Jurnal Pendidikan Fisika
Volume 10 Nomor 1 June (2021), pages 67-71
ISSN: 2301-7651 (Online) 2252-732X (Print)
DOI : 10.22611/jpf.v10i1.14056

ETHNOPHYSICAL INTEGRATION IN COOPERATIVE LEARNING BASED ON BATAK CULTURE TO IMPROVE GENERIC SKILLS OF SCIENCE (GSS) AND STUDENT TEAMWORK

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Submitted: 15 July 2019, Revised: 15 July 2021, Accepted: 19 July 2021

Abstract. This study aims to improve the generic science skills and teamwork of students through cooperative learning models based on Batak culture with the Culturally Responsive Teaching approach. This research was conducted at the MAS Medan UIN SU Laboratory T.P 2018/2019. This type of research is a quasi-experimental exercise using two group pretest-posttest design. The instruments used were generic science skills test instruments and student collaboration questionnaires. Data were analyzed using SPSS 16.0, t test and gain test. The results showed that the generic science skills and teamwork of students who were taught by cooperative learning models based on Batak culture were better than those taught by conventional models. Physics learning through the Culturally Responsive Teaching approach integrated with ethnophysics can increase KGS and student collaboration including; direct observation, the law of cause and effect, logical inference, ability to participate, sharing ability and communication skills.

Keywords: *Cooperative Learning Model based on Batak culture, Generic Science Skills, Teamwork*

INTRODUCTION

Integrating education and culture in the learning process will create meaningful learning. In learning physics, teachers are expected to enable students to master concepts and solve problems with the habit of critical, logical, systematic, and structured thinking. However, in fact, in the process of learning physics, various research results indicate that physics learning has been centered on teachers and students as objects of distribution. Students complete the problem samples according to what the teacher presents. They do not have enough time to construct the knowledge they have in learning physics, concepts and principles are given directly from the teacher to students without going through the construction process by students. Students experience difficulties because the strategies taught in learning are only to solve problems that require mere mathematical calculations and students produce less generic skills. If it is assumed that behavioristic views in physics learning are inadequate, then another alternative is needed for physics learning based on constructivist views that are oriented towards understanding, enhancing skills especially generic science skills and student collaboration, and meaningful local culture. One effort that can be done to overcome the above problems is by implementing a learning model that can improve students' generic science skills and cooperation.

The right learning model used as an alternative solution to the problem is through a cooperative model based on Batak culture which means that learning physics can be supported by experiments conducted by students and associated with cultural facts that exist in the environment around students. The learning model was developed with the CRT approach (Culturally Responsive Teaching) which is the result of modification or refinement of the cooperative learning model, precisely the cooperative learning model). (CRT) is designed to help empower children and adolescents by using meaningful cultural connections to convey academic, social, and attitude knowledge.

CRT is a learning approach using cultural knowledge, prior experience, and differences in student performance to provide meaningful learning experiences (Gay, 2000). Culturally Responsive Teaching approach to the principle of learning carried out there are 5 stages: Self-Identification, Cultural Understanding (cultural understanding), Collaboration (Collaboration), Critical Reflections (Thinking critical reflection), Transformative Construction (Transformative construction) (Rahmawati, 2018).

(Arends, 2008) states that cooperative learning models are developed to achieve at least three important goals: academic achievement, tolerance, and acceptance of diversity, and social skills development by confronting cooperative learning models based on Batak culture are

expected to foster student collaboration which is the capital for students to build their knowledge and students have generic science skills to gain knowledge and understanding of science.The application of this learning is expected to be able to bring students more active in learning activities, develop skills in particular generic science skills and scientific attitudes, improve cognitive abilities, and be able to better understand physics and be able to work well together in discussion groups.

METHODS

The research was carried out at the Laboratory of UIN SU Medan MAS. The research population was all students of class X MIA. This type of research is quasi-expansive. The sample consisted of two classes namely the experimental class and the control class taken by cluster random sampling technique with the design of the Two Group Pretest-Posttest Design. This study was analyzed with SPSS 16.0, t-test, and gain test.

