The Effect of Contextual Collaborative Learning Based Ethnoscience to Increase Student's Scientific Literacy Ability

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ABSTRACT

Scientific literacy is used as the primary goal in science education because it is considered to be used to prepare today's generation. Aspects of scientific literacy consist of the concepts, processes, and attitudes of science that can be used in people's daily lives, a picture of the success of science education carried out by each country. However, this ability has not been trained optimally through the process of learning science in Indonesia. This research aims to increase students' scientific literacy ability through contextual collaboration learning based on ethnoscience. This study used a quasi-experimental research method with a pre-experimental design that involved pretest and posttest of one group. This research has been conducted in the Chemistry Education UNDIKMA Mataram for the number of research subjects as many as 31 students. The instrument used is multiple choice tests to measure the achievement the content and process of science students while attitude scale to measure students' scientific attitudes. The results showed that the achievement of content, process, and science attitudes of students overall has increased in the medium category. This means that the effect of contextual collaborative learning based ethnoscience the capacity of scientific literacy in content, process, and attitude of students.

Keywords: CCLE, Scientific Literacy

INTRODUCTION

Advances in science and technology have both positive and negative impacts on human life. Positive effects arise due to various facilities that can improve the quality of human life. Ethical, moral, and global issues are negative impacts resulting from the development of science and technology (Sari et al., 2017). Therefore, students need to be equipped with the ability to care and respond to issues that develop in society, think critically and creatively to plan problem solving, and have in-depth knowledge and understanding to be applied in problem-solving (Eny & Wiyarsi, 2019). This can be achieved if students have scientific literacy.

Important scientific literacy is developed because (1) understanding of science can provide individual satisfaction and pleasure after studying nature; (2) to make a decision needed information and scientific thinking; (3) every public discourse and debate needed the involvement of science and technology; (4) and scientific literacy is needed in the world of work because it involves higher-order thinking skills are reasoning, creative thinking, making decisions, and solving problems (Wulandari, 2016). The above description shows the importance of someone having a literacy in science. Therefore scientific literacy is used as a benchmark in education quality.

The findings of this study (OECD, 2013) stated that student literacy achievement is low from all aspects (content, process and context). This is confirmed by Yustin & Wiyarsi

(2019) that the learning environment and climate at school influence variations in student literacy scores. Kurnia et al., (2014) also revealed the low scientific literacy of Indonesian students is closely related to the gap between science learning implemented in schools and PISA demands. Students scientific literacy is low indicate that there are still many students have not been able to measure body temperature properly, playing on the field in heavy rain, throwing garbage in the river without regard to cleanliness and disasters that can occur from his actions, likes foods that contain additives, not even a few high school students have started smoke. This condition is the causes of the low ability of students' scientific literacy. Therefore we need learning that can train students' scientific literacy skills. Learning that is considered a potential to practice students' scientific literacy skills is contextual collaborative learning based ethnoscience.

Contextual collaborative learning is a method of combining two methods or modification of the contextual and the collaborative method (Rochayati et al., 2018). Collaboration learning prioritizes learning that involves several students joined together in groups that have different abilities and thoughts for each individ-ual (Ulfiana et al., 2016). Combined with contextual learning, matrices are presented according to the student environment, so students can understand and develop their knowledge (Setiyorini, 2018). Contextual is a holistic learning process that aims to help students understand personal, social and cultural contexts in daily life so students have skills and knowledge of dynamic and flexible (Dewi et al., 2018). Contextual is a connecting learning model real world situations that aim to equip students with knowledge that can applied in concrete daily life (Yulianto & Zaini, 2019).

A study shows that contextual collaboration learning can understand and develop their knowledge (Said et al., 2014; Zhong et al., 2012; Wiyarsi et al., 2020). While ethnoscience is part of contextual learning. Ethnoscience is an interdisciplinary science that combines human and cultural anthropology with science education. The study of the scientific knowledge that is gained by examining the local knowledge that is contained in the culture of a community or ethnic group. Local awareness is derived from local communities' thought and ideas about daily life, including customs, values , beliefs and views on the world (Lestari & Fitriani, 2016). Ethnoscience, rooted in students' lives, is a type of contextual experience (Setiawan et al., 2017). Ethnoscience will allow students to investigate the facts and phenomena present in society and be integrated with scientific knowledge (Melyasari et al., 2018). Ethnoscience can captivate learners because it's connected to their own regional identity. Ethnoscience may also encourage knowledge and preserve local culture (Supriyadi & Nurvitasari, 2019). The ethnoscience model of chemistry learning can improve scientific literacy for students (Dewi et al., 2019; Basyari et al., 2019; Fathonah & Subali, 2020).

