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Research Paper

The Effect of Ethnoscience-Based CTL (Contextual Teaching and Learning) Model on Motivation and Physics Learning Outcomes of Students on the topic of Sound Waves

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Abstract: The purpose of this study was to determine the effect of using the ethnoscience-based CTL (contextual teaching and learning) model on student motivation and learning outcomes on the topic of sound waves in class XI MIPA 4 at SMA Negeri 2 Mataram. This research method uses a mixed method, with the sampling technique using the purposive sampling method. The research subjects were 26 students of class XI MIPA 4 SMA Negeri 2 Mataram. Quantitative data were analyzed using statistical analysis techniques through t-test by first doing normality test and homogeneity test. The results showed that the calculated t value was greater than the t table value, which was 9,203 which was greater than 2,068. Based on the results of the interviews showed an increase in the understanding of the concepts possessed by students. Thus, there is an effect of applying the Ethnoscience-based CTL model to students' motivation and learning outcomes.

Keywords: CTL; Ethnoscience; Motivation; Learning Outcomes; Sound Waves.

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INTRODUCTION

Education is a process in which an individual gets guidance or experience so that he can innovate and develop into a person who is broad-minded, responsible and virtuous (Dewi & Dwikoranto, 2021). Education is one of the most important aspects in supporting the development of the country. This is because without education, the mindset of humans will be retarded so it will be difficult to change their social strata for the better (Kasmawati et al., 2017). Education in a broad sense is all learning activities that take place throughout the ages in human life. The main object in education is human civilization in improving self-quality. In a narrow sense, education is a planned teaching and learning activity, with learning materials that are organized, held on a scheduled basis, and given an evaluation based on predetermined learning objectives (Oktaviansa & Yunus, 2013).

Effective education is education that allows students to learn easily, fun and learning can achieve the expected goals. Thus, teachers as educators are required to be able to increase the effectiveness of learning so that learning can be useful for students. The problems that arise in the world of education are so diverse and emerge from various circles. So far, there have been many opinions that think that formal education is only considered as a formality to process human resources and does not pay attention to how the results of formal learning are. The thing that is prioritized is that students have carried out education

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to a high level and are considered great things by most people. Such an assumption causes the level of effectiveness of learning in Indonesia is still very low (Agustang et al., 2021).

One of the internal factors that influence the learning process is student learning motivation, which is the driving force that comes from students to carry out learning activities. Student learning motivation can be measured using learning instruments based on predetermined aspects. The aspects that can be used to measure the level of student motivation are referred to as ARCS or Attention Relevance Confidence Satisfaction (Sari & Sunarno, 2018). Attention is the attitude shown by students by paying attention or focusing on learning Physics. Students' attention arises because of curiosity. Relevance is a student's view of the relationship between benefits and their application in everyday life. Students' learning motivation will be maintained if students can find a relationship between what is learned and its benefits in meeting personal needs and in accordance with the values believed. Confidence is students' self-confidence in learning Physics and solving Physics problems. Satisfaction is a sense of satisfaction from within students towards learning outcomes because they can solve the physics problems being studied (Tholani, 2013).

Students who have a sense that they are competent or capable in studying Physics, the desire to study Physics is getting better. In teaching and learning activities include three elements, namely teaching objectives, teaching and learning experiences and learning outcomes. The target of learning activities is learning outcomes. Learning outcomes are defined as the results of a student's achievement obtained from the learning process as a measuring tool to see the level of student learning success. In achieving learning success, the teacher as an educator must know and understand what the students want. For example, the need for students to excel, because each student has a need or desire for achievement that differs from one student to another (Sari & Sunarno, 2018).

Not a few students have low achievement motivation, and they tend to have a fear of failure and do not want to take risks in achieving high learning achievement, although many students also have high achievement motivation (Masfufah & Ellianawati, 2020). Students will have high achievement motivation if the desire to succeed really comes from within themselves. Students will work hard both on their own and in competition with other students. Students who have a positive attitude in the learning process will influence or improve the learning outcomes of students (Aulia, 2021). Whether or not someone is active in learning will ultimately affect learning outcomes. This can be interpreted that student who are highly motivated, have high learning energy can lead to high learning outcomes, and vice versa. The teacher in delivering the material has an effect on students' understanding (Irwan et al., 2015).

In creating an atmosphere of quality education in the teaching and learning process, it is necessary to have an appropriate learning management strategy. One way to manage teaching and classes can be realized in the selection or application of a model or strategy in teaching. Each teaching model will be different from other teaching models, so as an educator you must know the right way to choose a teaching model to be applied to students (Emda, 2018). One way to manage the teaching and learning process to be effective and efficient is by applying a learning model (Srilisnani et al., 2019).

