

Lesson study towards pro-environmental

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Lesson study towards pro-environmental behavior In environmental chemistry subject

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Abstract

This research is applying lesson study in chemical education of muhammadiyah University of Semarang, the purpose of this research is to improve the quality of environmental chemistry learning to support the achievement of chemistry education vision in the field of environment: inspiring Chemical Educator: professional qualified, characteristic, entrepreneurship based, International, in synergy with nature to build civil society. This research uses 12 students of chemistry education and involves 1 lecture model. The research process is done in 4 stages: briefing, lecturer model explanation in one direction and last stage observation of lecturer teaching according to observer specification and end with deep reflection between model lecturer and observer. Lesson study results: the number of students in the discussion was adjusted to the severity of the discussion material, the student's emphasis on learning during the learning process that served as the "cognitive imprint", the discussion was made 1 topic discussed by several groups so that there were comparison one group and other groups, reconstruction of lesson design. Lesson study is an evidence-based approach to teaching improvement. In the best cases, teachers get important insights into how their students learn the lesson, where they get stuck, what changes take place, and how they interpret ideas

Key Words: *Lesson Study, pro-environmental, behavior, chemistry*

INTRODUCTION:

Modern society places a high value on economic prosperity. Individuals present at this time will be exposed to cultural values that emphasize the acquisition of wealth and property. But there is a negative impact on environmental damage caused by high levels of consumerism (Jackson, 2009). The higher natural damage due to exploitation on behalf of economic progress will have a negative impact on human life, this is because the quality of our living environment decreases. Therefore there must be a way to prevent our environment from getting damaged.

Education is one of the effective means to put the knowledge and attitude of the man in behave to his environment. One of the educational institutions that exist one of them is the university chemical education muhammadiyah Semarang. In order to achieve these goals, the study program has a vision. The vision of Chemistry education department in University of Muhammadiyah Semarang (Unimus) is an inspiring Chemical Educator: professional-qualified, character-driven, entrepreneurial-based, research-driven and international-oriented, in synergy with nature to build civil society.

The Chemistry Education Study Program profiles are Chemical Educator, Environmental Educator, Young Researcher, Chemical Entrepreneurship. This is the basis,

the courses related to the profile in such, such as Introduction to Environment, Environmental Science. We want our graduates to be competent in implementing pro-environment attitudes and applying them significantly to life in society.

Behavioural interventions are generally more effective when they are systematically planned, implemented and evaluated. Four key issues to be addressed are: (1) identification of the behaviour to be changed, (2) examination of the main factors underlying this behaviour, (3) application of interventions to change the relevant behaviours and their determinants, and (4) evaluation of intervention effects on the behaviour itself, its main determinants, environmental quality, and human quality of life (Linda Steg & Charles Vlek, 2009)

A person's attitude towards pro-environmental behavior can be a good predictor of such behavior (Staats H., 2003). Attitudes are relatively easy to change and can alter with new information or circumstances (Ajzen, 2005). But attitudes tend to be measured with respect to a specific target object or event and are therefore relatively narrow. An attitude towards one behavior may not necessarily be related to another behavior.

Some examples of pro-environment attitudes that exist in our society are numerous, but not all have a pro-environment character. Environmental behavior broadly as all types of behavior that change the availability of materials or energy from the environment or alter the structure and dynamics of ecosystems or the biosphere (cf. Stern, 2000). Changing purchasing behavior generally has greater environmental benefit than reusing or recycling available products (cf. Gardner & Stern, 2002).

Based on our reflection, include "What has the students learned from the learning process?", "What is the value that students get when the process is in progress?" And "What will the next student do (implementation)?" The results are not significant. It is possible that the achievement of competence in the learning process has not been achieved, which may be the ability of the lecturer in the learning process (method) is not effective. Related to these conditions, then, of course, needed an intensive and planned improvement for comprehensive improvement associated with the input to be generated. Efforts to be made is improving learning through open lesson activities with the concept of lesson study.

The open lesson is one form of information disclosure during the learning process and aims to dig the data to be submitted by the observer used for reflection. One answer is lesson study, as Hiebert et al. (2002) suggest. Lesson study is a teaching improvement and knowledge building process that has origins in Japanese elementary education. In Japanese lesson study teachers work in small teams to plan, teach, observe, analyze, and refine individual class lessons, called research lessons. In a survey of 125 active lesson study practitioners in Japan, 98% reported that lesson study helped them improve their teaching

and 91% believe that lesson study is the most effective form of professional development (Murata & Takahashi, 2002).

