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**LEARNING WITH ETHNOMATHEMATICS BASED OPEN ENDED  
APPROACH IMPROVES CREATIVE THINKING ABILITY, CURIOSITY  
CHARACTER**

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**Abstract**

Think more creatively and innovatively in dealing with problems and sites will not be possessed without extensive knowledge. This is one of the demands on all students to be able to think more creatively. The character of curiosity to be observed. The character of curiosity that will be instilled so that students have a strong self-curiosity, strength, and do not give up easily. Curiosity needs to be instilled in students through a fun approach so that students do not feel bored. Here, teachers as educators must be more creative in finding ideas to choose the right approach in developing students' curiosity. Many teachers are found using an expository model, where the teacher explains the material, provides examples and practice questions so that students are trained to do questions such as mechanics or machines. In addition, the assessment carried out emphasizes more on the final assessment and pays less attention to the process, so that mathematics learning is less meaningful; Prioritizing memorization over understanding. The purpose of this study is to examine whether learning with an Ethnomathematics-based Open Ended approach can improve students' creative thinking ability and curiosity in mathematics. Based on the above problems, an appropriate learning approach is needed that can bridge these problems, namely learning with an Ethnomathematics-based Open Ended Learning approach, where students are given the flexibility to answer their abilities to find and develop their own knowledge. The steps begin with the awarding of a problem sourced from culture and end with analyzing and evaluating the problem-solving process. Thus, learning with an Open Ended Learning approach based on Ethnomathematics, will have a very high contribution to students' mathematical creative thinking ability and the character of students' curiosity in mathematics learning.

**Keywords : creative thinking, curiosity character, open ended learning, ethnomathematics**

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**INTRODUCTION**

In facing the era of globalization, which is accompanied by the very rapid development of science and technology, education is faced with challenges that require it to be able to produce human resources (HR) that can meet global demands (Dacholfany, 2015). Because education is a forum for activities that strive to build society and national character on an ongoing basis, namely fostering mental, rational, intellectual and personality in order to form a complete human being. Therefore, education needs to receive intensive attention, handling and priority from the government, society and education administrators (Nashihin, 2019).

Education is something that absolutely must be addressed by the Indonesian people if they want to improve the quality of human resources. One of the government's efforts to improve the quality of education is to improve the curriculum. In 2006, the Education Unit Level Curriculum (KTSP) was implemented in the education system in Indonesia. KTSP is an operational curriculum that is prepared, developed, and implemented by each educational unit that is ready and able to develop it in accordance with the potential of the school or region, the characteristics of the school or region, the socio-culture of the local community, and the characteristics of students. (Fadhli, 2017).

According to law number 20 of 2003 education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by them. society, nation and state. Education is a very basic need for people's lives, both national and international communities. People are now starting to realize the importance of education for their

children. This public awareness must of course be balanced with an increase in the professionalism of a teacher. Increasing professionalism includes the knowledge and skills of teachers in carrying out learning activities in schools.

Education plays a major role in efforts to create and strengthen understanding of diversity. The law regarding the implementation of education in Indonesia has been stipulated. National Education System Law No. 20 of 2003 article 4 paragraph 1 explains that "Education is carried out in a democratic and fair and discriminatory manner by upholding human rights, religious values, cultural values, and national pluralism.

According (Yusnadi, 2013) In the context of building a multicultural society, besides playing a role in improving the quality of the nation so that it is commensurate, standing on an equal footing with other nations, education also plays a role in providing glue between various differences between cultural communities or groups of people who have different cultural backgrounds.

On the other hand, there are still many opinions from the public who say that our education is considered lacking in character and has not been able to produce quality citizens, both academic achievement and good behavior. The emphasis on learning is still focused on mastering the material, while character education is "less attention". This can be seen when students are about to face the National Examination given additional hours with the hope of passing all of them, by obtaining high National Examination scores that have not touched character education as a support for student achievement. In fact, if learning is carried out by implementing character education, it will produce intelligent and conscientious people.

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To carry out character education requires creativity in developing mechanisms that include educational models and methodologies (Suprayitno & Wahyudi, 2020). Therefore, here, we will raise the issue of learning Mathematics which emphasizes one student character, namely the character of curiosity based on local culture.

In this study, the character of curiosity will be observed. The character of curiosity will be instilled so that students have a strong, strong self-curiosity and do not give up easily. Curiosity needs to be instilled in students through a fun approach so students don't feel bored. Here, the teacher as an educator must be more creative in finding ideas to choose the right approach in developing students' curiosity.