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Table 1. *Two Group Pretes – Posttes Design*

Group / Class	Pretest	Treatment	Postes
Experimental class	T_1	X	T_2
Control class	T_1	Y	T_2

Information :

T_1 = The pretest was given to the experimental class and the control class before treatment

T_2 = Posttest were given after treatment in the experimental class and the control class

X = Teaching by applying cooperative learning models based on Batak culture

Y = Teaching by applying conventional learning models

$T_1 = T_2$

The instruments used in this study were generic science skills test instruments and student collaboration questionnaires.

The results of the pretest-posttest generic science skills and student collaboration were then analyzed using gain -test to determine the increase. The following formula for calculating the gain value of students' generic science skills:

$$g = \frac{skor\ post.test - skor\ pre.test}{skor\ max - skor\ pre.test}$$

Information :

g < 0,3 low category

0,3 ≤ g ≤ 0,7 medium category

g > 0,7 high category (Hake, 2007)

From the results of the pretest and posttest data, the calculation is done using the formula g factor (normalized gain score) so that the gain scores of the generic science skills of students are obtained.

RESULTS AND DISCUSSION

This research is a culture-based study where physics learning is associated with student culture. The experimental class applied the Cooperative Culture-Based Learning model of the Batak and the control class applied to conventional learning. The implementation of the study lasted for four meetings both in the experimental class and in the control class based on four Learning Implementation Plans. The material is static fluid, sound wave, Organa pipe, and heat transfer. Each student meeting is given a Student Activity Sheet which has been prepared based on the GSS indicator. Posttest is given after the treatment for four meetings is completed to see students' abilities in the experimental and class classes control. The following Figure 1 shows the average value of posttest generic science skills and student collaboration.

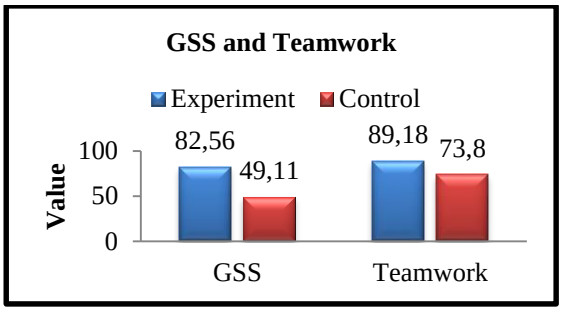


Figure 1. GSS and Teamwork Value

Based on the posttest scores of the experimental class and the control class, it shows that the cooperative learning model based on Batak culture can improve student learning outcomes such as generic science skills and student collaboration.. According to Akcay (2014) through cooperative learning models, learning allows students to have a better understanding of the problems displayed. Teachers using CRT apply teaching methods, collaborative strategies, strategies, and ways of interacting that support students' cultural, linguistic, and racial experiences and integrate methods with evidence-based practicess (Aceves & Orosco, 2014).

Gain Students' Generic Science Skills

The generic science skills of students who are taught by cooperative learning models based on the Batak culture show better results than those taught by conventional learning. The following Table 2 shows an increase in the GSS gain value in the experimental and control classes.

Table 2. GSS Gain Value of Experimental and Control Classes

GSS aspect	<g> Experiments	Category	<g> Control	Category
Direct observation	0.9	High	0.3	Medium
Indirect observation	0.7	Medium	0.2	Low
Scale awareness	0.7	Medium	0.2	Low
Symbolic language	0.7	Medium	0.1	Low

Logical Frame	0.7	Medium	0.2	Low
Logical Consistency	0.7	Medium	0.2	Low
Law of Cause and Effect	0.7	Medium	0.2	Low
Modeling	0.7	Medium	0.2	Low
Logic Inference	0.8	High	0.3	Medium
Abstraction	0.7	Medium	0.3	Medium

Based on the results of the posttest and pretest scores of students in the experimental class, the highest n-gain value obtained in the direct observation aspect was 0.9 with a high category. Indirect observation of 0.7 in the medium category, this increase occurs because during the learning process based on the Batak culture in using measuring instruments properly. Awareness about scale, symbolic language, logical frames, logical consistency, cause and effect law is 0.7 with a moderate category. The following is Figure 2 which shows the GSS gain value of the experimental and control classes.

