

# An Ethnosains Based Project Based Learning Model with Flipped Classroom on Creative Thinking Skills

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**Abstract:** Education in the 21st century demands very rapid development of knowledge and technology, so that 4C skills are needed, namely creative thinking skills, critical thinking and problem solving, communicating, and collaborating to face global challenges. Creative thinking skills as a very important skill for students in the era of global competition because the level of complexity of problems in all aspects of modern life is also getting higher. Learning with ethnoscience can be implemented in the PjBL learning model by incorporating the culture that develops in society into learning. Flipped Classroom is carried out by students by studying at home through books or videos that have been integrated with the culture of society. This study aims to determine the effect of the ethnoscience-based PjBL learning model with a flipped classroom on creative thinking skills. This research is a literature study using secondary data sources in the form of books and scientific journal articles. Data was collected using publish or perish applications and analyzed one by one manually. The results show that the application of project-based models and ethnoscience with flipped classrooms influences creative thinking skills.

**Keywords:** Creative thinking skills; Ethnoscience; Flipped classroom; Project based learning models

## Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results. The industrial revolution 4.0 has made technology have a significant impact on human life, especially in education (Premana et al., 2020). Education is required to develop 21st century skills. These skills include problem solving skills, critical thinking skills, collaboration, communication skills, and creativity skills (Hosnan, 2014). This is in accordance with the demands of the 21st century, namely students are required to have creative thinking, critical thinking and problem solving, communication, and collaboration or commonly referred to as 4C (Sa'adah et al., 2022).

Creativity is the key to a human learning process. Therefore, educational institutions make efforts to increase proactive learning and innovative abilities

through adaptive education and promote creative thinking as a core competency in a learning construction for secondary schools (Education, 2014). Creativity can be formed if a person has a high ability to think creatively. Students' ability to think creatively has an important role so that problem-solving skills increase and can make decisions that can be accounted for.

Creative thinking for students is very important in the era of global competition because the level of complexity of problems in all aspects of modern life is also getting higher. Creative thinking includes high order competencies and is a continuation of basic competencies or basic skills in learning. In line with the statement by the Career Center Maine Department of Labor USA that the ability to think creatively is important and is a skill needed in the world of work (Mahmudi, 2010).

The results of studies in China and the United States on creativity and the ability to pose a problem show that

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there are differences in student performance in the three groups in asking problems, calculating skills, and solving problems (Harpen et al., 2013). The results of the Program for International Student Assessment or PISA research in 2018, stated that Indonesia was ranked 74th out of 79 countries with an average score of students' mathematical abilities in Indonesia, namely 379, this score was below the international average, namely 489 (Kemendikbud, 2019). The results of this PISA research can be related to the ability to think creatively because PISA questions are contextual questions that require reasoning, argumentation, and creativity in solving the problems.

While the results of the Trend of International on Mathematics and Science Study (TIMSS) survey on student achievement in 2015, Indonesia was ranked 42 out of 46 participating countries. Positions with an average score of 405 are in a low position. Furthermore, based on a creativity survey in the Creativity and Prosperity Institute, Indonesia is ranked 115th out of 139 countries. Based on data from the global creativity index (Herrera-Usagre, 2019) which is reviewed in terms of technology, talent, and tolerance, Indonesia is ranked 115 out of a total of 139 countries. This means that Indonesia is a country that is not yet creative. The research results of Ramdani et al. (2018) state that the ability to think creatively mathematically in Indonesia is still relatively low. This is shown from the research of Handayani et al. (2018) which mentions students' difficulties in solving PISA questions, namely not being able to write answers that are different from the others or creative and are not used to solving non-routine questions during learning activities.

Students' skills in creative thinking are not optimal because teachers are still teacher centers and have not sought knowledge and understanding of students' abilities to think creatively (Azhari et al., 2014). The same thing has also been expressed by Sirait et al. (2018) the cause of the low test results for students' creative thinking skills can be caused by the learning styles and learning models applied by teachers at school. The cause of students' low creative thinking skills is that the learning model applied in schools tends to make teachers use conventional learning models (Septiana et al., 2017) and teacher-centered learning so that teachers seem more active than students during learning activities (Sihaloho et al., 2017).

