathematical knowledge and understand that humans and their cultures are vastly diverse.

As a result of the historical review of the curriculum, D'Ambrosio argues that the educational curriculum from the ancient Roman era to the colonial period has not been able to prepare citizens to face the present and the future. Therefore, D'Ambrosio proposed a Trivium curriculum consisting of "*Literacy, matheracy*, and *Technoracy*".

Literacy students can process and use information in daily life in written and oral form, which includes reading, writing, counting, representing, and using media and the internet (communicative instruments). Thus, literacy has the meaning of not only reading, but also includes numeracy competence, the ability to understand graphs, tables, code languages, and other ways of exchanging information. If you pay attention, it turns out that numeracy competence is part of literacy (D'Ambrosio, 1999). Therefore, if the matter of numbers is part of modern literacy, then where does mathematics go?

Literacy from an ethnomathematical perspective includes not only basic reading and writing abilities in a mathematical context, but also involves understanding the culture, social context, and values associated with the practice of mathematics in society. In this case, ethnomathematics highlights the relationship between mathematics culture and daily life (D'Ambrosio, 1986).

Matheracy is the student's ability to interpret and analyze signs and codes, propose and utilize models and simulations in everyday life, and describe abstractions based on real representations (analytical instruments). The ability to conclude, propose hypotheses, and conclude data according to D'Ambroiso is also mathematics. This ability is no less important than literacy. Unfortunately, mathematics is rarely or even absent from the curriculum in schools (D'Ambrosio, 1999). In the ethnomathematics perspective, mathematics is a domain of skills, strategies, and competencies that empower students to be aware of the way they explain traditions, myths, and symbols, with the scientific knowledge and mathematical knowledge they have mastered (D'Ambrosio, 1999). Thus, matheracy highlights the importance of understanding mathematics within the cultural, social, and everyday framework of a society.

Technocracy is the student's ability to use and combine instruments, both simple and complex, including their bodies, and then evaluate the possibilities and limitations as well as their adaptation to various needs and situations (material instruments) (D'Ambrosio, 1999). From a technological perspective, it is an important characteristic of scientific knowledge in the form of artifacts. This can be realized in technological tools that translate ways of dealing with natural, social, cultural, political, economic, and environmental.

The trivium curriculum critically provides education with the communicative, analytical, and technological instruments needed to develop 21st-century education (Ambrosio, 1997). The incorporation of the trivium into the classroom implies a curricular reconceptualization where ethnomathematics and mathematical modeling are tools for the learning process (Rosa et al., n.d.). Therefore, teachers have the challenge of not only comprehensively mastering mathematical knowledge and other pedagogical competencies, but also teachers need to understanding and enrich cultural knowledge and reflect the moral values contained in culture.

Ethnomathematics of the Lampung Pepadun Community

Studying Lampung ethnomathematics means examining the similarities between Lampung's cultural anthropology, mathematics, and mathematical modeling. From the results of the study of Lampung Culture, Lampung people have developed ways, styles, and techniques in doing something in response to every search for explanation, understanding, and learning from a phenomenon to meet their needs. The environment near the river is responded to by using it for water transportation and the use of water resources to meet the need for food. The phenomenon of tidal floods made them develop anti-flood building styles and techniques. As well as developing a calculation of the time to catch fish. They also developed fishing techniques with their various traps.

The phenomenon of outsiders coming to conduct trade is responded to by mastering the ability to recognize currencies and barter. In addition, they also develop traditional ceremonies with various supporting components such as dances, music/art, and typical clothing. All activities, both trade and social life, are carried out imbued with the noble values of Lampung culture.

Lampung traditional clothing, namely tapis, has a distinctive feature in the form of patterns that are arranged in an orderly and beautiful manner. Mathematical knowledge in the form of mathematical ideas, procedures, and practices is developed and applied in the manufacture of filters. They make patterns that are then knitted or embroidered with very diverse motifs and patterns. The creation of this pattern pays attention to the principle of similarity and regularity of the pattern made. This pattern is symmetrical by following certain rules and models. Research conducted by (Susiana et al., 2020) Related to the filter pattern associated with mathematics is described as follows.

