woro IOP 2018 (2)

by Woro Sumarni

Submission date: 05-Jan-2020 07:09PM (UTC+0700)
Submission ID: 1239318923
File name: Woro_IOP_2018_2.PDF (276.54K)
Word count: 4277
Character count: 24868

Increasing character value and conservation behavior through integrated ethnoscience chemistry in chemistry learning: A Case Study in The Department of Science Universitas Negeri Semarang.

IOP Conf. Series: Materials Science and Engineering **349** (2018) 012061 doi:10.1088/1757-899X/349/1/012061

Increasing character value and conservation behavior through integrated ethnoscience chemistry in chemistry learning: A Case Study in The Department of Science Universitas Negeri Semarang.

Sudarmin[*], **Woro Sumarni**

Chemistry Department, Mathematics and Natural Science Faculty Universitas Negeri Semarang, D6 Building 2nd Floor , Sekaran Campus, Gunungpati, Semarang, Indonesia 50229

[*)] Corresponding author . sudarmin@mail.unnes.ac.id

Abstract. The purpose of this study was to obtain a factual picture of the improvement of students' conservation character and conservation behavior through the application integrated ethnoscience chemistry learning. This research was a case study on students majoring in the Department Of Science Mathematics and Natural Science Faculty Universitas Negeri Semarang. The subjects of the study were 30 students attending ethnoscience course in one of the teacher education institutions in the even semester of the academic year of 2016/2017. The subjects were given chemistry learning integrated into ethnoscience for eight weeks. The technique of data collection was done by using attitude scale arranged based on Likert scale. The data were analyzed by using qualitative descriptive. The results showed that the integrated ethnoscience chemistry learning contributed positively to the improvement of the character value and conservation behavior

I. Introduction

In the 21st century there have been revolutionary changes in the field of science and technology that spread throughout the world. The changes that occur, in addition to giving positive impacts, also increasingly impact on the occurrence of new problems related to global issues that actually threaten human survival. Therefore, in order to live in the midst of modern society, besides requirement of adequate thinking skills, it is also required strong conservation character and behavior. Strong character will enable citizens to change all obstacles into challenges and opportunities and be able to leverage their knowledge to solve daily life's problems and also problems in the broader spectrum of life [**1**]. Similarly, for prospective teachers, by having strong conservation character and behavior, they will be the individuals who always try to protect and preserve cultural values and act in a real way related to the use of natural resources in a sustainable manner so that natural resources could be enjoyed by present and future generations.

Referring to Universitas Negeri Semarang (UNNES) ' Vision as Conservation-Oriented University that has been declared since March 2010, it has a strategic meaning in the context of character building. This is related to the meaning of conservation that is not just a physical connotation, but more broadly is value and culture **[2]**. Conservation, the choice of name attached to Semarang State University, has a very deep value content. Conservation is not only concerned with activities that are

purely physical, related to the relationship between man and nature, but also includes a broad and universal value system. There are three activities in it, namely *protection, preservation, and sustainable use*. In such a context, rights and obligations become the main buffer of human attitudes and behavior, namely that what we gain must be in balance with what we give. It certainly is in the widest sense. The balance between rights and obligations is not only on the things that are economic, but in the relationship between humans and the natural environment. Breathing in the fresh air, enjoying the coolness of the trees, enjoying the charming birds singing; are the rights that we gain from the universe. Therefore, by taking the principle of protection, preservation, and wise use of the life order, whether physical, social, or cultural, this conservation is expected to establish and develop the students' character to become good citizens.

As a teacher education institution, one of the areas that can contribute significantly to improve the nation's competitiveness is through innovation in education and teaching. The emergence of Conservation Education course on curricular structure, it is appropriate to conduct collective consciousness on conservation values, on formal lecture activities. UNNES has formulated 11 conservation-based character values. The 11 conservation values are: religious, honest, caring, tolerant, democratic, polite, intelligent, strong, nationalist, loving homeland and responsible. Conservation values are very important for science learning, because in the next 50 years there will be 10 major problems faced by humankind that are 1) energy, 2) water, 3) food, 4) environment, 5) poverty, 6) terrorist and war, 7) disease, 8) education, 9) democracy, and 10) population. There are 5 of 10 problems namely energy, water, food, environment and disease that are closely related to science and can only be solved with new science concepts or green science [**3**].