The project-based learning model (Project Based Learning) as a learning model based on experience. The method of the PjBL learning model is consistent with applying the concept of "learning by doing" from the American philosopher and educator, John Dewey. This PjBL model places students as learning centers, so that students are actively involved in the learning process.

The PjBL model can improve students' ability to think creatively, because in this PjBL learning model it applies indicators in the form of the ability to identify, analyze, solve problems, think logically, and make decisions correctly and be able to draw conclusions (Sugandi, 2021). As a result it involves students in gaining knowledge that will promote their development of 21st century abilities, project-based learning is a model of instruction that should be used (Sart, 2014).

Ethnoscience as an activity in transforming indigenous knowledge that develops in society into scientific science. The application of ethnoscience in learning apart from being an effort to preserve and develop regional local wisdom is also able to improve students' creative thinking skills (Amini et al., 2021). Ethnoscience in the form of natural knowledge in the form of customs and culture, morals, language, and technology created with natural knowledge (Sudarmin et al., 2014). Through contextual learning or also known as ethnoscience-based learning, students can gain knowledge through observing local culture/wisdom. Through these observations, students are expected to be able to connect the material discussed with local culture/wisdom, so that learning will be easier to understand and beneficial to life.

Johnson (2013) explains Flipped classroom as a strategy that provides a little direct instruction during learning activities and is carried out by maximizing interaction between educators and students. Activities carried out at home are delivering material, which is usually done in class (Yuliyatno, 2020), by studying assignments in the form of material and practice questions through digital media in the form of videos or e-books (Roehl et al., 2013).

Students understand material by watching videos or through digital media by preparing questions or problems that they don't understand. While in class, students play an active role in problem solving (individual or group), discussions or group activities (Sohrabi et al., 2016). The liveliness of students in interacting through active learning can increase knowledge retention (Susanti et al., 2019).

Hmelo-Silver et al. (2007) argues that learning activities with the PjBL model will help reduce students' "cognitive load". Cognitive load is obtained from student activities in carrying out tasks involving cognitive processing systems (Latifah et al., 2016). Reduced cognitive load will assist students in compiling good problem-solving steps so as to achieve cognitive growth (Bell, 2010) related to students' mental abilities and activities in information processing, thinking skills in solving problems (Khyarusoleh, 2016). Therefore, the PjBL model that is integrated with the flipped classroom can help students achieve better cognitive growth. This

is in line with the opinion of Trianggono et al. (2022) who stated that the flipped classroom actively assists students during learning activities that require higher-level thinking. Cognitive tasks play an important role in learning using the flipped classroom concept.

Based on this explanation, studies are needed related to the application of the Ethnoscience-based PjBL model with a flipped classroom in improving creative thinking skills. This is important in order to provide input, descriptions and references in designing learning strategies in an effort to improve creative thinking skills. One of the learning models that can be used is project-based learning based on ethnoscience with flipped classroom.

**Method**

This research is a type of systematic literature review research. A type of research method identified as a literature review tries to study, analyze, and synthesize specific knowledge (Snyder, 2019). The data source used in this study uses secondary data in the form of scientific articles that are searched using publish or perrish. The steps in writing this article include: 1) Collecting data about the ethno-Project Based Learning with flipped classroom on creative thinking skills, 2) reading and recording research results, 3) analyzing and concluding the data obtained.

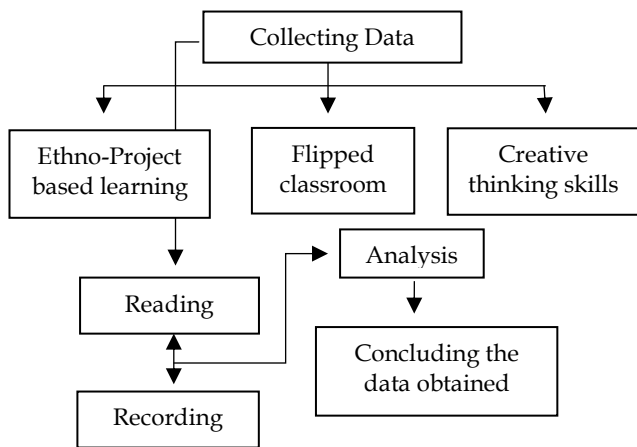


Figure 1. Steps writing the article

**Result and Discussion**

Results should be clear and concise. The discussion should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Project-based learning (PjBL) is an innovative learning model in developing 4C skills (Arisanti et al., 2017; Putri et al., 2018). Project-based learning is also an

