

# Relevance of Improvement of Items Domination with Students Character Values Through Chemical Environmental Lecturing Base on Problems

*by M. Nuuswowati*

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# Relevance of Improvement of Items Domination with Students Character Values Through Chemical Environmental Lecturing Base on Problems

M Nuswowati

*Chemistry Departement of Mathematic and Science Faculty, Semarang State University*

E-mail: nuswowati@gmail.com

**Abstract.** This research is aim to improve student character values and items domination through environmental chemical lecturing base on problems. Our nation character values also include with taking care of environmental continuity which have seen progressively be worried. Require to be conducted an efforts to increase the character values through formal activity and also non formal. This research is conducted to student of program study of chemical education in a public campus in Semarang city who taking environmental chemical class at even semester. Experiment class (23 student) and for control class (23 student). Research result of experiment class show N-gain items domination is 40% (middle) and control class is 33% (middle), while N-gain character values for experiment class is 33% (middle) and control class is 22% (low). Result of correlation Product Moment analysis for the experiment class ( $n = 23$ ) showing value  $r = 0,814$  with value significant is 0,052 more than  $5\% = 0.05$ , hence told improvement of items domination and character values not significant. Improvement of character values require to be conducted continually with various strategy according to item subject and student needs.

## 1. Introduction

The universe is as a whole that can be separated into chemistry, physics and biology, but universe itself does not recognize this separation. The separation is merely to facilitate our understanding of events in nature [1]. Collage subject of environmental chemistry discusses environmental chemistry and its role, pollution of soil, air and water, the effect and how to cope, waste water treatment, additives in food and pesticides [2], as an optional course in the 6th semester, Environmental Chemistry became one of the subjects that must be taken for students majoring in chemistry Unnes. Each material consists of several chapters to be discussed one by one and as far as possible be applied in everyday life [3], as the reason that environmental education is also one important factor in achieving success in environmental management, a means which is very important in generating human resources to carry out the principles of sustainable development.

The continuation development principle of education in Indonesia needs to be supported with character education. Today, the character education has become a trend and an important issue in our education system. Efforts to revive the (reinventing) character education is certainly is not making it up, but it is the mandate outlined in Act No. 20 of 2003 on National Education System in Article 3, which states that *national education serves to develop the capabilities and forming character and civilization of dignity in the context of the intellectual life of the nation*. Character education goals referred currently perceived still inadequate. It is possible to integrate the principle that effective character education. If these issues raised in the study of learning chemistry would be very interesting and meaningful to learners, because the benefits are felt directly. Learning aimed at solving actual problems it was designed through a problem-based approach or PBL (problem based learning) [4]. Teaching strategies with the manufacture of paper every teaching materials with examples of enrichment material base learning dominated problems increase the likelihood of students see the reality what is done, so that students feel kontens and context [5]. The advantages of PBL, designed especially to help students

develop thinking, problem solving skills, intellectual skills: study the role of adults with experience through a variety of simulated situations; and independent learners and autonomous [6]. So the study was designed to develop a chemistry lecture-based environmental problems that can increase the values of character and mastery of the material.

## 2. Method

This research is a study of learning innovation with non-equivalent design (pretest and posttest) Control Group Design Nonequivalent Control Group Design [7]. At this design the experimental group and the control group was not chosen at random. The study was conducted at the Department of Chemistry, State UNNES education. Subjects were students of the second semester of chemistry department of education who signed the environmental chemistry courses. In this study were taken two classes of class E (23 students) for experiments, while the K classes (23 students) for control.

This study, both groups of experimental and control groups were compared, although the group is selected and placed without via random. Two groups that exist given the pretest, then given treatment, and given postes in the last, can be seen in Table 1.

**Table 1.** Non –equivalent (Pretes & Postest) Control Group Design in testing the effectiveness of lectures.

Groups	Pretest	Treatment	Postest
Experiment	O	—————	O
Control	O	X1 <sup>a</sup> X2 <sup>b</sup>	O

<sup>a</sup> Applying a Model Class Environmental Chemistry with problem-based learning approach. <sup>b</sup> Applying Environmental Chemistry Class model used to date.

Types of instrument that would be used to collect the data in the research plan can be seen in Table 2.

**Table 2.** Types of instruments needed to be prepared in research

Types of instrument	Description
Student character marker test	This test is used to measure the character of students, which includes the elaboration of indicators reason thought, attitude and action. This test is given in the pre-test and post-test.
Masteriy of subject test	Multiple choice test and a subjective or essay of materials / environmental chemicals associated with environmental problems.
Student questionnaire	This test is given in the pre-test and post-test
Student observation sheet	Getting the student responses to the environmental chemistry lectures development Guidelines for the implementation of the observations of students in lectures

The data analysis was conducted simultaneously between quantitative and qualitative data Creswell (2008) [8] called triangulation mix-design method. Processing of quantitative data in this study were analyzed by Normalized-gain (N-gain). Whereas the qualitative data were analyzed using a generalized description of the research results.

### 3. Result and explanation

#### 3.1. Characteristic of Environmental Chemistry lectures based problem

Environmental chemistry lectures designed to develop creative thinking skills students use the strategy of the stages of problem-based learning approach. Lectures orientation designed with environmental issues, the formation of the group, the investigation group. Lectures designed to combine problem solving that has been done by the government or previous investigators, searched their advantages and disadvantages. The environmental chemistry course consists of four topics, they are air chemistry, air pollution and how to overcome them; soil, polluting the land and how to cope; water, water pollution and how to cope as well as chemical and public health.