There are four types of conservation character developed during the education process, namely (1) cultural values-based character education (moral conservation); (2) cultural-based character education (cultural conservation); (3) environmental-based character education (environmental conservation), and (4) character education based on self-potential (humanist conservation). When the four types of conservation characters developed are implemented in students' daily life through relationships with the universe; trees, birds, water, air, and fellow human beings; it will internalize those values to students as a moral knowing, moral feeling, and moral action. Based on moral analysis from [**4**], there are three development approaches namely Cognitive Moral Development, Affective Moral Development, and Behavior Moral Development.

The problem is not all academic community implements the values of character and conservation behavior either in their learning or life even though UNNES has been declared as a conservation university for seven years. The internalization of character values and conservation behavior has not been achieved optimally. The result of in-depth questionnaire and interviews of graduates in the last three years (2014-2016) has shown that only 34% of graduates implementing conservation character values (honest, intelligent, caring, and strong) and only 36% of graduates who have conservation behaviors (awareness of environmental protection, save energy and water) with good and very good category. Most students have enough conservation character and conservation values that are adequate and less. Students tend to be less honest (such as cheating on the exam, making a report not based on the data obtained, not mention the source clearly if the statement or opinion used refers to the source); less optimize ability to think, be easy to despair if they face difficulties, less care for people and the environment around them. Most students have low conservation behaviors which are indicated by less environmental-conscious behaviors (such as littering, much use of plastic bags, much use of air-conditioned rooms, and much use of motor vehicles) and energy waste behavior.

Based on the explanation mentioned before, it takes a way that can be utilized as a means of internalization of character value and conservation behavior for all academicians, especially lecturers and students, so that after going through the process of conservation values internalization, it is expected that the values will grow in every breath of spirituality. They are not only loving and responsible for the universe, but they are also doing it to their creator; creator of the universe. The intensive interactions

between lecturers and students occur in classroom learning. The result of field observation has shown that the learning done so far only focuses on the concept mastery. Lecturers are less likely to give students opportunities to learn meaningfully and less emphasize on attaining character values and conservation behavior. Meaningful learning will occur if students are given the opportunity to reconstruct knowledge of a phenomena and relate it to the concepts of science **[5]**.

The integrated ethnoscience learning is a strategy for creating learning environment and designing learning experiences that integrate culture as part of the learning process [**6, 7, 8**]. The education of science that concerns the wisdom of local culture, character and customs is a matter that needs to be addressed in the Curriculum in Higher Education and High School. Cultural integration into learning is a very important effort to do, because school learning that is appropriate for the 21st century is a multicultural approach to science **[9]**. Local culture approach learning that transforms (reconstructs) indigenous knowledge of society into scientific knowledge is definitely important, because there are not many Sains lecturers that have used it as one of learning resources [**10**].

This research is conducted to cultivate students' awareness on the environment, support students to get good learning outcomes after learning, and get the character of moral conservation, culture, environment and humanism. The students as prospective teachers should be familiarized to follow the learning on campus with a learning approach that can internalize the value and spirit of integrated local wisdom Scientific Method.

Some researchers who examine the importance of local cultural aspects of science learning conclude that students 'cultural backgrounds have influences on students' learning processes and outcomes in schools [**11-14**], In addition, it is also showed that ethnoscience that lives and develops in society is still in the form of concrete knowledge as a result of interaction between environment and culture The example is research from The Reconstruction of Society Indigenous Science into Scientific Knowledge in the Production Process of Palm Sugar [**15**].