excellent model for developing basic skills needed by students for their lives, such as making decisions, creativity, learning outcomes, and problem solving (Suwarno et al., 2019; Yahya, 2014). Research conducted by Chiang et al. (2016) also stated the same thing that learning by applying the PjBL model is able to increase the learning motivation of vocational school students and is able to facilitate the problem solving abilities of SMK students. PjBL is an effective educational approach to improve skills in creativity, thinking, problem solving, and interaction between their peers to create and use new knowledge (Indrawan et al., 2020). Project based learning (PjBL) is considered as a learning method, philosophy, or didactic conception and as a coherence of knowledge construction and research approach (Lasauskiene et al., 2015). Project-based learning prepares students for academic, personal and career success, as well as prepares students to overcome the challenges of the world in which they live (Sahin, 2019). Project-based learning can train students to apply the scientific method in developing their science process skills (Hayati et al., 2013). In addition, project-based learning can also develop ideas (Start, 2014). The application of the PjBL model in the learning process can significantly improve the relationship between teachers and students and increase students' enjoyment in the learning process (Hugerat, 2016).

Shiva et al. (2013) stated that students would be more active in class by implementing project-based learning. Zahran (2018) states that PjBL has a positive effect on student writing performance. Du et al. (2016) also stated that PjBL has a positive effect and provides great benefits to students' academic achievement, namely language skills, critical thinking, and knowledge acquisition. In PjBL, students explore authentic and meaningful topics that are relevant to their lives and create artifacts that allow them to demonstrate their learning in public to record their scientific engagement (Krajcik et al., 2014). In the research of Ayazu et al. (2015), learning with the PjBL model further improves student achievement in physics subjects because the field of physics is very directly related to everyday life.

Project Based Learning (PjBL) refers to an inquiry-based learning method that involves students in the construction of knowledge by means of students completing a project that develops its product (Brundiars et al., 2013). PjBL involves direct contact with the object of study and ends with the realization in the form of student work projects (Bell, 2010), applying knowledge and skills in developing an attitude of cooperation (Sánchez, 2018). Therefore, in the Project Based Learning model, it does not only require understanding of concepts but can develop other skills or abilities in creating new innovations while

completing projects through collaboration (collaboration) in groups.

Learning will focus on students and provide meaningful activities for them. The learning process will assist students in building material concepts (Afriana et al., 2016). Using the PjBL approach in learning activities, students will be more involved in the learning process and because they do some research in solving problems, students will better understand the lesson than memorize (Juleha et al., 2019). PjBL emphasizes students to work independently in their learning and accumulate it in the form of real products (Setyarini et al., 2020). In project based learning students understand concepts by producing the best products (Lutfi et al., 2018). With project-based learning, the assessment will be more authentic, it measures skills that cannot be measured through standardized tests. Mastery of student skills is measured through performance-based assessments which include rubrics, self-evaluation, and reflection (Bell, 2010).

Research conducted by Citradevi et al. (2017) suggests that project-based learning can improve science process skills at every meeting and students are able to construct their knowledge through projects that are structured. Ramadhani et al. (2020) said that the implementation of PjBL in the Project-Flipped Classroom using e-modules had a significant effect on developing students' thinking skills. In addition, the application of the PjBL model can improve students' higher-order thinking skills (HOTS) (Eliyasni et al., 2019).

Ethnoscience as one of the recommended scientific approaches in the world of education. In ethnoscience there is integration between the science learning process and the local potential of a particular region, nation, or social group (P. Handayani et al., 2019; Sudarmin et al., 2014). Indonesia, which is rich in culture from various tribes, can be integrated into learning to better understand science. This will be more easily accepted by students and encourage them to like and preserve their own culture. Integrating ethnoscience into learning will add insight regarding local wisdom values from the potential of each region (P. Handayani et al., 2019). Learning will connect original knowledge and scientific knowledge that they understand, so that students can indirectly apply theory in life.