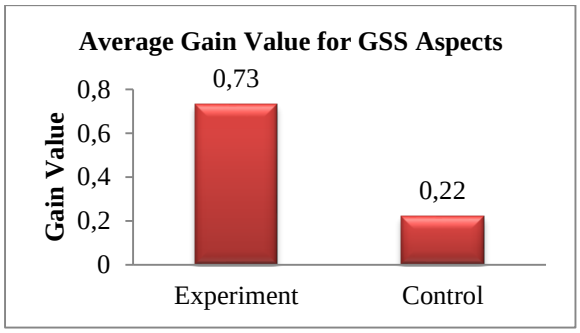


Figure 2. Value of gain in GSS aspects

Based on Figure 2, there is a clear difference in the increase in generic science skills between the experimental class and the control class. This shows that the generic science skills taught through cooperative models based on Batak culture have a tendency to increase significantly compared with the control classes taught with conventional models.

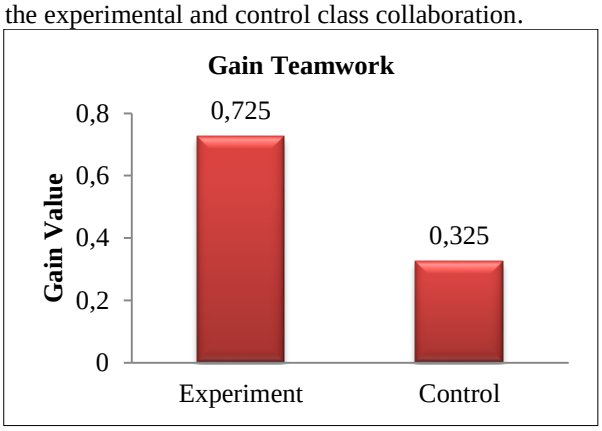
Gain Student Teamwork

Cooperative learning is a learning strategy that involves student participation in a small group to interact with each other. The following table 3 shows the gain values of each aspect of student collaboration.

Table 3. Gain Teamwork Aspect

Student Teamwork Aspects	<g> Experiments	Category	<g> Control	Category
Interdependence	0.7	Medium	0.4	Medium
Sharing skills	0.7	Medium	0.3	Medium
Participation skills	0.7	Medium	0.3	Medium
Communication Skills	0.8	High	0.3	Medium

Based on the data analysis that has been done, it is known that the gain value of the collaboration ability of the experimental class is higher than the control class. The following is Figure 3 which shows the average gain values of the experimental and control class collaboration.



.Figure 3. Average Cooperation Gain Value

The results obtained in this study indicate that there is a difference in the increase in collaboration in the experimental class using cooperative learning models based on Batak culture and control classes using conventional learning. Implications of Cooperative Learning Model Based on Batak Culture Through the CRT Approach to KGS and Student Teamwork.

The application of cooperative learning models based on Batak culture through the CRT approach to GGS and Student Cooperation has an impact on the development of GGS and collaboration includes direct observation, causal law, logic inference, sharing skills, participation skills, communication skills.

Direct Observation

Observation is defined as the process of observing an object with all senses. In this aspect, students make direct observations of objects by using the sense of sight and have observed changes that occur in the experimental device after being given treatment. Through the activities of various experiments conducted during learning, students find it easier to understand physics that is integrated into their own culture. Students' responses when making observations are quite diverse such as:

"I prefer learning physics with practicum especially by integrating physics with our culture compared to just explaining and working on the questions" (Student interview, April 27, 2019).