Many students at every level of education consider mathematics as a difficult subject and often cause complex problems to solve, resulting in low student learning outcomes. Errors that are made are not only sourced from the lack of ability of students, but there are factors that also determine the success of students in learning mathematics, namely learning that is tailored to the needs of students. In order for learning outcomes to work well, it is necessary to have the right method or strategy in the learning process carried out by students and teachers (Saironi & Sukestiyarno, 2017).

This happens because in general students have not been able to think creatively well what they have learned so that it is very influential on students' mathematical creative thinking abilities. The low ability of students to solve math problems is caused by the low ability of students to think creatively. This is because many schools still use the expository method which is carried out continuously so that the learning outcomes obtained by students are not maximized.

With the above problems, new learning strategies are needed that involve more students. Learning strategies that are able to make students work together and encourage students to think creatively and explore their abilities independently. To solve this problem, it is necessary to have an appropriate learning approach so that students can understand mathematical concepts well and are able to develop mathematical creative thinking abilities optimally. One appropriate learning approach to

overcome this problem is the Open Ended approach. The Open Ended Approach is an open learning activity or often known as Open Ended Learning (OEL) is a learning process in which the goals and desires of individuals/students are built and achieved openly, Hannafin, Hall, Land, & Hill.

From this description, the author will examine whether learning with an Ethnomatematika-based Open Ended approach can improve students' creative thinking skills and curiosity in mathematics?

## **RESEARCH METHOD**

This study uses a systematic literature review or also called a literature review. The method used for data collection techniques is conducting studies identifying, reviewing, evaluating, and interpreting the available research, literature books, and reports. Researchers carry out reviews and identify journals systematically and in each process follow the steps that have been determined (Triandini et al., 2019). In completing this study the researcher collected relevant journal articles. The keywords of this study are learning outcomes, communication skills, recitation methods and open-ended approaches.

## **RESULTS AND DISCUSSION**

### **1. Mathematical Creative Thinking Ability**

Every human being in essence must always think, but the level of breadth will always be different. Thinking more creatively and innovatively in dealing with problems and situations will not be possessed without extensive knowledge. This is one of the demands of all students to be able to think more creatively.

Thinking more creatively will not be born suddenly without ability. High curiosity and followed by skills in reading. As expressed by Porter and Hernacki that "a creative person always has a sense of curiosity, wants to try adventure and is intuitive".

Creative thinking means trying to solve a problem by involving all the appearances and facts of data processing in the brain. There are five creative processes expressed by De Porter and Mike Hernacki (Uno & Mohamad, 2014) that is :

1. Preparation, defining the problem, goal or challenge;
2. Incubation, digesting facts and processing them in the mind;
3. Illumination, pressing to the surface, ideas emerge;
4. Verification, ascertain whether the solution actually solves the problem;
5. Application, take steps to follow up on the solution.

The creative process certainly cannot be carried out without the knowledge that can be obtained through reading, language, and other aspects. Therefore, a student is required to be able to develop and train his mindset to be more creative. This shows that the student process has completed a learning process and thought development properly and proves that the learning strategy he has chosen can and is successful.

### **2. Karakter**

In (KBBI, 2019) the term "character" means Wyne's psychological, moral or ethical qualities in (Aqib, 2010) The word character comes from Greek which means "to mark" and focuses on how to apply the value of kindness in the form of action or behavior. So the term character is closely related to a person's personality, where a person can be called a person of character if his behavior is in accordance with moral rules.

In the book "Cultural Education and National Character" Balitbang Puskur 2010 national character education is defined as: education that develops cultural values and national character in students so that they have these values in their own lives, as members of society and citizens who religious, nationalist, productive, and creative (Aqib, 2010).

According to Thomas Lickona in (Sutarna, 2016) Character is the nature of a person in responding to situations morally. This nature is manifested in concrete actions through good behavior, honesty, responsibility, respect for others and other noble characters. The understanding put forward by Lickona is similar to what was expressed by Aristotle, that character is closely related to "habit" or habits that are continuously carried out. Furthermore, Lickona emphasizes three things in educating character, which are formulated beautifully: knowing, loving, and acting the good.

According to the success of character education begins with understanding good character, loving it, and implementing or exemplifying that good character.