The components of a learning model include objectives, syntax, environment, and management system. Each learning model has different characteristics. The choice of learning models is very varied, making it easier for teachers to adjust the learning model to the material and needs of students (Nurhidayah et al., 2015). One of the choices of learning models that can be used is CTL (Contextual Teaching and Learning). CTL is a contextual learning model that emphasizes the overall process of student involvement to find the material being studied so that students can relate and apply it in everyday life (Masfufah & Ellianawati, 2020).

The reason it is necessary to apply the CTL model in learning is because it contains learning concepts that help teachers to align the material being taught with real-world situations. Contextual learning can be carried out if students are able to find and process new information or knowledge in accordance with students' thinking references based on memory, experience, and stimulus (Irwan et al., 2015). Learning materials provided in schools will be more meaningful if students learn them through the context of their lives. Contextual learning does not only include activities in the classroom, but also connects activities outside the classroom that take place scientifically so as to provide additional experiences for students in building knowledge (Ayuningtias et al., 2019).

Contextual learning concerns real-world situations and students' everyday lives. In addition to receiving formal scientific knowledge from schools, students basically already have knowledge that comes from the indigenous people in their environment (Wildani et al., 2021). Knowledge that comes from the habits of the previous community or culture that is related to science, which is referred to as ethnoscience. Ethnoscience-based learning processing requires an approach in the form of models and learning

methods so that they can be combined with scientific learning materials (Normina, 2017). One of the appropriate learning models to be applied in ethnoscience-based learning is conceptual learning (CTL). The combination of the CTL learning model with ethnoscience-based learning can harmonize the relationship between scientific learning and community culture so as to produce learning materials that can encourage students' motivation and interest in learning (Harefa, 2017).

Science learning in schools is still centered on the literacy of reading books and rarely relates it to the cultural reality around students. The implementation of the material provided by the teacher to students lacks integrity with the culture. Seeing these conditions, innovation is needed in the form of the ability to combine original knowledge with scientific knowledge. This combination requires the application of learning models that are in accordance with the supportive surrounding culture. The use of the CTL (Contextual Teaching and Learning) learning model can be one solution that functions to integrate science and culture-based learning with scientific learning of science (Dinissjah et al., 2019). The process of combining scientific science learning with ethnoscience learning using the CTL learning model, which begins with classifying students' habits or culture and visualizing a science material which will later be put together so as to increase students' understanding of cultural science concepts (Parmono et al., 2013).

Culture will be maintained if it is included in learning activities, one of which is in the field of science education. The values of local wisdom contained in culture vary depending on each region, because Indonesia consists of various tribes, ethnicities, and traditions. One of the distinctive cultures found on the island of Lombok, West Nusa Tenggara Province is the *Nyongkolan* culture. *Nyongkolan* is a traditional activity that accompanies a series of events in the wedding procession of the *Sasak* tribe. This *Nyongkolan* activity is in the form of a procession, in which the bride and groom depart from the groom's house to the bride's house, accompanied by the family and relatives of the groom, wearing traditional *Sasak* clothes, and accompanied by a musical troupe commonly called the tambourine band, or *Gendang Beleq*. This marriage culture can be categorized as a traditional act because the *Sasak* people have been carrying out *Nyongkolan* in accordance with regional customs and traditions that have existed since ancient times. This shows that the tradition lived by the *Sasak* people is a cultural communication inherent in the social order (Sumarto, 2019).

In this *Nyongkolan* culture, there are educational values that can be channeled through formal education. Now, Ethnoscience is often channeled in various fields, such as agriculture, health, ecology and science. Ethnoscience can be integrated in formal physics learning with various learning themes according to student needs (Munawir, 2020). Physics learning aims to prepare students' knowledge, understanding, and abilities for the development of science and technology. Physics learning must emphasize the concepts of physics based on products, processes, and scientific attitudes. A student is said to have mastered the concept of physics if the student can understand the meaning of the physics material he is studying either scientifically or theoretically and is able to apply it in everyday life and can channel the concept to solve other physics problems (Lestari, 2016).

Mastering the concept of physics is not just memorizing the formulas used to solve problems, but the concept of physics must be understood more deeply so that it can be applied, not only to solve problems at school but also to solve problems faced in society. One of the efforts to get rid of various bad assumptions related to physics learning is by connecting physics theory with cultural phenomena in real life. This effort aims to make learning physics a respected learning and can be easily understood by students at school. Students who have understood the concept of physics can definitely explain information in their own words and do not need the help of notebooks or references to read. An example of culture that can be applied to physics material is the *Nyongkolan* culture by raising Sound Wave material (Umam et al., 2012).