The concept that is contextual in science learning can be related to ethnoscience. Chemistry learning can be integrated into ethnoscience because it involves contextual experience in everyday life about local wisdom into learning materials and a phenomenon that exists in society (Dewi et al., 2019 & Azalia et al., 2020). Learning chemistry is theoretically teaching students to have the ability to identify chemical problems and making a conclusion based on evidence for the sake of recognizing natural changes and the effect of human interaction on nature (Gorokhov, 2010). This complex world changes quickly, which requires an understanding of chemistry to handle it (Fitriyanti et al., 2019). Because understanding chemistry literacy is highly demanded in formal education (Sumarni et al., 2017). It means that the students should not only know and memorize things related to the concepts of chemistry but also understand and implement it in their daily life (Marks & Eilks, 2009). According to Ariningtyas (2017); Ibe & Nwosu (2017) that scientific literacy can be increased through learning chemistry charge ethnoscience. Perwitasari et al. (2017) & Usman et al. (2019) showed that learning application based ethnoscience in chemistry can improve students' scientific literacy.

This research aims to increase students' scientific literacy ability through contextual collaborative learning based ethnoscience. Formulation of research problem are 1) Is there the differrent students' scientific literacy before and after implemented CCLBE model?, 2) Is there increase students' scientific literacy ability before and after implemented CCLBE model?. Therefore, it is necessary to do learning which can relate the daily lives of students with cultural environment through contextual collaborative learning based ethnoscience to improve students' literacy so learning becomes more meaningful, and can be used for introduce the local culture of the place student residence in accordance with student characteristics. So, the novelty of this research is learning chemistry in social life mostly related to maximizing context local wisdom so that it can stimulate motivation for students to build knowledge and integration of cultural competences in different professions will be decisive key in improving scientific literacy in terms of content, context and attitude.

METHODS

This study used a quasi-experimental research method with a pre-experimental design that focused on contextual collaborative learning based ethnoscience implementation in studying, learning, and teaching to improve students' scientific literacy ability. This research aimed to improve students' scientific literacy ability by using the contextual collaborative learning based ethnoscience model. Data in this research is students' scientific literacy ability indicator that can be measured through a student's ability to solve the designed test. The form of pre-experimental design in this study was One Group Pretest-Posttest Design (Sugiyono, 2013). The shape of the design is illustrated in Table 1.

Table 1. *Pre-experimental Design*

Subject	Pretest	Posttest
One Group	O_1	O_2

Information:

O_1 = Pretest value before contextual collaborative learning based ethnoscience model.
O_2 = Posttest value after contextual collaborative learning based ethnoscience model.

This research has been conducted in the Chemistry Education UNDIKMA Mataram for the number of research subjects as many as 31 students. The sampling technique is saturated sampling, namely the technique determining the sample if the population is the same as the sample (Sugiyono, 2013). The trial results of the scientific literacy instrument showed that the probabilities of all items were above 5%. Thus, it can be concluded that all items are valid, as shown in table 2.

Table 2. *The Validity of Scientific Literacy Instrument*

Item	1	2	3	4	5	6	7	8	9	10
Pearson Correlation	.665**	.862**	.482**	.564**	.521**	.536**	.556**	.505**	.531**	.544**
Sig. (2-tailed)	.000	.000	.008	.001	.004	.003	.002	.005	.003	.002
Criteria	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid
Item	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Pearson Correlation	.593**	.617**	.672**	.706**	.512**	.866**	.506**	.636**	.534**	.531**
Sig. (2-tailed)	.001	.000	.000	.000	.004	.000	.005	.000	.000	.003
Criteria	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid
Item	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Pearson Correlation	.520**	.580**	.709**	.531**	.534**	.636**	.506**	.617**	.866**	.544**
Sig. (2-tailed)	.004	.001	.000	.003	.003	.000	.005	.000	.000	.002
Criteria	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid

The reliability of scientific literacy instrument showed that value for 30 items was 0.85 with very high criteria as shown in table 3.

Table 3. *The Reliability of Scientific Literacy Instrument*

Cronbach's Alpha	N of Items
0.858	30

The increase scientific literacy through CCLBE model

The instrument used was a reasonable multiple-choice question used to measure students' scientific literacy ability. The different students' scientific literacy before and after implemented CCLBE model and increase students' scientific literacy ability in this study was determined based on T-test and N-Gain. The calculation results obtained <g> value are then interpreted into three categories namely:

Table 4. *Gain Value Classification*

Average Gain	**Criteria**
$0,00 < g \leq 0,30$	Low
$0,30 < g \leq 0,70$	Medium
$0,70 < g \leq 1,00$	High

(Ardianto & Rubini, 2016)

FINDINGS AND DISCUSSIONS

To find out the different students' scientific literacy before and after implemented CCLBE model and increase students' scientific literacy ability were analyzed using T-test and N-gain, as seen from the table, is presented as follows.