Considering the importance of efforts to improve the character and conservation behavior of prospective teachers, this study is implemented by utilizing local culture and wisdom (integrated ethnoscience learning) as a means to increase the value of character and conservation behavior of prospective teachers. The purpose of this research is to analyze the increase of character values and conservation behavior of prospective teachers through the application of integrated ethnoscience learning while providing experiences to students in learning process integrated into culture.

2. Method

This study is a case study based on observations on the character value and conservation behavior of prospective teachers before and after being given integrated ethnoscience learning. The subjects of the study were students of the ethnoscience course of Integrated Science Department in one of the teacher education institutions in Central Java with a number of 30 students. The study was conducted on lectures of even semester of academic year 2016/2017. To measure the character values and conservation behavior of students, it was used attitude assessment sheet related to character and conservation behavior of students in the form of check list that was declared “valid” by the expert. Assessment of attitude was done by 3 assessors by using rating scale with category ranging from not good (1) to very good (4). Reliability of the rating sheet was 0.718 as split-half method. Other instruments used to collect evidence during the study were diaries, lesson profiles, and the performance of study subjects [**16**]. The data were analyzed by using qualitative analysis technique.

To know the achievement level of character value and conservation behavior, it is classically used criteria as presented in Table 1.

Table 1. Criteria of Classical Achievement Level

Average Criteria Values	Average Criteria Values
$x \leq 35$	Low
$35 < x \leq 50$	Medium
$50 < x \leq 65$	High
$65 < x \leq 80$	Very High

To determine the achievement level of each indicator of character value and conservation behavior, it is used criteria as presented in Table 2.

Table 2. Criteria Level Achievement per aspect

Rata-Rata Nilai	Kriteria
$5 < x \leq 8$	Low
$8 < x \leq 12$	Medium
$12 < x \leq 16$	High
$16 < x \leq 20$	Very High

3. Research Results and Discussion

The learning applied in this study was chemistry learning integrated into ethnoscience which aimed to increase students' character value and conservation behavior. The cultural content and context were used as media in implementing chemistry learning integrated into ethnoscience that was relevant to the topic discussed in this study, namely colloid chemistry, solution and carbon compounds presented in Table 3.

Table 3. Content and context in relation to chemical matter

No	Topics related to chemical content	Context of local culture	aspects of chemical content developed
1.	Colloid Chemistry	making dhawet ireng	Colloid making
		making traditional herbal medicine	
		making camcao	
		making porridge from rice flour / sago / other tubers	
2	Acid-base solution	with the use of lime betel to exhale fruits	Base properties
3	Carbon compounds	making palm sugar	Carbohydrate
		making coconut oil	Lipid
		utilization of fibrous vegetables for various food products	Usage of cellulose / fiber
		Producing tapioca flour, cornstarch, etc. as basic ingredients of traditional food	Extraction

There were five character values and conservation behavior developed in this study, they were 1) environmental care, 2) love environment, 3) creative, 4) hard-working, and 5) responsible. The observation of the five aspects of character values and conservation behaviors was conducted before and after the end of lecture.

The result of observation before learning allowed researchers to create profile of character and conservation behavior classically, to create profile of each indicator of character value and conservation behavior, and to identify issues related to mastery of student's character and conservation behavior. Some of the important notes that could be identified before the implementation of chemistry learning integrated into ethnoscience were 1) the students' conservation behavior concerning the aspects of environmental care and loving environment was still low, and 2) the students did not show attitudes related to conservation character value ie creative, responsible and hard-working. In addition, the work ethic of the student group was still dominated by some students so that not all students were fully responsible for their work. Therefore, in the implementation of learning, lecturers gave more emphasis on the five aspects of character value and conservation behavior. The five aspects of character values and conservation behavior with their indicators are presented in Table 4.

Table 4. The aspects of character values and conservation behaviors and their indicators

Rated aspect	Indicator
Conservation behavior	
Environmental care	Protect natural environment
	Genuine knowledge of society
	Save energy and water
	Clean and healthy life
Love environment	Care for the environment, the value of conservation and local wisdom
	Like to plant crops
	Glad to see the green environment
	Use products that do not require a lot of energy
Conservation Character Value	
Creative	Use creative ideas in finding solution
	Create something new
	Ask various questions
	Like to do experiments
Responsible	Perform individual tasks well
	Accept risk
	Not accuse others
	Use energy with responsibility
Hard-working	Serious in doing task / test / exam
	Complete the task as well as possible
	Not easily give up
	Study hard

The assessment result of students' character and conservation behavior classically before and after learning is presented in Table 5.