Sound is a longitudinal type of mechanical wave that requires a medium to propagate and originates from a vibrating object. One medium of propagation of sound waves is air. This can be attributed to the musical instrument used during the *Nyongkolan* procession, namely the *Gendang Beleq*. *Gendang Beleq* is a musical art belonging to an ensemble consisting of *Gendang Mame*, *Gendang Nine, Cemprang, Perembaq, Petug, Oncer, Rincig, Reong Mame, ReongNine, Gong Mame*, and *Gong Nine*. The components on the outer surface of the drum use a material in the form of buffalo skin, so that it can produce a high-pitched beat. This is one application of the relationship between regional culture and sound wave material that can be applied to physics learning in schools. The difficulties experienced by students in studying physics material can be solved with one solution, namely applying Ethnoscience-based learning with a CTL learning model that elevates regional culture (Sukesti et al., 2019).

Based on the background described above, it shows that the application of physics learning combined with ethnoscience learning has the potential to deepen the concept of physics for students, so researchers are interested in conducting research with the title "The Effect of Ethnoscience-Based CTL (Contextual Teaching and Learning) Models on Motivation and Physics Learning Outcomes of SMAN 2 Mataram Students on the topic of Sound Waves".

METHOD

This research was conducted using mixed methods. Mixed research method is a research approach by combining qualitative research with quantitative research. The implementation of this research is located at SMAN 2 Mataram, with the research population being students of class XI MIPA at SMAN 2 Mataram, and the sample used is 26 students of class XI MIPA 4 at SMAN 2 Mataram. The sampling technique in this study was done by purposive sampling method. The data collection technique in this study used several instruments, including pretest, posttest, interviews, and documentation.

The type of data used in the form of primary data sourced from the results of pretest, posttest, and interviews. Testing of research data quantitatively was carried out with normality test, homogeneity test, and t test. The qualitative research data test was carried out using data reduction techniques to determine the synchronization of data describing the effect of the Ethnoscience-based CTL model on students' motivation and physics learning outcomes and using Conclusion Drawing (Verification) techniques to determine research conclusions based on the background, objectives, and research results. Interviews were conducted by giving 20 questions about the topic of sound waves and Nyongkolan culture to 4 selected samples from the total sample studied.

RESULT AND DISCUSSION

The following is a description of the research data obtained through the SPSS application. The normality test of the data is shown in Table 1.

Table 1. Normality Test of Pre-test and Post-test data

	class	Kolmogorov-Smirnov [a]			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
Yield Learn Student	Pre-test	0.179	26	0.032	0.942	26	0.148
	Post-test	0.155	26	0.110	0.964	26	0.480

Based on Table 1, it is known that the value of Sig. Shapiro-Wilk for the Pretest was 0.148>0.05 and the value of Sig. Shapiro-Wilk for Posttest 0.480>0.05 which means that the data is normally distributed. With normally distributed data, then proceed with the homogeneity test. The homogeneity test is shown in Table 2.

Table 2. Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Yield Learn Student	Based on Mean	1.979	1	50	0.166
	Based on Median	2.312	1	50	0.135
	Based on Median and with adjusted df	2.312	1	48.782	0.135
	Based on trimmed mean	2.027	1	50	0.161

Based on Table 2, it is known that the value of Sig. trimmed mean of 0.161> 0.05, it can be shown that the measured hypothesis is homogeneous. Thus, it can be said that the sample that has been taken comes from a population that has the same variance. The next test is the t test shown in Table 3.

Table 3. t test

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-5,743	9.836		-0.584	0.565
	Skills (Y)	1.057	0.115	0.883	9.203	0.000

a. Dependent Variable: Motivation (X)

The value of student motivation in learning with the ethnoscience-based CTL model is shown in Graph 1.