Lewis (2005) suggests that lesson study creates multiple “pathways for learning” that lead to instructional improvement. According to her model, teachers’ thinking and practice may improve in multiple ways as a result of, 1. increased knowledge of subject matter, 2. increased knowledge of instruction, 3. increased ability to observe students, 4. stronger collegial networks, 5. stronger connection of daily practice to longterm goals, 6. stronger motivation and sense of efficacy, and 7. improved quality of available lesson plans (p.115)

Efforts to apply lesson study to the Chemistry Education Study Program will be focused on improving the quality of learning in environmental chemistry courses. The hope of this research will be obtained a paradigm of learning that can be used in improving the quality of teaching.

METHODS

Twelve chemistry student teachers were purposely selected for this qualitative descriptive study. The application of Lesson Study is done on the Environmental chemistry eye by involving several observers. The research process includes 4 stages: briefing, lecturer model explanation in one direction and last stage of observation of lecturer teaching according to observer specification and end with deep reflection between model lecturer and observer. The findings were gathered through document analysis of teaching preparation books, interviews, and reflective writing journals. Subsequently, the data were analyzed using content analysis techniques. In addition, the results of this study are compared with related literature.

FINDING AND DISCUSSION

Through mentoring lesson study activities, a teacher can evaluate the learning process thoroughly, so that his expectations can improve the learning process becomes more effective. As Asep supriyatna (2017) says, "teaching is not to be tired". By Karen it is very relevant to the current conditions, with the number of students that many can have implications on the energy spent during the learning process. Therefore it is necessary to improve the learning process to be effective and efficient. Lesson study is one of the models used. The results of the observation of the lesson study lessons learned during learning "processing plastic waste based on pro-environmental principles" include content, concept and pedagogic.

In addition, the reflection of lecturers after the learning process as follows:

"The apperception given to the students has been adjusted to our daily life. Next, to the discussion I gave 3 topics and asked questions for discussion and answer questions, during the discussion process students interested and active discussion, but there are some students who just become "followers" during the discussion process. The discussion plan is too long and almost 50% of the lesson time is just discussion and the essence of the concept of the problem is very little. Therefore the remaining time of concepts such as plastic types, biodegradable plastic, oil refining aided explanation using video. I feel students are interested in the concept of explanation using video. In the final stages of learning, students are given project assignments to apply pro-environment concepts, but it seems the students are not interested and are feeling heavy. In addition, interest in learning lesson learning process is only flat, lack of enthusiasm. When asked before closing, a child scrambles a notepad, indicating that the student does not record the material lectured by the lecturer".

The reflection provides the basis for reflection along with the observer team at the Open lesson reflection session on the lesson study. This is similar to that delivered by some experts, Reflection is an important factor in cooperation or collaboration among teachers. "Reflective partnerships between teachers are particularly effective. Peer mentoring partnerships will support individual teachers in reflecting on and describing their practice. As a result of these focused discussions, a teacher is able to improve practice and be able to take steps to improve practice "(Rose, 2007, p.1).

Aspects emphasized during the reflection process exist, The aspects that are emphasized during the reflection process are in the pedagogical content knowledge of science component. Magnusson et al., (1999) explains that there are five key components of pedagogical content knowledge of science, namely (a) orientation to the science teaching, (b) knowledge of the science curriculum, (c) knowledge of students' understanding of specific science topics, (d) knowledge of assessment in science and (e) knowledge of science teaching strategies for science teaching. For Loughran et al., (2006), Henze et al., (2008), Drechsler and Van Driel (2008) mastery towards pedagogical content knowledge of science can help teachers present effective and meaningful teaching and learning process to students. The process of improvement, in the context of the lesson study, is not meant for the teacher's judgment, but to record and inventory some shortcomings or weaknesses during the learning process and reconstruction to be repaired.

Many educational researchers agree that the practice of reflection is one of the most critical components in a teaching program (Zippay, 2010; Pollard et al., 1997; Howard, 2004; Zeichner and Liston, 1996).

A teacher who has done direct learning in the classroom, it is important to reflect, this is in line with this statement.

"the most powerful, durable and effective agents of educational change are not the policy makers, the curriculum developers or even the education authorities themselves; they are the teachers"(Sellars, 2012)

This is similar to:

John Dewey (1933) argued that learning from experience is enriched by reflecting on the experience and Donald A. Schön (1987) theorized that reflective practice represents an important factor to improve professional activity. Jack Mezirow, (1991, 2000) gives reflection a central role in learning because through it we become aware of the ways in which we interpret reality and give meaning to actions and behavior"

Reflection is defined and interpreted by different academics and experts differently, they all accept that it is a practice and learning (Cole, 1997; Freese, 1999). Without reflection, length of experience does not automatically give insight and wisdom and thus, one can run the risk of relying on routinized teaching and not developing (Reiman, 1999; Hopkins, 1999). Besides the process of learning, sometimes we make mistakes, it is not a disgrace. Osterman (1990) indicates that 'Problems become, not dirty linen to be kept from the public's view, but the opportunity for dialogue, learning and change' (p. 140).