According to Suyanto (Sutarna, 2016) Character is a way of thinking and behaving that is characteristic of each individual to live and work together, both within the family, community, nation and state. Individuals with good character are individuals who can make decisions and are ready to take responsibility for any consequences of the decisions they make.

**Table 1 Values and Descriptions of National Character Education Values**

Value	Description
Religious	Obedient attitude and behavior in carrying out religious teachings. Those he adheres to are tolerant of other religious practices and live in harmony with followers of other religions.
Honest	Behavior based on efforts to make oneself a person who can always be trusted in words, actions, and work.
Tolerance	Sikap dan tindakan yang menghargai perbedaan agama, suku, etnis, pendapat, sikap, dan tindakan orang lain yang berbeda dari dirinya.
Discipline	Actions that show orderly behavior and comply with various rules and regulations
Hard work	Behavior that shows genuine effort in overcoming various learning and assignment obstacles, and completing assignments as well as possible.
Creatif	Think and do something to produce new ways or results from something you already have
Independent	Attitudes and behaviors that are not easy to depend on others in completing tasks
Democratic	Ways of thinking, behaving, and acting that value the rights and obligations of himself and others.
Curiosity	an action that always seeks to find out more deeply and broadly than something it learns, sees, and hears
Spirit of nationality	A way of thinking, acting and having insight that places the interests of the nation and state above self and group interests
Love of the Motherland	Ways of thinking, behaving, and acting that show loyalty, concern, and high appreciation for the nation's language, physical, social, cultural, economic, and political environment

### 3. Curiosity Character

In this study, the character of curiosity will be observed. The character of curiosity will be instilled so that students have a strong, strong self-curiosity and do not give up easily. Curiosity needs to be instilled in students through a fun approach so students don't feel bored. Here, the teacher as an educator must be more creative in finding ideas to choose the right approach in developing students' curiosity.

The standard content of mathematics subjects contained in Permendiknas no. 22 of 2006 states that the purpose of mathematics subjects is that students have the ability to understand mathematical concepts, use reasoning, solve problems, communicate ideas, and have an attitude of appreciating the usefulness of mathematics in life. If all of the learning objectives in the KTSP curriculum are truly embodied in learning, it is certain that Indonesian students will not experience difficulties in solving PISA or TIMSS oriented questions.

In this study, the character of curiosity will be observed. The character of curiosity will be instilled so that students have strong, strong self-confidence, and not easily follow other people whose level of truth is not certain. According to the Ministry of Education, curiosity is an attitude that shows understanding of one's abilities and self-esteem values. Curiosity needs to be instilled in students through a fun approach so students don't feel bored. Here the teacher as an educator must be more creative in finding ideas to choose the right approach in developing students' curiosity.

According (Waningsih, 2020) revealed that curiosity is an extraordinary power. Curiosity is like a reactor that generates all the energy in a person to achieve success. As the next generation of

the nation, it is very important to instill curiosity in students so that they grow into individuals who are able to develop their potential.

Personal characteristics of someone who has an attitude of curiosity include :

- a. It's not easy to experience despair. A person who is curious will always be enthusiastic about taking action, has determination, is diligent and never gives up.
- b. Can appreciate and his own efforts
- c. Prioritize your own business and not depend on other people.
- d. Dare to express your opinion. Someone who has an attitude of curiosity, one of which is the courage to express his opinion in front of many people.
- e. Responsibility with his duties. A person who is curious will always have responsibility for himself, namely always doing what is his duty in carrying out an action.
- f. Have aspirations to achieve success. The nature of curiosity is only possessed by people who are passionate about fighting and have a strong will, trying and realizing their dreams to become reality.
- g. Easy to communicate and help others.

#### **4. Open Ended Learning Approach**

The flow of constructivism, views that knowledge is actively built by individuals and places more emphasis on student-centered learning. The purpose of learning based on this view is to build understanding, so that learning in this view is not emphasized to acquire a lot of knowledge, but the main thing is to provide interpretation through the schemata that students have. One of the learning approaches that is part of constructivism learning is an open-ended approach in which learning is presented with a problem that has a variety of solutions or methods of solving it. The application of the open-ended approach in the learning process of mathematics requires teachers to increase their mathematical knowledge.