When the tradition of Mangupa integrated physics was explained, students immediately asked:

"*Mom, if for example, the eggs used are duck eggs or not? Is the way we know the duck egg is good or bad in the same way as chicken eggs? "(Student interview, 17 April 2019).*

Integrated cultural learning of physics makes students' curiosity increase. Students are very enthusiastic when carrying out practicum when learning takes place.

Law of Cause and Effect

One example is when students carry out debates about the concept of floating, sinking, and floating. Debates are held with caracole playing where the class is divided into 3 large groups. When the debate took place, an opinion emerged that attracted the attention of teachers, where students argued that good eggs would sink if put into the water because the density of eggs was greater than the density of water. Based on the learning activities carried out with the CRT approach, students can see the relationship between variables to be able to carry out the causes of events that occur in integrated physics learning Batak culture.

Logic Inference

According to Liliasari (2007), logical inference or logical consistency is a generic ability aimed at concluding. Physics learning using the CRT approach is new learning for students, so it is encouraging to be able to draw conclusions based on physics learning based on Batak culture. In learning, if the concept is not fully understood by students, it will be difficult to conclude. This course will affect the generic skills of students in aspects of logical inference.

"*I cannot conclude if I do not fully understand the subject matter that I have learned," said the answer of a student of class X MIPA 1 when interviewed by researchers openly. (Rosidah, 2017: 135).*

Sharing Capability

Some 21st-century skills in Gray & Koncz (2014) articles are leadership, teamwork, written communication skills, problem-solving skills, work ethic, analytical/quantitative skills, technical skills, communication skills (verbal), sharing ability, initiative, computer skills, flexibility/adaptation, interpersonal skills, detail-oriented, organizational ability, strategic planning skills. Almost every aspect of the CRT approach can support the formation of socio-cultural awareness. Socio-cultural awareness includes character of communication empathy, responsibility, discipline, and social care.

"*I like to study in groups, ma'am. Because when I don't understand something, my other friends can explain it to me so that I understand " (Student interview, April 20, 2019).*

Participation Ability

Generic science skills also provide opportunities for students to be actively involved in learning so that interactions occur between skills and concepts, principles, and theories that have been discovered or developed.

"*Cooperative learning models based on Batak culture are applied make students able to build interactions and participation in differences with other people to complete the tasks given by the teacher " (Observer Note, 24 April 2019).*

Communication Ability

The learning model applied through the CRT approach can improve student communication. Through our communication we grow and learn, we find ourselves and others, we associate, are friendly, hostile, love or love others, hate others, and so on. The learning process using Ethnophysical articles invites students to tell stories about the origin and culture of their respective regions. Popescu (2013) states that communication skills can develop collaboration and collaboration.

Thus, students feel comfortable sharing stories with the teacher. Student responses are quite diverse, such as linking the tradition with the area of origin of the parents as follows:

"*Mom, I've also seen Batak people carrying out the tradition of Mangupa, in this tradition, what if we use duck eggs or not, Mom?" (Student interview, 17 April 2019).*
'I am an Acehnese Mom, in Aceh, there are also musical instruments such as the flute Mom, the name is Jangat (Student interview, April 20, 2019)
"*Mom, my parents are from Java, on Java, there is also the culture of making Dodol like Alame for Batak animals. Ma'am, is the Alame the same as arrowroot Dodol? "(Student interview, April 27, 2019).*

Based on the notes and teacher interviews with these students, it appears that there are generic science skills and the ability of collaboration in students towards physical learning based on Batak culture. Through learning activities using the CRT approach, students can improve their reflective thinking through the debates held when presenting the results of the experiment. Culture-relevant learning is created by teachers to improve social relations with students, among students who support collaborative community learning (Jackson, 2011).

CONCLUSION

Gain or increase in generic science skills and teamwork of students taught with cooperative learning models based on Batak culture is better than gains in generic science skills of students taught with conventional learning model.

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