Figure 2. Filter bamboo shoot motif

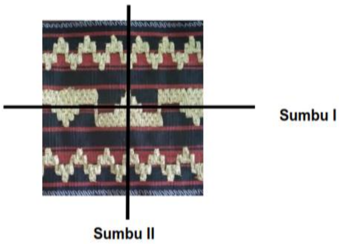

Figure 3. Axis of symmetry

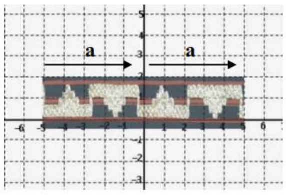

Figure 4. Translation

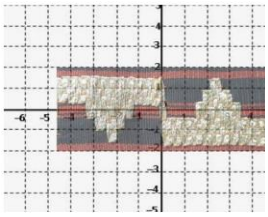

Figure 5 Rotation

The creation of filter patterns applies the use of the concept of transformation geometry in manufacturing. However, if analyzed more deeply, the study only looked at how the filter pattern fits with the concept of transformation geometry. Ethnomathematics as a slice of cultural anthropology, mathematics, and mathematical modeling. This means that it is not enough to only look at it from the perspective of cultural and mathematical contexts but must also involve mathematical modeling or in a cultural context called *ethnomodeling*. Unfortunately, research *ethnomodeling* within the cultural context of Lampung has not yet been done. Although some researchers have done it on other cultures.

Theoretical Framework of Ethnomathematics-Project-Based Learning Strategies.

Project-based learning theory, although it has many advantages, also has disadvantages. Philosophically, this learning departs from the concept of "*learning by doing*"Through the project, meaningful knowledge is obtained by prioritizing democratic values. Project-based learning can produce "smart" human beings in supporting mass industrialization and its efficiency by applying economic and capitalist principles (Fadhlullah, 2019). However, these competencies are not uncommon to be the cause of many socio-cultural problems such as large-scale exploitation of nature and humans, colonialism under the pretext of meeting industrial needs, injustice, and economic inequality. Of course, it is not expected to create intelligent but greedy human beings, but what is expected from education according to Ki Hajar Dewantara (in (Soeratman, 1989)) is an education that gives birth to intellectually intelligent and characterful humans. In addition, in practice, implementing project-based learning in the classroom may be daunting for experienced teachers and even more overwhelming for beginners (Grant, 2002). Therefore, placing ethnomathematical theory in project-based learning will be a new way/strategy that teaches meaningful learning and contains meaningful values for students' lives.

The placement of Ethnomathematics in a project-based learning model can be an ethnomathematics strategy in project-based learning hereinafter abbreviated as **Epsipo**. This strategy is built by paying attention to the philosophies underlying the project-based learning model and ethnomathematics, as well as how these two theories can complement each other. In addition, this strategy also pays attention to the syntax of the project-based learning model which will be enriched with a trivium curriculum based on cultural forms in the hope of meeting learning needs so that learning objectives can be achieved.

Philosophically, as explained earlier, project-based learning departs from the concept of "*learning by doing*"Through the project, meaningful knowledge is obtained by prioritizing democratic values. Project-based learning can produce "smart" human beings in supporting mass industrialization and its efficiency by applying the principles of economics and capitalism. However, these competencies are not uncommon to be the cause of many socio-cultural problems such as large-scale exploitation of nature and humans, colonialism under the pretext of meeting industrial needs, injustice, and economic inequality. c

In addition, Ethnomathematics and project-based learning depart from the same idea, namely both reject learning that provides explanations of ready-to-use/ready-to-use knowledge to students. Project-based learning requires students to construct knowledge through the projects they create (Sutinen, 2013). Ethnomathematics encourages creativity to create mathematical knowledge (Sutinen, 2013). Both lead to meaningful learning. Project-based learning has a clear procedure or syntax, but ethnomathematics does not have a clear procedure but has clear characteristics. Thus, from this gap, researchers see the possibility of placing ethnomathematics in a project-based learning model where the two complement and complement each other.

As a result of the syntax study, the project-based learning model has 4 learning steps, namely 1) Goal Determination, 2) Planning, 3) Implementation, and 4) Evaluation and Reflection. In the *First* namely goal determination, there is a main principle in this step, namely the willingness of students to achieve certain goals through project activities so that students are motivated for a project activity (Kilpatrick, 1918). The content of this activity is a project activity plan that is carried out related to learning objectives through basic questions. In this step, it is necessary to consider or choose the right project form to be used in learning. In the goal determination step, it is not uncommon to encounter obstacles or difficulties in its implementation. One of the obstacles in this activity is the consideration of the project budget and equipment which may require more resources than is available ((Grant, 2002).

