Improving Science Literation and Citizen Literation Through Thematic Learning Based on Ethnoscience

by Beny Dwi Lukitoaji

Submission date: 07-Oct-2021 09:15PM (UTC+0700)
Submission ID: 1667766966
File name: Atmojo_2021_J._Phys.__Conf._Ser._1823_012001.pdf (863.45K)
Word count: 3108
Character count: 17169

Improving Science Literation and Citizen Literation Through Thematic Learning Based on Ethnoscience

Improving Science Literation and Citizen Literation Through Thematic Learning Based on Ethnoscience

Setyo Eko Atmojo[1*], Beny Dwi Lukitoaji[2], Taufik Muhtarom[3]

[1)]Department of Elementary School Teacher Education, Faculty of Teacher Training and Education, Universitas PGRI Yogyakarta, Indonesia
[2)]Department of Elementary School Teacher Education, Faculty of Teacher Training and Education, Universitas PGRI Yogyakarta, Indonesia
[3)] Student of Postgraduate Program, National Dong Hwa University, Taiwan

*Corresponding author: setyoekoatmojo@yahoo.co.id

Abstract. This study aims to improve the scientific literacy and citizenship literacy of elementary school students through Ethnoscience-based thematic learning. This research method is experimental research with a quasi-experimental design type—data collection techniques using test techniques, namely science literacy tests and citizenship literacy tests. Based on the results of the post-test analysis of data Literacy of science obtained t value = 3.781> t table = 1.998 and t-test results of the test of citizenship literacy got t value = 4.971> t table = 1.998. It means that there are significant differences in scientific literacy and civic literacy in the experimental and control groups. While the N value of scientific literacy gain in the control group is 0.43 (moderate) while in the experimental group is 0.73 (high) and citizenship literacy in the control group is 0.34 (medium) while in the experimental group is 0.73 (high). Based on these results, it can be concluded that there was an increase in scientific literacy and high citizenship literacy in the experimental group and increased science literacy and moderate citizenship in the control group.

1. Introduction

The current pace of global development has brought changes to various lines of Indonesian people's lives. As part of global developments, students must be able to think critically about current global progress. People's literacy dramatically influences the ability to think and respond to globalization in a country or region. The results of the ranking released by PISA 2018 show that Indonesian children's literacy is still at a low level. The still low literacy of Indonesian children today will make it difficult for them to compete globally. Through this activity, it is expected to be able to increase the scientific literacy of elementary school students in the Bantul district of Yogyakarta. In addition to scientific literacy in the face of global change, a state attitude is also needed to show the national identity in the era of globalization. To have the right state attitude, it is necessary to instill citizenship literacy in elementary school students.

This literacy of citizenship becomes an essential part of navigating the globalization of the world in the future. With functional citizenship literacy, students will be able to choose and sort out global values that are in line and conflict with the values of citizenship in Indonesia [1]; [2]; [3]; [4].

Citizenship Literacy is citizens' ability to understand their rights and obligations as part of the Indonesian state and as part of global developments [5]; [6]. Based on the statement, learning needs to be done to increase scientific literacy and civic literacy. This learning must be designed concerning the cultural situation that develops in the environment around students to support the learning process. One learning design that has these advantages is ethnoscience based learning.

Ethnoscience-based learning is suitable for increasing the science literacy and citizenship literacy of elementary school students. Through this ethnics-based learning, students will be invited to learn through a local culture in the environment around students and relate it to the concepts of science. By linking local culture with the concept of science, this will increase the students' scientific balance [7]. Through ethnosciences-based thematic learning will also be able to improve the literacy of elementary school student citizenship. This citizenship literacy can be formed because students understand that the existing local culture is interconnected with each other and related to the science concepts in the school. Through these ethnics-based thematic learning, students know that respecting and preserving cultural values in everyday life is part of maintaining the sustainability of the life of the nation and state. Preserving and preserving culture is one of the obligations of citizens.

2. Method

This research was conducted in two schools in the Pajangan sub district, Bantul Regency, Yogyakarta. Kerebet Elementary School as an experimental group that applies ethnics-based thematic learning and Sendangsari Elementary School as a control group that implements regular thematic learning. This research was conducted for three months, namely from April 2020 to June 2020. This research is experimental research with a quasi-experimental design type. This research design can be seen in Table 1.

Table 1. Research Design

Calss	Pre-Test	Treatment	Post-Test
Control	K1	o	K2
Experimen	E1	x	E2

Information:
K1 : Pre Test of Control Group
E1 : Pre Test of Experiment Group
o : Control Group Learning (Reguler Thematic)
x : Experiment Group Learning (Thematic Etnosains)
K2 : Post Test of Control Group
E2 : Post Tes Experiment Group

3. Result and Discussion

Based on the results of the study, obtained data about scientific literacy and literacy of elementary school student citizenship. Data on scientific literacy and citizenship literacy were obtained using test questions developed based on indicators of scientific literacy and citizenship literacy. The indicators of scientific literacy and citizenship literacy used in this study can be seen in Table 2.