Table 5. The analysis result of characteristic value and conservation behavior of prospective teacher classically (n = 30, max value = 80, minimum value = 5)

No	Rated aspect	Before learning		After learning	
		Value	Category	Value	Category
1	Conservation character	33,7	low	60,3	high
2	Conservation behavior	37,8	medium	64,5	high

A good character consisted of moral knowing, moral feeling, and moral action, which were explained as habit in way of thinking, habit in heart, and habit in action (Lickona, 2013). In Table 5, it can be seen that the character value and conservation behavior of students before learning on the five aspects classically have a mean value in the medium category. After the implementation of chemistry learning integrated into ethnoscience, the five aspects reached a very high category.

These results showed that there was an increase in students' character value and conservation behavior after the introduction of integrated ethnoscience learning. The increase in student values showed that the learning implemented was suitable for improving the student's conservation character and behavior. This is in line with [**17**] and [**18**] that creative soft skills, hard-working and responsible in group can be created if learning is based on continuous improvement. Soft creative skills, hard-working, and responsible as parts of individual characteristics are developed through ongoing processes, until personal growth is achieved. The role of lecturers in learning is to help improving the mastery of soft skills. Lecturers should be sensitive to changes in soft skills of learning subjects. This result is also according to [**13**] who conveys that science learning integrated into ethnoscience can increase student interest and achievement.

The students' values of conservation character and behavior are also analyzed in every aspect. The achievement analysis result in each aspect of values of conservation character and behavior is presented in Table 6.

Table 6. The result analysis of aspects of students' conservation character and behavior (n = 30, maximum score = 20, minimum score = 5)

Rated aspect	Before learning		After learning	
	Value	Category	Value	Category
Environmental care	5,7	low	12,8	high
Love environment	8,2	medium	14,6	high
Creative	9,6	medium	13,2	high
Responsible	9,6	medium	15,8	high
Hard-working	6,6	low	14,4	high

Environmental awareness expresses general attitudes towards the quality of the environment embodied in the willingness of self to state actions that can improve and maintain the quality of the environment in any behavior related to the environment. In Table 6, it appears that the value of environmental care aspect as the conservation behavior aspect is in the low category before being implemented integrated ethnoscience learning, while the aspect of loving environment is in the medium category. This indicates that the internalization of conservation behavior cannot be formed by itself, but it must be given an advance understanding (explanation), made as a continuous obligation, until finally become a habituation [**14, 19, 21**]. After implementing integrated ethnoscience learning, both aspects of conservation behaviors are increased to be categorized high. This proves that the application of integrated ethnoscience learning makes the majority of students (84%) feel concerned about the surrounding environment, as many of the examples taught show how the relation of chemical concepts studied to local cultures is still widely maintained in society [**12, 21**].

In Table 6 it also appears that the three student character values (creative, responsible, hard-working) have improved from the medium and low categories at the time before learning becomes high after learning. This shows that when lecturers elaborate knowledge in class, it is at once given the character value of being creative, hard-working, and responsible. The creative indicator is shown by the way students solve the given problem, whether students complete by memorizing the given examples or they use different techniques but getting the appropriate results. The hard-working indicator is shown by the tireless attitude in completing tasks to obtain results that can be accounted for, willing to surf the

internet even though the place is less comfortable and takes a long time. The responsible indicator is demonstrated by acknowledging the mistakes made and not repeating the same mistakes, doing the tasks as instructed and reporting when they are done.

