Jurnal Pendidikan Matematika (J U P I T E K) | June 2023 | Volume 6 Number 1 | Page. 1 – 8
ISSN: 2655-2841 (Print); 2655-6464 (Electronic)
DOI https://doi.org/10.30598/jupitekvol6iss1pp1-8

ANALYSIS OF STUDENT RESPONSE TO THE IMPLEMENTATION OF THE ETHNO-FLIPPED CLASSROOM MODEL ASSISTED BY COLLABORATIVE CLOUD CLASSROOM

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Submitted: January 14,2023 *Revised: March 5, 2023* *Accepted: March 18, 2023*
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Abstract

The ethno-flipped classroom model is a collaborative and student-centered learning model developed by integrating the flipped learning model and the ethnomathematics approach. The implementation of the ethno-flipped classroom model is assisted by Collaborative Cloud Classroom which was developed as a Learning Management System during the implementation of learning. The purpose of this study was to determine student responses to the application of the ethno-flipped classroom model assisted by Collaborative Cloud Classroom for high school students in Gunungsitoli City, Nias Island, North Sumatra Province. This research is descriptive quantitative research with data collection techniques using Likert-scale questionnaires in Small Group and Field Test. The research sample was Gunungsitoli City High School students, namely 25 students in the small group stage and 222 students in the filed test stage. The results showed that 83% of students gave a very good response at the small group stage and 85% of students gave a very good response to the application of the model at the filed test stage. The achievement of the percentage of student responses concluded that the ethno-flipped classroom model assisted by Collaborative Cloud Classroom can be further implemented in the application of other cultural contexts in future research.

Keywords: student response, ethno-flipped classroom, collaborative cloud classroom, math learning

1. Introduction

Mathematics is one of the basic subjects (basic science) that plays an important and useful role in the development of science and technology. Mathematics provides learning experiences that train students to think logically, critically, practically, and have a positive attitude and creative spirit. Current mathematics learning has used a new paradigm of learning that presents meaningful and student-centered mathematics learning (Polman et al., 2021). Facts obtained in the field show that the learning model applied by mathematics teachers in sixth senior high schools on Nias Island (36 mathematics teachers) has implemented student-centered learning through cooperative learning models. However, the learning model used by teachers has not been well validated regarding the suitability of the syntax in the model and its application in the field. This statement follows interviews with 36 high school mathematics teachers in Gunungsitoli-Nias Island, where the learning model was not validated before being applied to classroom learning. Validation of the learning model needs to be done by the teacher so that the learning model follows the characteristics and needs of students (Ko et al., 2016). The learning model is also not practical and effective in helping students improve their mathematical abilities. This can be seen from the lack of implementation of learning that brings students closer to meaningful learning experiences.

Meaningful learning is one of the goals of mathematics learning today. Meaningful learning is also one of the goals of the Sustainable Development Goals (SDGs) program which focuses on Achieving Quality Education for All. Education for Sustainable Development (ESD) contributes to involving community participation in sustainable development issues, one of which is strengthening local culture in developing the quality of education. Hill et al. (2020) and Zidny et al. (2020) agree that the combination of knowledge gained from local culture and science is possible to continue at various scales and educational sectors. Referring to Hill et al. (2020) and Zidny et al. (2020) statement, the integration of cultural context can be done in the process of learning mathematics, one of which is through mathematical activities designed through a learning model with an ethnomathematics context.

Meaningful math learning can be done by integrating the surrounding cultural context. In addition, flexibility in learning also makes it easy for students to obtain learning without being limited by limited learning space and learning time at school (Attard & Holmes, 2020a; Fernández-Martín et al., 2020). The application of flexible learning and providing more opportunities for students to explore, as well as providing informal problems that are close to the traditions and culture of students is one of the learning solutions that can be developed (Prahmana et al., 2021), especially in Gunungsitoli City, Nias Island. Nias Island itself is an island in North Sumatra Province and has ethnic and cultural homogeneity.

Based on these facts and expectations, a learning model that is integrated with the surrounding cultural context and has flexibility needs to be developed and implemented. Therefore, researchers developed the ethno-flipped classroom model to be applied as a solution to the learning problems found. The ethno- flipped classroom model is a collaborative and student-centered learning model developed by integrating the flipped classroom model and the ethnomathematics approach (Ramadhani et al., 2021). The flipped classroom model is a blended learning model where learning activities are carried out in two stages, namely out- class learning and in-class learning (Ramadhani, 2020; Ramadhani et al., 2019; Ramadhani & Fitri, 2020). The implementation of the flipped classroom model provides space for students to interact not only between fellow students, but also between students and teachers, as well as between students and material content (Attard & Holmes, 2020b; Fernández-Martín et al., 2020).