Table 2. Indicators of Science Literacy and Citizenship Literacy of Elementary School Students

No	Indicator	
	Science Literacy	Citizenship Literacy
1	Recognize situations in life that involve science and technology	Recognize the condition of the environment around students
2	Understanding nature on the basis of scientific knowledge	Recognize the rights and obligations as a citizen
3	Identifying scientific issues	Use Indonesian properly in the community

4	Explain scientific phenomena	Behave positively towards others
5	Using scientific evidence	Actively participate in the social environment of students
6	Support science inquiry	Identify changes that occur in the student environment
7	Interest in science	Initiate positive changes in the student environment
8	Responsibility for environmental resources	Responsible for the actions taken

The indicators listed in Table 2 are indicators of the development of the test questions used to measure scientific literacy and student citizenship literacy. In this study, scientific literacy and citizenship literacy were carried out before and after learning both in the control group and the experimental group. The average score of scientific literacy and civic literacy in the control and experimental groups can be seen in Table 3.

Table 3. Results of Measurement of Science Literacy and Literacy of Student Citizens

Group	Average Science Literacy score		Average Citizenship Literacy score	
	Pre Test	Post Test	Pre Test	Post Test
Control	42,50	67,55	51,25	68,25
Experiment	42,75	84,75	50,76	86,74

Based on the results of the calculation of the average scientific literacy and literacy of student citizenship, it is known that the average post-test in the experimental group is higher than the control group. This is supported by the results of calculating the t-test results of the post-test of scientific literacy. The value of t arithmetic = 3.781> t table = 1.99 and t-test results of the test of literacy citizenship with the value of t count = 4.971> t table = 1.998 which means that there are differences the significant scientific literacy and civic literacy in the experimental and control groups.

The implementation of ethnics-based thematic learning causes the difference. Ethnoscience-based thematic learning has the characteristics of integrating local culture around students with the concept of learning in the class [8]; [9]; [10]; [11]. Learning to integrate local culture is more easily learned and accepted by students because it discusses things that happen in the student environment. In this study, the culture that is integrated into making wooden batik in thematic learning in elementary schools Class V on Theme 9 sub-themes 1 and sub-themes 2. The selection of theme nine is based on the suitability of the theme with local cultural characteristics integrated into learning. The compatibility between theme and culture will facilitate and maximize the learning process [12]; [13]; [14]. Through this optimal learning process, it will produce maximum cultural literacy and civic literacy as well. N gain test results on the pre-test and post-test of the scientific literacy of students in the control group, and the experimental group can be seen in Table 4.

Table 4. Test for Increasing Science Literacy Score

Group	Pre-Test	Post-Test	Gain-Score	N-gain	Criteria
Control	42,50	67,55	25,05	0,43	Medium
Experiment	42,75	84,75	42.00	0,73	High

In Table 4, it is known that the N value of the scientific literacy gain in the control group was 0.43, while the N gain value in the experimental group was 0.73. Based on the results of the N gain test, it can be concluded that the increase in scientific literacy in the control group is higher than the increase in science literacy in the experimental group. This shows that ethnics-based thematic learning is

effective in increasing the science literacy of elementary school students. In addition to increasing literacy in learning science, it can also increase the literacy of student citizenship. The N gain test results for literacy scores of citizenship students can be seen in Table 5.

Table 5. Test for Citizenship Literacy Improvement

Group	Pre-Test	Post-Test	Gain-Score	N-gain	Criteria
Control	51,25	68,25	17,00	0,34	Medium
Experiment	50,76	86,74	35,98	0,73	High

Table 5 shows that the increase in citizenship literacy in the control group was 0.34 in the medium category. While the increase in student literacy in the experimental group by 0.73 was in the high category. Based on these results, it can be concluded that the increase in citizenship literacy in the experimental group was higher than the increase in student literacy in the control group.

The increase in scientific literacy and civic literacy in the experimental group that was higher than the control group was due to the implementation of ethnics-based thematic learning. The success of Ethnoscience-based learning in improving science literacy and civic literacy is because in thematic learning based on ethnoscience, it integrates local culture. The integration of local culture becomes an essential part of Ethnoscience-based learning [15]; [16].