The conservation behavior of environmental care is a caring attitude toward the environment that is shown in the willingness to express actions that can improve and maintain the quality of environment in any behavior related to the environment. The results obtained in this study provide a picture that the character value and conservation behavior can be improved by applying integrated ethnoscience learning. But to note, the success of formation in students' conservation character and behavior cannot be evaluated immediately, it can only be seen in a long span of time. This is due to the character and behavior associated with the internalization of values and habituation that require a long process.

4. Conclution

The results of study and data analysis about the effort to increase the character value and conservation behavior of prospective teachers in attending integrated ethnoscience course, provide some information and findings formulated in the following conclusions:

First, the implementation of integrated ethnoscience learning is able to increase the students' value of conservation character. This learning makes students' willingness to ask increases. The courage of students in delivering papers seems more confident. Likewise, there is an increased willingness to respond to the issues being discussed either by lecturers or by students presenting the discussion material. In responding to questions from other friends, it is done clearly, objectively, scientifically in accordance with scientific procedures that have been understood.

Second, the implementation of integrated ethnoscience learning is able to improve students' conservation behavior, In the quality of providing answer, it is increased and can be shown in the use of relevance of reference book resources into reference material. The positive attitude of students' awareness of the environment has improved after the application of integrated ethnoscience learning model. Based on the research findings, the recommendation offered is that this model still needs to be developed further to test its effectiveness, it also needs to be socialized and disseminated among lecturers and students to improve the quality of learning.

Acknowledgement

Our thanks go to 1) Mathematics and Natural Science Faculty Universitas Negeri Semarang , which has provided funding for this research and 2) students who contribute to the completion of this research.

References

[1]. Rahayu, S. 2016. Mengembangkan Literasi Sains Anak Indonesia melalui Pembelajaran Berorientasi Nature of Science (NOS). Pidato Pengukuhan Jabatan Guru Besar Bidang Pendidikan IPA pada FMIPA disampaikan pada Sidang Terbuka Senat Universitas Negeri Malang tanggal 17 Maret 2016.

[2] Masrukhi. 2015. Mengembangkan Karakter Mahasiswa Berbasis Nilai Konservasi (Kasus Unnes Semarang). Tersedia: https://masrukhiunnes. wordpress. com/2015/ 01/26/ mengembangkan- karakter-mahasiswa-berbasis-nilai- konservasi-kasus-unnes-semarang/ diakses 20 Juli 2017

[3] Hjeresen, D.L., Schutt, D.L.;, Boese, J.M., 2000, Green chemistry and education. *J. Chem. Educ* 2000, 77, 1543–1544.

[4] Kurtines, W. M. 2002. *Morality, Moral Behavior, and Moral Development.* New York: John Wiley & Sons.

[5] Kipnis, M. & Hofstein, A. 2007. The Inquiry Laboratory As A Source for Development of Metacognitive Skills. International Journal of Science andMathematics Education, 6(3), 601-607.