The open-ended approach with diversity in completion or settlement methods mentioned above, provides flexibility for students to express answers. Through presentations and discussions of alternative solutions, this approach makes students aware of the existence of various methods of solving. In the end it is hoped that there will be an increase in students' mathematical capacity in solving mathematical problems. The reality in the field is that there are obstacles in the process of developing students' mathematical reasoning and problem solving abilities (Mansur et al., 2008). This is because it does not make reasoning and problem solving the basis for understanding. The process of learning mathematics at school is more dominated by the doing aspect than the thinking aspect. This means that it has more to do with the problem of manipulative skills than the problem solving process which emphasizes matters relating to the questions 'why is that' and 'what are the implications, so that students' understanding is limited to rote memorization.

Open learning or what is often known by the term (Team et al., 2021) is a learning process in which the goals and desires of individuals / students are built and achieved openly. Not only objectives, OEL can also refer to ways to achieve the learning objectives themselves, Hannafi, Hall, Land, & Hill (Huda & Pembelajaran, 2014) There are several assumptions underlying this OEL. Are as follows :

- a. Context and experience are important things to understand: learning will be most effective if it involves rich and concrete experiences with which students can discover, shape, and change their theories practically in the field.
- b. Understanding must be individually mediated: Siawa assesses what, when, and how learning occurs.
- c. Improving cognitive processes is often more important than creating learning products. For this reason, an open ended environment needs to be designed to support high-level cognitive skills, such as identifying and manipulating variables, interpreting data, hypotheses, and experimentation. The process of scientific research is valued more than obtaining the scientific 'truth' itself.
- d. Understanding is more valuable than knowing: An open-ended learning environment must immerse students in experiences that enhance their understanding through exploration, manipulation, and opportunities to 'understand' ideas rather than direct teaching.

- e. Qualitatively different learning processes often require qualitatively different methods: OEL focuses on problem-solving skills in authentic contexts and provides opportunities for exploration and theory building. OEL syntax can be done with :
- Presenting the problem;
  - designing learning;
  - Observe and record student responses;
  - Guiding and directing students; and
  - Draw conclusions.

According (Huda & Pembelajaran, 2014) The steps that need to be taken by teachers in OEL (Open Ended Learning) are :

- Facing students with open problems by emphasizing how students arrive at a solution.
- Guiding students to find patterns in constructing their own problems.
- Let students solve problems with various solutions and various answers.
- Ask students to present their findings.

The components of OEL can be divided in the following ways, according to Hannafin, Hall, Lan, and Hil (Huda & Pembelajaran, 2014) :

- Context – built externally, introduced externally, or created individually
- Source – static and dynamic.
- Strategy – processing, searching, collecting, organizing, and creating.
- Scaffolding- konseptual, metakognitif, dan strategis.

## **5. Etnomatematika**

The term ethnomathematics, hereinafter referred to as ethnomathematics, was introduced by D'Ambrosio, a Brazilian mathematician in 1977. The definition of ethnomathematics according to D'Ambrosio is :

The prefix ethno is today accepted as a very broad term that refersto the socialcultural context and therefore includes language, jargon, and codes of behavior, myths, and symbols. The derivation of mathema is difficult, but tends to mean to explain, to know, to understand, and to do activities such as ciphering, measuring, classifying, inferring, and modeling. The suffix tics is derived from techné, and has the same root as technique (Rosa & Orey, 2011).

Linguistically, the prefix "ethno" is defined as something very broad that refers to the socio-cultural context, including language, jargon, code of conduct, myths, and symbols. The basic word "mathema" tends to mean explaining, knowing, understanding, and carrying out activities such as coding, measuring, classifying, concluding, and modeling. The suffix "tics" comes from techne, and means the same as technique. In terms of ethnomathematics is defined as :

"The mathematics which is practiced among identifiable cultural groups such as national tribe societies, labour groups, children of certain age brackets and professional classes" (d'Ambrosio, 1985).

Meaning: "Mathematics is practiced among identifiable cultural groups such as national societies, tribes, labor groups, children of certain age groups and professional classes " (d'Ambrosio, 1985). The term was then refined to become :

"I have been using the word ethnomathematics as modes, styles, and techniques (tics) of explanation, of understanding, and of coping with the natural and cultural environment (mathema) in distinct cultural systems (ethno)" (d'Ambrosio, 1985).

From this definition, ethnomathematics can be interpreted as mathematics practiced by cultural groups, such as urban and rural communities, labor groups, children of certain age groups, indigenous peoples, and others. (d'Ambrosio, 1985) states that the purpose of ethnomathematics is to recognize that there are different ways of doing mathematics taking into account the academic mathematical knowledge developed by different sectors of society as well as taking into account the different modes in which different cultures negotiate their mathematical practice (way of grouping, counting, measuring , designing buildings or tools, playing and others).