Furthermore, the ethnomathematics approach is learning that makes it easy for students to do mathematical modeling based on ideas, methods, and techniques from what has been developed by the surrounding community and can be used as an alternative to introduce students to get closer to the phenomena that occur in the surrounding life (Prahmana et al., 2021; Risdiyanti & Prahmana, 2018). The ethno-flipped classroom model has previously been developed by researchers equipped with the components of the model: syntax, social system, management reaction principles, support system, instructional impact, and accompanying impact (Joyce & Weil, 2003). The ethno-flipped classroom model developed has also undergone a valid, practical, and effective analysis process based on quality of teaching model by Nieveen (Akker et al., 2006). The results of this related research have been reported in other publications. Therefore, the ethno-flipped classroom model can be used in mathematics learning which aims to see student responses when given different treatments in the learning process.

The Ethno-Flipped Classroom Model starts by securing learning readiness regarding adjustment to the technology utilized and the learning environment. This model's student-centered learning activities expect students to explore the material at their own pace. The discovery of problems related to cultural characteristics, phenomena, and activities assists students in identifying, reducing, visualizing, analyzing, and forecasting the presented data. Meanwhile, investigation and collaboration schemes are essential and are carried out in stages by utilizing the cultural characteristics possessed by students to gain character and moral values. Students are divided into groups based on their ability level and collaborate in tiers.

The implementation of the ethno-flipped classroom model is also assisted using a learning platform specifically developed by researchers, namely the collaborative cloud classroom. Collaborative cloud classroom is a learning application system developed using a cloud-based system. The Cloud ClassRoom system provides flexibility for students to be able to freely choose learning methods that match the characteristics and interests of students (Ramadhani et al., 2022). The Cloud ClassRoom system is a product of big data that has unique advantages from the information technology used, namely a combination of the Internet of Thins (IoT) and data mining (Gao et al., 2021). The Collaborative Cloud ClassRoom or CCCR (3CR) system developed is unique in that it uses the framework of the Cloud ClassRoom system and the stages of the ethno-flipped classroom model. The collaborative cloud classroom system will be used as part of the process of implementing the ethno-flipped classroom model, both in the out-class learning stage and the in-class learning stage (Ramadhani et al., 2022).

The application of the ethno-flipped classroom model assisted by a collaborative cloud classroom in learning mathematics is expected to provide a meaningful learning experience and provide the flexibility needed by students during the learning process. The flexibility and meaningfulness provided through the ethno-flipped classroom model assisted by collaborative cloud classroom can also increase students' motivation and interest in learning mathematics. Therefore, this study was conducted with the aim to determine students' responses to the application of the ethno-flipped classroom model assisted by Collaborative Cloud Classroom for high school students in Gunungsitoli City, Nias Island, North Sumatra Province.

2. Method

The research method used in this study is quantitative-descriptive which aims to describe and analyze student responses after receiving learning treatment using the ethno-flipped classroom model assisted by a collaborative cloud classroom. This study is an advanced study of a series of studies that have been conducted by researchers. The sample of this study was obtained from two stages of implementing the ethno-flipped classroom model assisted by collaborative cloud classroom, namely the small-group stage and the field-test stage. The research samples were XII grade students of the State Senior High School Science Program in Gunungsitoli City, Nias Island, North Sumatra Province. The number of samples of this study were 25 students in the small-group stage and 222 students in the filed-test stage.

The data collection technique was carried out using a questionnaire that had previously been validated. Student responses were measured using a questionnaire consisting of 20 statement items on three indicators, namely interest in following the learning process (8 statements), interest in learning process (5 statements), and usefulness of participating in learning process (7 statements). The questionnaire uses a Likert scale with a score range of 1-4. Student response data was then analyzed using quantitative description analysis techniques using the following response percentage formula.

$$PRS = \frac{The\ Score\ Obtained}{The\ Total\ Score} \times 100$$

Where: PRS = Percentage of Student Response

The criteria for sttudent responses to the application of the ethno-flipped classroom model assisted by a collaborative cloud classroom can be seen in Table 1 below.

Table 1. Criteria for Student Response to the Learning Model (Akbar, 2015)

Student Response (%)	Category
$81{,}25 \leq PRS \leq 100$	Very good
$62{,}50 \leq PRS \leq 81{,}24$	Good
$43{,}75 \leq PRS \leq 62{,}49$	Less Good
$25{,}00 \leq PRS \leq 43{,}74$	Not good

3. Results and Discussion

3.1 Results

The results of the analysis of student responses after being given the learning treatment using the ethno- flipped classroom model assisted

by a collaborative cloud classroom are shown in Table 2 below.