Kokotsaki et al. (2016), recommends several things to be applied in the learning process that integrates the PjBL model including students need to be guided and supported effectively so that time management, student self-management, and utilization of information resources can be maximized; creating quality group work; ensuring students develop knowledge and skills in the project implementation process; progress of

student skills at the stage of reflection assessment, self-evaluation, and peers need to be done regularly; and the PjBL process gives students a sense of ownership and control over their learning.

Students tend to pay less attention to the material offered since learning takes place in schools lacks context. Schools do not provide context for learning, which causes students to pay less attention to the lessons being taught. That means students' appreciation of learning is increased when employing ethnoscience lessons (Atmojo, 2012). Joseph (2010) describes learning that uses an ethnoscience approach based on the recognition of tradition as an expression and communication of a thought and scientific progress. Integrating ethnoscience in the PjBL learning model by linking local traditions with theories in science learning. Students will practice in the activities of compiling a project in solving a problem related to the culture in their area. Handayani et al. (2019) explain that they will solve problems by designing projects through scientific procedures such as determining ideas, problem formulation, hypotheses, determining tools and materials, compiling work steps in making creative products.

Learning science using an ethnoscience-based PjBL model will make it easier for students to increase their understanding because it is linked to local wisdom traditions around students. Implementation in implementing the integration of project-based learning with ethnoscience encourages students to be more creative (Handayani et al., 2019). Students can learn the concept of science learning that is integrated with traditional knowledge and the culture of the local community, it will be easier and more interesting for students to gain direct experience in everyday life. Mirnawati et al. (2021) show that the ethnoscience-based PjBL model has a good influence on students' ability to think creatively.

The application of the PjBL model really provides space for students to process and arrange problem solving through project activities that will be carried out based on existing problems. This activity will hone student skills through practice, theory that will be applied (Djamarah, 2019), so this will require a lot of time allocation and class conditions that are not conducive because students must carry out discussions of various project assignments to be carried out (Trianto, 2014). Therefore, learning with the ethnoscience-based PjBL model is carried out through a flipped classroom.

Johnson (2013) explains Flipped classroom as a strategy that is given by minimizing direct instruction during learning activities and is carried out by maximizing interaction between educators and students. Milman (2012) identified that in a flipped

classroom there are advantages, namely: 1) training student learning independence by providing some material as study material at home before class meetings; 2) One strategy that can be applied in increasing interest in learning and the quality of the learning process. The flipped classroom strategy is a combination of learning activities carried out in class and outside the classroom so that students can still access, view, and study material from the teacher repeatedly with the internet network or videos provided during learning (Syam, 2014).

The implementation of the flipped classroom that is carried out in class is related to project discussion activities both between team members, between teams, and with educators (Davies et al., 2013). Before in-class learning begins, students can study at home with books and videos related to material from the teacher, where the learning material has been integrated with the culture that exists in society (Sánchez, 2018). From this, the flipped classroom is very supportive regarding the implementation of the ethnoscience-based PjBL model in solving the problems represented in a project. Flipped classroom can provide opportunities for students to practice creative thinking skills, the flipped classroom method is considered to be able to stimulate students' creative thinking abilities.

Based on the results of the discussion from each literature source, PjBL can develop student skills in creative thinking and there are many other benefits for students which are reflected through positive student responses during learning activities.

## Conclusion

Based on the results of the review and analysis of several studies obtained from various journal articles and books, it can be concluded that there is an influence in the application of the ethnoscience-based PjBL model with flipped classroom on students' skills in creative thinking. This can be seen from several research results and supporting theories. Based on the discussion and conclusions from the results of the literature study that has been presented, there are several suggestions given, namely: for educators, students may experience difficulties in completing the responsibilities and expectations of educators during the implementation of the flipped classroom in the ethnoscience-based Project Based Learning model. Therefore, transitions are needed in learning activities, for example by explaining responsibilities in a fun way, giving assignments in a clear way, and giving appreciation or rewards. For educators, arrange each step during learning activities well and directed so that the project can be completed properly, and students can understand the learning process well; and for students, prepare access to stable

internet technology while studying materials, videos, and other teaching resources.

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## Author Contributions

This research contributes to the treasury of ethnosains based project-based learning model with flipped classroom on creative thinking skills. The author is involved in the overall making of this article.

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## Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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