Improvement of the various mistakes made during the learning process can be used as a discussion material and found the solution. Of course with the various problems can be used discussion materials to improve the learning process. Dewey (1933) states that growth comes from a 'reconstruction of experience' (p. 87). Therefore, experiential learning theory holds the idea that learning is dependent on the integration of experience with reflection. It puts reflection at the center of the learning process. Based on this theory, it can be argued that by reflecting on their own experience, teachers as learners can construct their own educational perspectives and gain new insights from that experience and develop new strategies to use in subsequent teaching (Kolb, 1984; Boud et al, 1985; Osterman, 1990; Reiman, 1999).

Some other studies that reflection is a good method for improving the learning process (Fatemipour, 2013). It also can make "Individuals can show readiness for learning throughout their career" (Rădulescu, 2013). In the process of reflection, teachers should involve the ability to think critically in pouring reflection in the journal. Clarke (2008) states that effective teaching will only be produced by carrying out a critical reflection on teaching goals, teaching methods, and students' ability levels.

¹ A common misconception about lesson study is that the study is intended to determine the lesson's effectiveness (e.g., whether students learn what they are supposed to learn and achieve the lesson's goals) (William Cerbin and Bryan Kopp, 2006) Of course this is an important question and one that most teachers want to answer. However, the primary focus of lesson study is not what students learn, but rather how students learn from the lesson. To investigate how students learn, teams focus on student thinking during the lesson, how they make sense of the material, what kinds of difficulties they have, how they

answer questions, how their thinking changes during the lesson and so forth. This is different from efforts to determine a lesson's effectiveness that might use pre- and post lesson evaluation of student learning or comparisons between the performance of students in the research lesson with a suitable comparison group (e.g., students taught the material in a different lesson). Instead of observing how the teacher teaches, as in typical classroom observations, observers focus on how students respond to the lesson, which was designed by the team rather than by the person who happens to be teaching.

Formulating Learning Goals

Students can differentiate the types of plastic, Students can apply Principle 6R, Students are able to identify the raw materials of biodegradable plastic manufacture and Students are able to explain the principle of refining plastic waste into oil.

Designing the Research Lesson

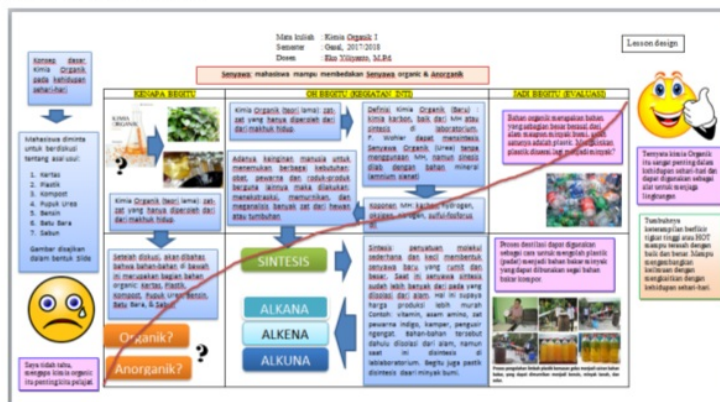


Fig. 1 Lesson Design

Designing the Study

The team develops a plan to investigate how students learn from the lesson. The plan specifies the type of evidence the team will collect and how observers will observe and record data during the lesson. Planning the study coincides with planning the lesson. As teams design the lesson they discuss what types of data they will collect evidence of student learning and thinking.

Teaching and Observing the Research Lesson

Here are the findings presented by the observer during the learning process of environmental chemistry.

Table. 1. Post-learning joint reflection


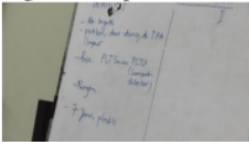
Content	Concept	Pedagogic
Garbage in the landfill	The concept of "biogas" is considered a student can be made from plastic waste	Group discussion organizations repeat themselves because the material is discussed only for each group
	Plankton can decompose waste	The emphasis on writing as a "cognitive imprint" of students
		