Table 2. Student Response Data After Receiving Learning Treatment Using the Ethno-Flipped Classroom Model Assisted by Collaborative Cloud Classroom

No.	Assessed Aspect	Average Score of Small Group Stage	Average Field Test Score
1.	**Interest in Following the Learning Process**		
	1. I am interested in learning because it uses the cultural context that I have and is close to my daily life.	3.3	3.3
	2. I am interested in learning because it uses an application system that is easy to use anywhere and anytime	3.3	3.4
	3. I am interested in learning because it applies two phases of learning (in-class and out-of-class)	3.4	3.4
	4. I am interested in learning because I can study the learning material before it is discussed in class through the application system used.	3.2	3.6
	5. I am interested in learning because the division of study groups is adjusted to the level of initial math ability, so I feel more confident.	3.4	3.8
	6. I am interested in learning because it gives me the opportunity to express my opinion in solving informal problems given in the study group.	3.2	3.4
	7. I am interested in learning because the teacher facilitates tiered social interaction so that all students can jointly decide on the solution to the informal problem given.	3.5	3.7
	8. I am interested in learning because the teacher provides opportunities for students to reflect independently and provides apperception based on our cultural traditions (through Maena dance as a form of gratitude for successfully solving informal problems).	3.4	3.4
2.	**Interest in Learning Process**		
	1. I am interested in participating in learning activities that use my cultural context.	3.2	3.5
	2. I am interested in participating in group discussion activities, because I am given the opportunity to give opinions and ideas in solving problems.	3.4	3.3
	3. I am interested in learning the material provided because the teacher facilitates learning through an excellent application system.	3.3	3.4
	4. I am interested in helping friends when they have difficulties in the process of understanding and solving informal problems.	3.3	3.2
	5. I am interested in doing more productive self- learning using the application system facilitated by my teacher.	3.4	3.3
3.	**Usefulness of Participating in Learning Process**		
	1. The ethno-flipped classroom learning model used by the teacher helped me to improve my understanding of statistics material that is close to my daily life.	3.2	3.3
	2. The learning activities I participated in helped me understand the concept of statistics through the help of the 3CR application system used.	3.3	3.4
	3. The learning activities that I participated in trained me to learn independently through the 3CR application system used.	3.3	3.3
	4. The learning activities I participated in trained me to give my opinion during group discussion activities to solve informal problems given to me.	3.4	3.5
	5. The informal problems given in the statistics materials are easy for me to imagine and solve.	3.2	3.0
	6. The learning activities I participated in helped me understand the cultural values that I have and are close to my daily life.	3.3	3.4

No.	Assessed Aspect	Average Score of Small Group Stage	Average Field Test Score
7.	The learning activities I participated in trained me to be confident in tiered group discussion activities and improved my attitude of caring and cooperation with other peers.	3.4	3.4
	Average Score	**3.32**	**3.40**
	Average Percentage of Each Stage	**83%**	**85%**
	Overall Average Percentage	**84%**	

The results of the analysis of student responses after receiving learning treatment using the ethno-flipped classroom model assisted by a collaborative cloud classroom show the average percentage of each stage in the excellent category, namely 83% at the small-group stage and 85% at the field-test stage. The average percentage of overall student responses also obtained a very good category, which amounted to 84%. Based on the results of the analysis of student responses, it was found that learning mathematics using the ethno-flipped classroom model assisted by a collaborative cloud classroom received a positive response by all students in this research sample (both students who were in the small-group stage, and students who were in the field-test stage).

3.2 Discussion

The ethno-flipped classroom model assisted by collaborative cloud classroom also has a significant impact on students' interest in participating in learning activities, students' interest in learning activities carried out, and students' ability to understand the cultural context used in learning activities. The application of the ethno-flipped classroom model assisted by a collaborative cloud classroom also has an impact on students' positive attitudes in participating in mathematics learning, cooperation skills, the ability to express opinions, activeness in discussion sessions, critical thinking skills in providing responses and responses, and collaboration skills that contain character and cultural values that are embedded in students' daily lives.

The results of the student response analysis are in line with the researchers' expectations when developing the ethno-flipped classroom model and collaborative cloud classroom application system. The ethno-flipped classroom model is based on constructivism learning theory that provides opportunities for all students to construct their own understanding through the interaction process that occurs in the learning environment (Loyens & Gijbels, 2008). The ethno-flipped classroom model is built on constructivism theory and reinforced by Ausubel's (Vallori, 2014), Vygotsky's (1978), ecological (Bronfenbrenner, 1986), cognitive load (Akkaraju, 2016; Mattis, 2014), and self-determination (Muir, 2021) theories. Applying the ethno-flipped classroom model in learning mathematics is a novelty in this study because no research integrates ethnomathematics context, meaningful learning, and flexible learning in one complete learning model.