The Ethnoscience-based learning process aims to create a very dynamic meaning. The ethnics-based learning process allows students to express their various curiosities, engage in a creative process of analysis and exploration to find answers, and engage in different concluding. Thus, the ethnoscience-based learning process is in no way static as students passively listen, accept, take notes, and the teacher always dominates the class with his lectures [17]; [18]. Activities in ethnoscience-based learning are not designed to activate students but are made to facilitate social interaction and meaning negotiation until the creation of meaning occurs. Meaningfulness, in this case, is obtained from the results of social interactions and negotiations between students' fundamental knowledge and experience with new information obtained in learning, between students and other students, between students and teachers (knowledge able others) in the context of cultural communities.

The process of creating meaning through the learning process based on ethnoscience has several components, namely meaningful tasks, active interaction, contextual explanation and application of science, and utilization of various learning resources [19]; [20]; [21]; [22]; [23]. In Ethnoscience-based thematic learning, culture in which there are concepts of science becomes a medium for students to transform their observations into creative forms and principles in the theme of ongoing learning. Thus, the learning process based on ethnics is not just transferring or conveying culture or cultural manifestations but also using culture to make students create meaning, penetrate the limits of imagination, and creativity to achieve a deep understanding of the material and concepts being studied by students.

4. Conclusion

Ethnoscience-based learning can improve the science literacy and citizenship literacy of elementary school students. This is evidenced by the results of research showing that there is a difference in the increase in scientific literacy and civic literacy in the control and experimental groups. The student's score gain test revealed that the increase in scientific literacy and citizenship literacy of control group students was at a moderate level ($0.3 \leq g \leq 0.7$). While the increase in_ scientific literacy and citizenship literacy of students in the experimental group in the high category ($g > 0.7$).

Refferences

[1] A. Bentahar and J. L. O'Brien, "Raising students' awareness of social justice through civic literacy," *J. Soc. Stud. Educ. Res.*, vol. 10, no. 1, pp. 193–218, 2019.
[2] C. Larrotta and H. Chung, "Foreign-born TESOL Instructors Assisting Adult Immigrant

Learners to Develop Civic Literacy Skills: A Pen Pal Project," *Int. J. Educ. Lit. Stud.*, vol. 8, no. 2, p. 1, 2020, doi: 10.7575/aiac.ijels.v.8n.2p.1.

[3] L. Zhang, H. Zhang, and K. Wang, "Media Literacy Education and Curriculum Integration: A Literature Review," *Int. J. Contemp. Educ.*, vol. 3, no. 1, p. 55, 2020, doi: 10.11114/ijce.v3i1.4769.

[4] A. Mu, "Civic Writing on Digital Walls," *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 2019, doi: 10.1017/CBO9781107415324.004.

[5] M. E. Hylton, J. L. Sims, Y. A. Padillo, M. E. Hylton, and J. L. Sims, "Promoting Civic Knowledge and Political Efficacy Among Low- Income Youth Through Applied Political Participation Promoting Civic Knowledge and Political Efficacy Among Low-Income Youth Through Applied Political Participation," vol. 12, no. 2, 2020.

[6] M. Manfra and C. Holmes, "Integrating Media Literacy in Social Studies Teacher Education," *... Issues Technol. Teach. Educ.*, vol. 20, pp. 121–141, 2020.

[7] F. Ni'mah, "Research trends of scientific literacy in Indonesia: Where are we?," *J. Inov. Pendidik. IPA*, vol. 5, no. 1, pp. 23–30, 2019, doi: 10.21831/jipi.v5i1.20862.

[8] E. Risdianto, M. J. Dinissjah, Nirwana, and M. Kristiawan, "The effect of Ethno science-based direct instruction learning model in physics learning on students' critical thinking skill," *Univers. J. Educ. Res.*, vol. 8, no. 2, pp. 611–615, 2020, doi: 10.13189/ujer.2020.080233.

[9] F. M. Fatimah and N. F. Anggrisia, "The Effectiveness of 7E Learning Model to Improve Scientific Literacy," vol. 277, no. Steach 2018, pp. 18–22, 2019, doi: 10.2991/steach-18.2019.4.

[10] W. Widodo, E. Sudibyo, Suryanti, D. A. P. Sari, Inzanah, and B. Setiawan, "The effectiveness of gadget-based interactive multimedia in improving generation z's scientific literacy," *J. Pendidik. IPA Indones.*, vol. 9, no. 2, pp. 248–256, 2020, doi: 10.15294/jpii.v9i2.23208.

[11] S. N. Izzah, S. Sudarmin, Wiyanto, and A. P. B. Prasetyo, "Identification of the indigenous science concepts in the batik-manufacturing process to develop STEM integrated ethnoscience learning," *J. Phys. Conf. Ser.*, vol. 1567, no. 4, 2020, doi: 10.1088/1742-6596/1567/4/042032.