The solution to solve problems related to budget, implementation difficulties, and resources is to use cultural context in project determination. The cultural system has taught us the value of using the resources around us to meet our needs without having to depend on others (Nurdin et al., 2020). It can be understood how cultural forms are greatly influenced by the resources available in the area. For example, people in riverside areas use river products as their typical cuisine. Culture has developed itself to make the most of what has been bestowed upon them to form a civilization (Koentjaraningrat, 2009).

The application of ethnomathematics in the project determination step is strongly supported by the teacher's literacy ability about culture (Rosa et al., n.d.). The literacy in question is ethnomathematical literacy related to cultural understanding, social context, and values related to the practice of mathematics in a society. Good ethnomathematical literacy skills will be able to determine the project to be chosen, as well as relate it to the learning objectives and characteristics of students. Therefore, the determination of the project can make the cultural context the chosen project activity.

The *second*, is, planning contains activities to plan the activities of the selected project. The plan can be in the form of understanding the project, making a *timeline,* determining the activities, materials, and tools used, and dividing the tasks among each group. In its implementation, it is not uncommon for the planning step to have obstacles, namely the planning carried out does not have clear steps or stages of activities for students, and its relationship with learning objectives (Kokotsaki et al., 2016). Therefore, breaking down the project into clear and managed stages can be challenging, and each stage must contribute to achieving the ultimate goal of learning.

Projects that make the cultural context the chosen project activity of course clarify the activities to be carried out. This is because by using a context that is close to the surrounding environment, students become familiar with and easily understand the learning material ((Freudenthal, 2000), (D'Ambrosio, 1986)). The challenge is how the project activities in the cultural context contribute to the understanding of mathematics. This is still considered a challenge, considering that students' perception of mathematics has nothing to do with culture. Therefore, placing ethnomathematics in this step is a strategy to not only clarify the stages to be carried out but also the activities carried out contribute to mathematical understanding.

Matheracy In the Trivium Ethnomathematics curriculum helps the stages in the project activities to connect with mathematics. *Matheracy* is the ability of students to interpret and analyze signs and codes, propose and utilize models and simulations in everyday life, and describe abstractions based on real representations (analytical instruments). the ability to draw, hypothesize, and draw conclusions from data according to D'Ambroiso is also *Matheracy*. In the ethnomathematical perspective, mathematics is a domain of skills, strategies, and competencies that empower students to be aware of the way they explain traditions, myths, and symbols, with the scientific knowledge and mathematical knowledge they are good at. (D'Ambrosio, 1999). Therefore, it is recommended that the series of activities carried out in project activities be arranged in a worksheet with an orientation so that students can interpret, analyze, propose models, utilize models, conclude, propose hypotheses, and draw conclusions from data.

The *third* is the implementation of a project or project activity. This activity contains the implementation of a project that has been planned and produces a product. For activities to be carried out properly, there needs to be monitoring by teachers. In its implementation in the classroom, it is not uncommon even though students have planned the project well but sometimes it is still difficult to carry it out (Grant, 2002). Projects created with a cultural context will easily be seen as culture in the form of activities and artifacts. Of course, students will easily understand it and even carry out projects with cultural contexts because it is close to their lives. Students will easily understand mathematical concepts if they are based on a real environment (Freudenthal, 2000).

Tekhnoracy In the Trivium Curriculum, ethnomathematics helps the implementation of cultural context projects in the form of activities and artifacts. Technology is an important feature of scientific knowledge in the form of artifacts (D'Ambrosio, 1999). *Tekhnoracy* translates matters related to the natural, social, cultural, political, and economic environment using technological instruments. Therefore, *Tekhnoracy* which is well mastered by students will support the implementation of the project. Thus, the implementation of the project in the form of activities or artifacts that are close to the students' lives will make it easier for them to carry out the project.

The *fourth* Namely, evaluation and reflection contains some activities such as presentations and discussion sessions between teachers and students. Teachers and students can develop discussions to improve performance during the learning process so that in the end a new finding is found (*new inquiry*) to answer the learning objectives as stated in the initial step. In its implementation, it is not uncommon for this step to have difficulties in making suitability/relationships related to projects that have been implemented with learning objectives (Kokotsaki et al., 2016). Students are busy with the implementation of activities or project products created and ignore the learning objectives. If this is left unchecked, the expectation that students will be able to construct knowledge through projects will not be achieved or the knowledge obtained by students will be very shallow.