Felder (2012) and Bergmann & Sams (2012) agree that student centered learning models, including the ethno-flipped classroom, are based on constructivist learning theory. The essence of constructivist learning theory is that the learning environment is student-centered, and the knowledge built in the learning environment is acquired through the process of social interaction. A learning environment based on constructivist learning theory includes four elements, namely situation, cooperation, conversation and meaning construction. These four elements are fulfilled by the ethno-flipped classroom model, where the teacher will act as an organizer, mentor, helper, and facilitator, while students play a dominant role in learning activities.

Another learning theory that supports the construction of student understanding through the ethno-flipped classroom model is Vygostky's theory. The ethno-flipped classroom model, which is also based on Vygostky's theory, offers collaborative learning between teachers and students, where the teacher organizes learning activities, in this case the Zone Proximal Development, by providing assistance when students experience difficulties (Vygotsky, 1978). Vygotsky's theory also explains that all high-level cognitive work in humans starts from their culture, so that the process and mental work in reconstructing their knowledge. Ausebel's theory, cognitive load theory and self-determination theory also contribute to the successful implementation of the ethno-flipped classroom model assisted by the collaborative cloud classroom.

The essence of Ausebel's learning theory is reflected in the ethno-flipped classroom model which also emphasizes meaningful learning. Cultural and social experiences are brought into the

classroom through mathematics learning. New experiences and old experiences that students have interact with each other until there is a transformation that forms a new knowledge scheme. The ethno-flipped classroom model, which is based on the ethnomathematics approach, has six dimensions that are closely related to each other and aim to be used in analyzing the sociocultural roots of mathematical knowledge (D'Ambrosio & Rosa, 2017; Rosa & Orey, 2016). Based on the perspective of cognitive load theory, self-directed learning designed in the ethno-flipped classroom model assists students in managing their cognitive load, and thus facilitates them during the learning process (Seery & Donnelly, 2012; Turan & Goktas, 2016). Akkaraju (2016) also explained that the management of cognitive load perceived by students in ethno-flipped classroom model-based learning is related to the availability of instructional guidance. This is obtained in the implementation of the flipped classroom model where students can process new information before the meeting in the real class.

Students' positive response after learning using ethno-flipped classroom model assisted by collaborative cloud classroom is also influenced by self-determination theory. The application of self-determination theory to the ethno-flipped classroom model lies in its emphasis on the level of student motivation to utilize their learning environment in promoting and improving their basic cognitive needs (Deci & Ryan, 2008). Based on the findings of the analysis of positive student responses after being given learning using the ethno-flipped classroom model, the model is proven to provide a solution to the problems that have occurred so far. Mathematics learning that has not been meaningful, student contributions are still small, and the flexibility of learning implementation can be resolved through the application of the ethno-flipped classroom model assisted by a collaborative cloud classroom.

4. Conclusion

Based on the research results, all aspects listed in the student response questionnaire to learning with the ethno-flipped classroom model assisted by a collaborative cloud classroom show the Very Good category. The application of the ethno-flipped classroom model assisted by collaborative cloud classroom has a significant impact on student interest in participating in learning activities, student interest in learning activities carried out, and students' ability to understand the cultural context used in learning activities. The application of the ethno-flipped classroom model assisted by a collaborative cloud classroom also has an impact on students' positive attitudes in participating in mathematics learning, cooperation skills, the ability to express opinions, activeness in discussion sessions, critical thinking skills in providing responses and responses, and collaboration skills that contain character and cultural values that are embedded in students' daily lives. The achievement of the percentage of student responses concludes that the ethno-flipped classroom model assisted by a collaborative cloud classroom can be further implemented in further research. The findings in this study can also be used as a recommendation to other researchers to be able to apply the ethno-flipped classroom model to the application of other cultural contexts in Indonesia.

Mathematics learning using the ethno-flipped classroom model needs to be further implemented in other schools, both at the high school and junior high school levels. Further implementation is recommended by integrating different cultural contexts so that the ethno-flipped classroom model is further developed with a choice of cultural context integration following the cultural characteristics lived by students. Mathematics learning using the ethno-flipped classroom model can also be implemented by adding instructional and accompanying impacts to be measured. Furthermore, using Collaborative Cloud Classroom as an LMS in implementing the ethno-flipped classroom model can be replaced with other LMS tailored to school needs.

Acknowledgements

Thank you to the Mathematics Education Doctoral Program, Postgraduate Program, Universitas Negeri Medan and Universitas Potensi Utama for supporting this research activity.

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