[12] D. A. Istikomah and P. Jana, "Mathematical Prolem Solving Ability in Apos Modified Learning Model (M-APOS)," *J. Phys. Conf. Ser.*, vol. 1254, no. 1, 2019, doi: 10.1088/1742-6596/1254/1/012071.

[13] Kintoko and P. Jana, "Development of Mathematics Module on the Material of Flat Side Space Building in DIY Culture-Based," *J. Phys. Conf. Ser.*, vol. 1254, no. 1, 2019, doi: 10.1088/1742-6596/1254/1/012072.

[14] M. Aristeidou and C. Herodotou, "Online Citizen Science: A Systematic Review of Effects on Learning and Scientific Literacy," *Citiz. Sci. Theory Pract.*, vol. 5, no. 1, 2020, doi: 10.5334/cstp.224.

[15] Rinto, N. Hayati, Wiyanto, and S. Ridho, "Content Validity Analysis of Ethnoscience-based Interview Worksheets in Bukit Ajimut for Medicinal Plants Pharmacognosy Learning," *J. Phys. Conf. Ser.*, vol. 1567, no. 2, pp. 8–12, 2020, doi: 10.1088/1742-6596/1567/2/022061.

[16] Parno, L. Yuliati, F. M. Hermanto, and M. Ali, "A case study on comparison of high school students' scientific literacy competencies domain in physics with different methods: PBL-stem education, PBL, and conventional learning," *J. Pendidik. IPA Indones.*, vol. 9, no. 2, pp. 159–168, 2020, doi: 10.15294/jpii.v9i2.23894.

[17] N. K. 2020 Wahyu, Y., Suastra, I. W., Sadia, I. W., & Suarni, "Wahyu, Y., Suastra, I. W., Sadia, I. W., & Suarni, N. K. 2020.pdf." .

[18] M. Paristiowati, T. Hadinugrahaningsih, A. Purwanto, and P. A. Karyadi, "Analysis of students' scientific literacy in contextual-flipped classroom learning on acid-base topic," *J. Phys. Conf. Ser.*, vol. 1156, no. 1, 2019, doi: 10.1088/1742-6596/1156/1/012026.

[19] A. Pahrudin, Irwandani, E. Triyana, Y. Oktarisa, and C. Anwar, "The analysis of pre-service physics teachers in scientific literacy: Focus on the competence and knowledge aspects," *J. Pendidik. IPA Indones.*, vol. 8, no. 1, pp. 52–62, 2019, doi: 10.15294/jpii.v8i1.15728.

[20] L. Listiana, A. Abdurrahman, A. Suyatna, and P. Nuangchalerm, "The Effect of Newtonian Dynamics STEM-Integrated Learning Strategy to Increase Scientific Literacy of Senior High School Students," *J. Ilm. Pendidik. Fis. Al-Biruni*, vol. 8, no. 1, pp. 43–52, 2019, doi: 10.24042/jipfalbiruni.v8i1.2536.

[21] M. D. Komalasari, B. Pamungkas, A. M. Wihaskoro, P. Jana, A. Bahrum, and N. Z. Khairunnisa, "Interactive Multimedia Based on Multisensory as a Model of Inclusive Education for Student with Learning Difficulties," *J. Phys. Conf. Ser.*, vol. 1254, no. 1, 2019, doi: 10.1088/1742-6596/1254/1/012057.

[22] S. E. Atmojo, A. Rusilowati, and S. I. A. Dwiningrum, "Characteristics and validity of SETS-based disaster learning models," *J. Phys. Conf. Ser.*, vol. 1567, no. 4, 2020, doi: 10.1088/1742-6596/1567/4/042064.

[23] S. E. Atmojo, W. Kurniawati, and T. Muhtarom, "Science Learning Integrated Ethnoscience to Increase Scientific Literacy and Scientific Character," *J. Phys. Conf. Ser.*, vol. 1254, no. 1, 2019, doi: 10.1088/1742-6596/1254/1/012033.

Improving Science Literation and Citizen Literation Through Thematic Learning Based on Ethnoscience

ORIGINALITY REPORT

12%	13%	10%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Setyo Eko Atmojo, Wahyu Kurniawati, Taufik Muhtarom. "Science Learning Integrated Ethnoscience to Increase Scientific Literacy and Scientific Character", Journal of Physics: Conference Series, 2019 Publication	3%
2	eudl.eu Internet Source	2%
3	Submitted to Far Eastern University Student Paper	2%
4	mafiadoc.com Internet Source	2%
5	journal2.um.ac.id Internet Source	2%

Exclude quotes	On	Exclude matches	< 2%
Exclude bibliography	On		