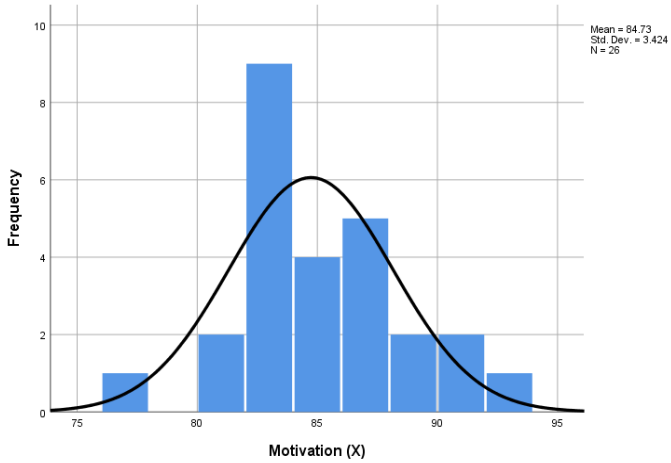

Figure 1. Student Motivation Value

Based on Table 3 and graph 1, it is known that the t-value is 9.203>2.068 (t-table), and the t-table results in the 23rd order have a Sig value. 0.000 <0.05, it can be said that there is an effect of using the Ethnoscience-based CTL model on the learning motivation of class XII MIPA 4 students with an average learning outcome score of 84.73. The use of the CTL model in the Ethnoscience-based sound wave physics material has a positive influence on increasing student motivation and learning outcomes, which is marked by increased student creativity, changing students' mindsets to become more critical, increasing student activity in learning, and students getting to know the culture of their area of origin.

Sampling for interviews is done by determining in advance what percentage of the data you want to collect. Researchers determined a sample of 15% of all participants so that 4 samples were obtained. Samples were taken based on the average score obtained by students, where the researcher took 2 students with the highest average score and 2 students with the lowest average score. The student scores can be seen in table 4.

Table 4. Student Scores

	Student Scores	
Student Name	Pretest	Posttest
FSH	71	92
MK	69	90
SP	57	82
HDP	55	77

Next, the four students were asked questions related to the use of the Ethnoscience-based CTL learning model and on average students could answer well about understanding concepts in sound wave material, such as classifying sounds based on the *Nyongkolan* culture chosen by the research team. However, when students are given more difficult questions, students begin to have difficulty in identifying sounds based on *Nyongkolan* culture, this student's difficulty is based on their lack of knowledge about *Nyongkolan* culture, such as knowing the types of musical instruments in the *Gendang Beleq* art, the sound produced and the medium used. passed on every musical instrument. However, based on Table 4, it can be said that there is a significant effect on the use of learning models on student learning outcomes, both those with high and low average scores.

In addition, based on interviews conducted by the research team, it was found that there was an increase in creativity during learning activities, as shown in Figure 1 when students did simple practicum activities in small groups. Many students ask questions related to the material in the form of ways to be able to visualize sound waves to the surrounding life. At the second meeting, where the learning objectives were students were able to explain the characteristics and were able to calculate the speed of sound propagation, it was proven that there was an improvement in the learning process where students were able to formulate problems to be solved. In practice, students try to use simple media where a glass filled

with water is vibrated by beating the table and then students measure the direction of the table's propagation of the vibration of the water. Motive is a potential energy for the occurrence of behavior or action. Students have a motive that aims to be able to motivate themselves in understanding the physics concepts being studied (Suharni & Purwanti, 2018).

Figure 2. Simple practice

Basically, many students already have an understanding related to the learning that is being carried out, but many of them are still having difficulties in understanding and studying the material presented. In this study, researchers tried to use an Ethnoscience-based contextual learning model to illustrate that when teachers want to make students understand the concept of learning with media, teachers can use Ethnoscience media because this media is often and well known by students. When the teacher describes the explanation with the Ethnoscience media, the students are able to capture the material being explained. In addition, the Ethnoscience-based CTL model also serves to provide students with an understanding that in physics learning only uses the same equation, but when the equation is given different treatment, many students have difficulty solving it. Therefore, the use of the Ethnoscience-based CTL model can increase students' understanding that the culture they usually do if given different treatment, then only slight changes will occur.

The changes referred to in this context are the effects resulting from giving different treatments to the *Gendang Beleq* musical instrument. The first treatment, namely hitting the drum using a bat (stick) will cause vibrations and produce a high-frequency sound. The second treatment is hitting the drum using only the hands will cause vibrations but produce a sound with a lower frequency. Based on the conclusion of the analogy, it shows that different treatments only produce slight changes, but the two treatments are inseparable from the physical concept of sound wave material. Thus, ethnoscience-based learning by elevating the *Nyongkolan* culture is in harmony to be combined with sound wave material using the CTL model.

Based on field learning activities using the Ethnoscience-based CTL model, the researchers found several obstacles, including the lack of student knowledge regarding *Nyongkolan* culture and the art of *Gendang Beleq*, as well as the lack of teaching aids in the application of the Ethnoscience-based CTL model at SMAN 2 Mataram.

CONCLUSION

Based on the results and discussion, it can be concluded that the use of the Ethnoscience-based CTL (Contextual Teaching and Learning) learning model has a significant influence on students' motivation and learning outcomes on sound wave material for class XI MIPA 4 at SMA Negeri 2 Mataram. The results of the interviews showed that there was an increase in students' understanding of concepts.

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