[6] Aikenhead, G; Jegede, O.J. 1999. Cross-Cultural Science Education: A Cognitive Explanation of a Cultural Phenomenon. *Joumal of Research in Science Teaching, 36*, 269-287.
[7] Cobern,W.W & Loving,C.C. 2001. Defining "Science" in a Multicultural World: Implication for Science Education. *Science Education*. 85.
[8] Sudarmin. (2015). *Pendidikan Karakter, Etnosains dan Kearifan Lokal (Konsep dan Penerapannya dalam Penelitian dan Pembelajaran Sains).* Semarang: FMIPA UNNES.
[9] Gunstone, A. (ed.). (2014). *Developing Sustainable Education in Regional Australia*. Melbourne: Monash University Publishing. 216 + viii pp
[10] Sudarmin, Zaenuri Mastur, Parmin. (2017). *Pengetahuan Ilmiah Berbasis Budaya dan Kearifan Lokal di Karimunjawa untuk Menumbuhkan Soft Skills Konservasi*. Jurnal Pendidikan Sains Pascaarjana Unesa. 6 (2). 1362-1368.
[11] Suastra, I. W. (2006). Perspektif Kultural Pendidikan Sains: Belajar Sebagai Proses Inkulturasi, *Jurnal Pendidikan dan Pengajaran IKIP Negeri Singaraja,34(3) Juli 2006.*
[12] Suastra, I. W.; Tika, K.; Kariasa, N. (2011). Efektivitas Model Pembelajaran Sains Berbasis Budaya Lokal untuk Mengembangkan Kompetensi Dasar Sains dan Nilai Kearifan Lokal Di SMP. *Jurnal Penelitian dan Pengembangan. 5(3)*, 258-273.
[13] Shidiq, A. S., 2016. *Pembelajaran Sains Kimia Berbasis Etnosains untuk meningkatkan minat dan prestasi belajar siswa*. Prosiding Seminar Nasional Kimia dan Pendidikan Kimia VIII. FKIP UNS. 14 Mei 2016
[14] Abidinsyah. (2013). Internalisasi Nilai Peduli Lingkungan melalui Pembelajaran Berbasis Kearifan Lokal (Studi di SD Antasari Besar 7 Banjarmasin). Bandung. *Dissertation:* Universitas Pendidikan Indonesia.
[15] Woro Sumarni, Sudarmin, Wiyanto, Supartono. (2016). The Reconstruction of Society Indigenous Science into Scientific Knowledge in the Production Process of Palm Sugar. *Jurnal of Turkish Science Education*. 13(4): 281-292, Tersedia http://www.tused.org
[16] Elliot, J, (1993), *Action Research for education change,* Philadelphia
[17] Kreitner, R. & Kinicki, A. 2008. *Organizational Behavior*, 8th. Boston: McGraw-Hill Irwin.
[18] Sudarmin, Ria Febu K, M. Nuswowat, W.Sumarni, (2017). Development of Ethnoscience Approach in The Module Theme Substance Additives to Improve the Cognitive Learning Outcome and Student's entrepreneurship. *Journal of Physics: Conf. Series **824** (2017) 012024: tersedia:* The 3rd International Conference on Mathematics, Science and Education 2016
[19] George, J. (2001). *Culture and Science Education*: Developing Word. http://www. id21. org/education/e3jg1g2.html. Diakses tanggal 24 April 2017.
[20] Rahmawati, Sri Utami (2014) Meningkatkan Karakter Peduli Lingkungan Melalui Sekolah Berbudaya Lingkungan Hidup :Studi Deskriptif di SMP N 7 Bandung. *thesis,* Universitas Pendidikan Indonesia.
[21] Lickona,T. 2013. *Educating for Character, Mendidik Untuk Membentuk Karakter*, terjemahan Juma Abdu Wamaungo, Jakarta: Bumi Aksara.

.

woro IOP 2018 (2)

ORIGINALITY REPORT

14%	12%	7%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	mafiadoc.com Internet Source	6%
2	iopscience.iop.org Internet Source	2%
3	staff.uny.ac.id Internet Source	1%
4	china.iopscience.iop.org Internet Source	1%
5	Submitted to Universitas Negeri Semarang Student Paper	1%
6	link.springer.com Internet Source	1%
7	Submitted to Lambung Mangkurat University Student Paper	1%
8	Aryusmar, Muhartoyo. "Innovative Culture-Based English Learning Model for Non-English Faculty Students", Proceedings of the 2nd International Conference on Education and	1%

	Multimedia Technology - ICEMT 2018, 2018 Publication	
9	pertambangan.fst.uinjkt.ac.id Internet Source	1%
10	Małgorzata Dymnicka, Joanna Badach. "City and Urbanity in the Social Discourse", IOP Conference Series: Materials Science and Engineering, 2017 Publication	<1%
11	Submitted to University of Wollongong Student Paper	<1%
12	D R Sari, Hardeli, Bayharti. "Development of Chemistry Triangle Oriented Module on Topic of Reaction Rate for Senior High School Level Grade XI Chemistry Learning.", IOP Conference Series: Materials Science and Engineering, 2018 Publication	<1%

Exclude quotes	On	Exclude matches	< 15 words
Exclude bibliography	On		