		Concentration of student's attention during the learning process
		Discussion is not done using a comparison
6R Concept (Rethink, Repair, Replace, Reuse, Reduce, and Recycle (6R))	The concept has not been received optimally: The existence of the seizure of notes when asked questions	there is no desire to write books as "cognitive imprints" of students
Plastic Type 7 Type (PETE, HDPE, PVC, LDPE, PP, PS, OTHERS)		
Biodegradable Plastics		At the time of viewing the student, the video must be accompanied by "orders" so that students are more focused in the learning process.
Plastics distillation becomes short chain hydrocarbons/fuel.	The concept of solving polymers in plastic distillation has not been delivered.	
	Concepts are delivered a bit	
Lesson Study Expert Notes: Lecturers need to reconstruct Lesson design in environmental chemistry courses		

Fig.2 Discussion

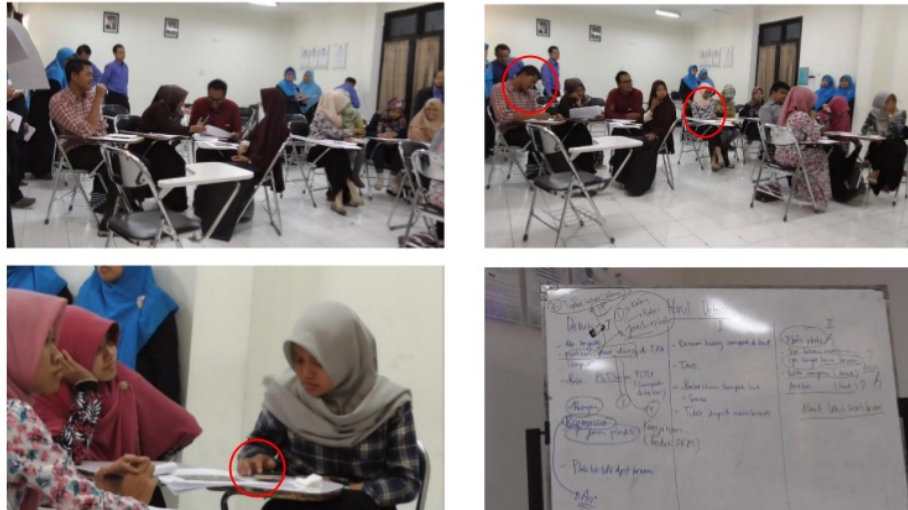


Fig.3 Evidence of observation by observer

Analyzing the Evidence

Based on the results of the analysis based on the video recording of the learning process and observer then there are some notes that can be used to improve the learning process.

- The essence of the number of students each group in the discussion, suggestion: the number of students in the discussion tailored to the severity of the discussion material
- There are students who do not record during the learning process that serves as a "cognitive imprint".
- Discussions do not arouse the atmosphere of the competition to express an opinion, therefore the discussion mechanism is suggested: discussion is made on 1 topic discussed by several groups so there are comparison one group and other groups.
- Discussed capital is not yet complete, students are invited to a hard discussion. Suggestion: students are given and prepared with sufficient capital, so that can be the in-depth discussion.
- Lesson design was redesigned to 1) Discussion 1 picture of landfill (TPA) 2) Provided 7 types of waste plastic, dental identification: plastic type, abbreviation, chemical formula, and plastic pl 3) Recognition of plastic waste management (6R)

4) Explanation of the principle of biodegradable plastic 5) Explanation of Waste Power Generation 6) Distillation of plastic based on the chemical formula of various types of plastic.

Those are some of the things that become inputs and become materials that can be followed up with a reorder lesson design. Teams try to design activities that will externalize student thinking, making it open to observation and analysis. We suspect that making student thinking visible affects the types of exercises and activities teachers incorporate in the lesson. It is challenging to design ways to make student thinking visible that are also pedagogically purposeful.

Repeating the Process

At this stage there is no repetition process, this will be repeated in the semester that will come on the same subject.

Documenting the Lesson Study

The lesson documentation includes: (a) the learning goals, (b) the lesson plan, (c) a rationale for the lesson topic and lesson design, and (d) supplementary materials such as student handouts, video clips of the lesson and instructors' notes. The study documentation includes: (a) the student learning goals, challenges, problems, and issues investigated; (b) a description of the types of data collected and the method used to study the lesson; (c) an explanation of data analysis and summary of findings; (d) conclusions about the lesson, especially with respect to student learning goals but also about the methods used to study it; and (e) supplementary material such as data collection instruments, checklists, rubrics and observation guidelines so that interested instructors could replicate the study. Lesson study is an evidence-based approach to teaching improvement. In the best cases, teachers get important insights into how their students learn the lesson, where they get stuck, what changes take place, and how they interpret ideas.

CONCLUSION AND SUGGESTION

The final result of this research can be concluded that: 1) lesson study make the teacher learn that environmental chemistry study needs improvement both content, concept and pedagogic 2) Lesson study is an evidence-based approach to teaching improvement. 3) lesson study towards pro-environmental behavior in the study of environmental chemistry.

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