## **6. Etnomatematika dalam Berpikir Kreatif**

According Knijnik 1994 (Saputra & Purwanti, 2010) Mathematics is a cultural knowledge that grows and develops to connect human needs which is known as ethnomathematics. Meanwhile,

according to Andreas Eppink, culture contains the entire notion of social values, social norms, knowledge, as well as all social, religious, and other structures, in addition to all intellectual and artistic statements that characterize a society..

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## **7. Ethnomatematics-Based Open Ended Learning Approach**

Problem-based learning is student-centered learning (student oriented) which is highly determined by the students themselves. Learning is controlled by the existence of a problem, learning starts from a problem to find a solution, and problems are placed in such a way that students feel the need to gather new knowledge before they solve the problem. By incorporating cultural elements as the root of learning problems, it will be more interesting, so that Ethnomatematics-based Open Ended Learning is developed. In ethnomatematics-based Open Ended Learning learning, the steps begin with giving a problem that originates from culture and ends with analyzing and evaluating the problem-solving process. The stages of ethnomatematics-based Open Ended Learning learning are as shown in Table 2

Minister of Education and Culture No. 65 of 2013 concerning process standards, learning activities consist of three stages, namely introduction, core, and closing.

**Table 2 Syntax of Ethnomatematics-based Open Ended Learning Approach**

<b>Step</b>	<b>Learning Activity</b>
<b>Introduction</b>	
<b>Step 1</b> Orient students to problems from their local cultural environment	1.1 Learner Orientation by collecting structured assignments of mathematical material problems with local culture given previously 1.2 Students are encouraged to submit hypotheses/conjectures from culturally charged material problems with leading questions (asking)
<b>Core</b>	
<b>Step 2</b> Organizing and designing students to learn	2.1. Through debriefing (asking), student organizations in small groups (forming networks), are directed to find alternative strategies to solve the material problems discussed 2.2. Learners are guided to design activities to test the hypotheses proposed
<b>Step 3</b>	3.1 Pay attention, record student responses & individual and group investigations
<b>Step 4</b> Guiding, directing, and presenting the work	4.1. Students in groups develop (reason) and present the results of the discussion
<b>Step 5</b> Analyze	5.1. Learners are directed to analyze and evaluate the process of solving problems
<b>Step 6</b> evaluate processes solving local culturally charged problems	The material learned is then given reinforcement in the group
<b>Closing</b>	
With the guidance of the teacher, students conclude the results of the discussion. The teacher carries out enrichment activities for students who have achieved completeness and provides remedial for students who have not achieved completeness	

Research modification by using OPL syntax (Huda & Pembelajaran, 2014) combined with raising problems from the cultural environment of students.

## **8. Characters love local culture**

The character of loving local culture is a national character that needs to be developed in students. Culture is an aspect that has begun to disappear, even though culture is an important aspect

for knowing the identity of an individual or society. Advances in technology, communication, information and transportation have led to the rapid entry of foreign cultural influences into Indonesia. In this globalization era, it has a negative influence on local culture in Indonesia. According (Suneki, 2012) The character of loving local culture is a national character that needs to be developed in students. Culture is an aspect that has begun to disappear, even though culture is an important aspect for knowing the identity of an individual or society. Advances in technology, communication, information and transportation have led to the rapid entry of foreign cultural influences into Indonesia. In this globalization era, it has a negative influence on local culture in Indonesia

## CONCLUSION

The selection of learning strategies to be used in the learning process must be oriented towards the learning objectives to be achieved. In addition, it must be adjusted to the type of material, the characteristics of students, the conditions in which the learning process will take place. There are various learning methods and techniques that will be used by teachers, but not all of them are equally effective in achieving learning objectives. For this reason, teacher activity is needed in choosing learning strategies. The obligation as an educator, is not only to transfer knowledge, but also to change the behavior and character of students and provide positive encouragement, so that students are motivated to provide a pleasant learning atmosphere so that they can develop as much as possible. To get maximum results from the educational process, of course, creative and innovative thinking is needed. Innovation in the learning process is needed to increase achievement towards the maximum and produce students who are innovative, have the ability to think creatively, have a high curiosity character. This innovation can be carried out using several learning approaches, learning strategies, and learning methods, including in this study discussing the problem of local culture-based or Ethnomatematics Open Ended learning approaches

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