The solution to this problem is to focus on evaluation and reflection not on the projects that have been implemented but through literacy, *Matheracy*and *Tekhnoracy* which has been done in steps one to three. The activity was carried out using trigger questions to encourage students to construct knowledge (Bell, 2010). The use of cultural context as a real context can be used to help students understand mathematical concepts (Prahmana, 2022). Furthermore, Prahmana has developed a theoretical framework for this, which is subsequently called Ethnomathematics-Realistic Mathematics Education (E-RME). The use of the E-RME concept in evaluation and reflection activities is expected to encourage students to construct mathematical knowledge and instill values.

The character of mutual cooperation (*gotong royong*) is one of the characters that must be taught and instilled in students. This character has been rooted since time immemorial and has become the identity of the Indonesian nation. Thus, Epsipo's strategy that uses the cultural context in Indonesia has the potential to develop the character of mutual cooperation. According to Notonegoro in (Listyaningsih, 2022), the character of mutual cooperation contains not only the physical dimension, but also contains the inner or spiritual dimension which includes charity because in it there is awareness, attitude of the soul and conversion. Therefore, the character indicator of mutual cooperation refers to the indicator of collaboration, care, and sharing.

Observing the learning steps of Epsipo and its characteristics, the Epsipo strategy theoretically has the potential to improve the character of mutual cooperation of students. The first step of this strategy is able to facilitate students to not only develop knowledge and understanding of the cultural projects raised in learning, but also students to carry out literacy of values in cultural projects. Teachers can also package either manually or digitally noble values or local wisdom in the culture that is raised so that through this way the cultivation of noble values, including the values of mutual cooperation, can be instilled in students. The second step is project planning, which is planning the project to be created. Given that there is quite a lot of work that must be done by the group in this activity, students must be able to divide the work among each member and work together to complete the project (cooperation). Each group member must coordinate with each other regarding their respective roles so that the overall project can run optimally (cooperation). Each group must pay attention to whether the plan that has been made is complete enough or not (concern).

The third step is Project implementation. In this activity, students have played a role in their respective roles which then coordinate in order to complete their projects as a whole (collaboration). Students voluntarily carry out their work for the benefit of the group (voluntarily). Students must pay attention that each member does not experience significant difficulties, but if this still happens, students must care and help their fellow members (sharing). The fourth step is Reflection and evaluation. In this activity, students who have understood mathematical concepts are expected to care and are willing to share knowledge with their group mates who are still experiencing difficulties (caring and sharing).

From the review above, the placement of ethnomathematics in project-based learning makes project-based learning easy to implement and meaningful for students so this becomes an ethnomathematics strategy in project-based learning called the Epsipo Strategy. This strategy involves a trivium curriculum of "literacy, *Matheracy*, and *Technoracy* in project-based learning in a cultural context. This strategy not only explains the steps of learning the epsipo strategy but also allows arranging mathematics learning materials or programs so that they are more meaningful and rich in value. Dick and Carey (1990) explained that learning strategies are not only limited to procedures or stages of learning activities but also include the arrangement of materials or learning program packages that will be delivered to students.

CONCLUSION

Mathematics as the highest form of rationality often causes most mathematics teachers to think that teaching mathematics is only to develop cognitive abilities.

Mathematics teachers have a responsibility not only for students to understand mathematics but also to instill universal human values in students.

Project-based learning has made a significant contribution to realizing meaningful mathematics learning. Although project-based learning has many advantages, it also has disadvantages. The learning that departs from the concept of "*learning by doing*" is seen as able to produce "smart" human beings in supporting mass industrialization and its efficiency by applying economic principles and capitalism. However, these competencies are not uncommon to be the cause of many socio-cultural problems such as large-scale exploitation of nature and humans, colonialism under the pretext of meeting industrial needs, injustice, and economic inequality. Of course, it is not expected to create intelligent but greedy humans. Ethnomathematics initiated by D'Ambrosio is rich in moral and social values. Therefore, the Epsipo strategy was developed by combining project-based learning model theory and Ethnomathematics looking at the many intersections and advantages of each of these theories.

The application of the epsipo strategy in mathematics learning is expected to make it easier for students to understand mathematical concepts by the strategy and level of student thinking. They also have socio-cultural values that can be instilled to build students' character and ethics as mathematics users so that the knowledge they use can be beneficial to world civilization.

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