Table 5. *T-tes Value of Student Scientific Literacy*

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std.Error Difference	Lower	Upper
Scientific Literacy	Equal variances assumed	.474	.494	2.544	62	.013	3.81250	1.49878	.81648	6.80852
	Equal variances not assumed			2.544	61.940	.013	3.81250	1.49878	.81642	6.80858

Based on table 5, the Sig. (0.013) <0.05, this indicates that there is a major gap between students scientific literacy before and after through contextual collaboration learning based ethnoscience model. The findings of these studies (Abonyi et al., 2014; Sumarni, 2018; Rahmawati et al., 2019; Adhi et al., 2018) showed that the introduction of ethnoscience-based chemistry learning will boost scientific teaching literacy.

a) The Increase scientific literacy ability of content aspects

Table 6. *Student Scientific Content Achievements*

Subtopics	% Pretest	% Posttest	% N-Gain
The Formation Process of Petroleum	34,5	65,5	44,9
The Main Components of Petroleum Compilers	44,5	75,7	56,2
The Impact of Burning Oil on Water	46,7	77,0	56,8
The Impact of Combustion of Petroleum on Land	52,0	78,0	54,1
The Impact of Burning Petroleum on Health	55,3	80,5	56,3
The Impact of Burning Petroleum on the Economy	56,5	80,0	54,0
Average	**48,3**	**76,1**	**53,7**

Student achievement in each content is shown in table 6 that there is the highest increase in the content "Impact of Burning Petroleum on the Waters" and the lowest increase occurred in the content "Process of Forming Petroleum." Students' mastery of the material "Impacts of Burning Petroleum on the Water" experienced the highest increase because the dominant activity when discussing this content was a collaboration discussion activity based on facts and experiences in daily life. Collaboration learning prioritizes learning that involves several students joined together in groups that have different abilities and thoughts for each individual (Ulfiana et al., 2016). Combined with contextual learning, matrices are presented according to the student environment so that students can understand and develop their knowledge (Setiyorini, 2018). While ethnoscience is one type of contextual learning. Ethnoscience is a cross-disciplinary science that connects the human or cultural anthropology with science learning. The study of the scientific knowledge that is gained by examining the local knowledge that is contained in the culture of a community or ethnic group. Local knowledge is derived from reasoning and ideas from local communities about everyday life, including traditional culture, values, beliefs, and world views (Lestari & Fitriani, 2016). Ethnoscience, rooted in students ' lives, is a type of contextual experience (Sudarmin, 2014).

b) The Increase scientific literacy ability of process aspects

Table 7. *Student Scientific Process Achievements*

Process Indicator	% Pretest	% Posttest	% N-Gain
Identifying scientific issues	54,5	68,5	30,7
Explain scientific phenomena	64,5	78,7	40,0
Using scientific evidence	53,7	77,0	50,3
Average	**57,6**	**74,7**	**40,3**

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c) The Increase scientific literacy ability of attitude aspects

Table 8. *Student Scientific Attitude Achievements*

Attitude Indicator	% Pretest	% Posttest	% N-Gain
Responsibility for resources and the environment	65,5	76,5	31,8
Support science inquiry	64,5	80,7	45,6
Interest in science	68,7	85,0	52,0
Average	**66,2**	**80,7**	**43,1**

The attitude aspect is the last aspect of scientific literacy. Unlike the two previous elements, this aspect of attitude looks more at students' responses to scientific issues and supports in scientific inquiry. To capture the achievements of students' scientific literacy aspects of belief used a scale instrument attitude amounting to 16 statements, where each report consists of 4 answer choices, namely strongly agree, agree, disagree, and strongly disagree. The attitude of science examined in this study includes three indicators, including (1) overall responsibility, the attainment of science attitudes of students before and after getting contextual collaboration learning-based learning ethnoscience can be seen in Table 4 illustrates that there is an increase in the attitudes of science attainment after getting contextual collaboration learning-based ethnoscience even though it is still in the moderate category. This is because learning implemented in the classroom involves phenomena that occur in everyday life so that such learning processes can have a positive impact on improving students' scientific attitudes in resources and the environment; (2) support science inquiry; (3) interest in science. The students' scientific literacy ability in aspects of attitude begins to be grown by giving contextual problems based on ethnoscience when starting learning activities. Because ethnoscience is knowledge acquired based on local culture that can be innovated in science-based learning at class (Abonyi et al., 2014). Ethnoscience is a learning approach that elevates local culture or wisdom to become an object of science learning. The introduction of science learning from the perspective of local culture and structured local knowledge relating to certain natural phenomena and events would increase students' scientific interests and make it easier for students to understand them (Dewi et al., 2019).

CONCLUSION

Based on the above definition, it can be concluded that there is a major gap between students scientific literacy before and after implemented CCLBE model and scientific literacy ability has increased in the medium category on capacity of students in content, process and attitude aspects. The uniqueness of contextual collaboration learning based ethnoscience (CCLBE) model is that students can integrate their knowledge with cultural competences in a different profession so that become the key determinants in improving students' scientific literacy in terms of content, context and attitude. This CCLBE model can be applied in different fields of education. Future research on the same subject should be performed in various topics and contexts.

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