The steps done in this lecturing activity is environmental chemistry lectures to enhance the character values of students in participating resolve environmental problems particularly related to the chemical through problem-based learning approach to enhance the character values. Characteristics of environmental chemistry lectures with problem-based models are:

- a. Syntax-Based Environmental Chemistry Class Issues to improve the character values include Introduction, Planning, Investigation, Confirmation and Evaluation.
- b. Problem-based learning model in enhancing the value of character concerned with the stages of the course with an open-ended problems.
- c. Class centered on students by providing the widest possible opportunity to students to be involved actively in lectures and open-ended problems.
- d. Class begins with the presentation of environmental contaminants issues were resolved to the stages of problem based learning through group investigation conducted in the classroom, in the laboratory and in the field when perkuliaahan or outside the lecture schedule.
- e. The evaluation was performed to assess the increase in value- character and mastery of subject matter the student in writing.

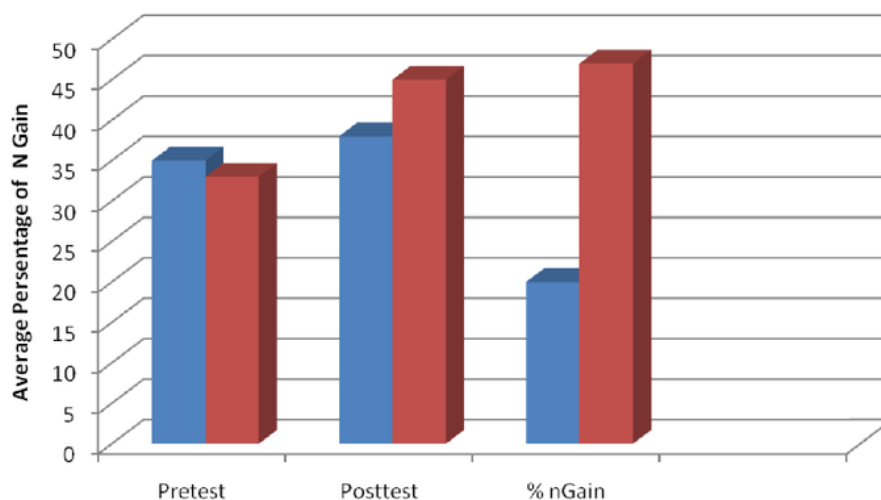
**Table 3.** Syntax Class with PBL Model to Improve Student Character Values

Study steps	Description
Introduction	<ol style="list-style-type: none"> <li>1. Lecturer conduct orientation problems to be solved by each group either in theory, open-ended problems and, investigative groups, discussions and ideas in order to trigger certain actions in participating in problem solving</li> </ol>
Planning	<ol style="list-style-type: none"> <li>2. Form a group, in a class made 6 groups. Each group determines the problems (open ended question) for each topic.</li> </ol>
	<ol style="list-style-type: none"> <li>3. Students act quickly determine the essential problem, identify problems in lapangan especially in the neighborhood we all, classifying the issues, reviewing the information, literature, tools and materials needed to resolve the problem, also did the division of tasks within the group.</li> </ol>
Investigation	<ol style="list-style-type: none"> <li>4. Response, the advantages and disadvantages settlement of problems that have been taken by the government / previous researchers</li> </ol>
	<ol style="list-style-type: none"> <li>5. Bring up the idea of settlement problems of environmental problems</li> </ol>
	<ol style="list-style-type: none"> <li>6. Students do a group discussion to draft action</li> </ol>
	<ol style="list-style-type: none"> <li>7. Perform the actions in solving environmental problems</li> </ol>
	<ol style="list-style-type: none"> <li>8. To discuss the problem-solving action</li> </ol>
	<ol style="list-style-type: none"> <li>9. Write down the results of the discussions associated with the study of theory</li> </ol>
	<ol style="list-style-type: none"> <li>10. Prepare the presentation materials</li> </ol>
Confirmation	<ol style="list-style-type: none"> <li>11. Lecturer facilitate ongoing class discussion</li> </ol>
	<ol style="list-style-type: none"> <li>12. Students present the results of the study of theory and action ideas</li> </ol>
	<ol style="list-style-type: none"> <li>13. Students of other groups asking questions, comments and suggestions to clarify their understanding</li> </ol>
	<ol style="list-style-type: none"> <li>14. Lecturer ask a few questions to direct the implementation of the presentation and give strengthening their understanding</li> </ol>
	<ol style="list-style-type: none"> <li>15. Lecturer urges mindfully, each individual act upon the idea of the group even more benefits</li> </ol>
Evaluation	<ol style="list-style-type: none"> <li>16. Students do a group discussion to improve the results of the study of theory and classroom discussion results</li> </ol>
	<ol style="list-style-type: none"> <li>17. Students create individual reports</li> </ol>
	<ol style="list-style-type: none"> <li>18. Lecturers assess mastery of subject matter and increase the values of the characters.</li> </ol>

### 3.2. Increasing character values

Character values marker revealed from character values response tests. The test consists of 14 questions, the scoring criteria is 1 to 4, a minimum of 14, maximum value is 56, so the average pretest marker character for the experimental and control classes are 35.00 and 36.04, before the lecturing activity in experimental or control class the character are categorized *began to emerge character*. It is based on grouping: Total score 14-24 = The values of character has not yet appeared; 25- 35 = values of character began to emerge; 32-45 = The values of the characters have already appeared; 46-56 = values are very good character. Post-tests were performed after application of the model as usual for control classes and lecture-based experimental class problem to get the average values of 40.04 and 45.04 characters, all belongs to the category of values and character has appeared and for the experimental class almost categorized as very good.

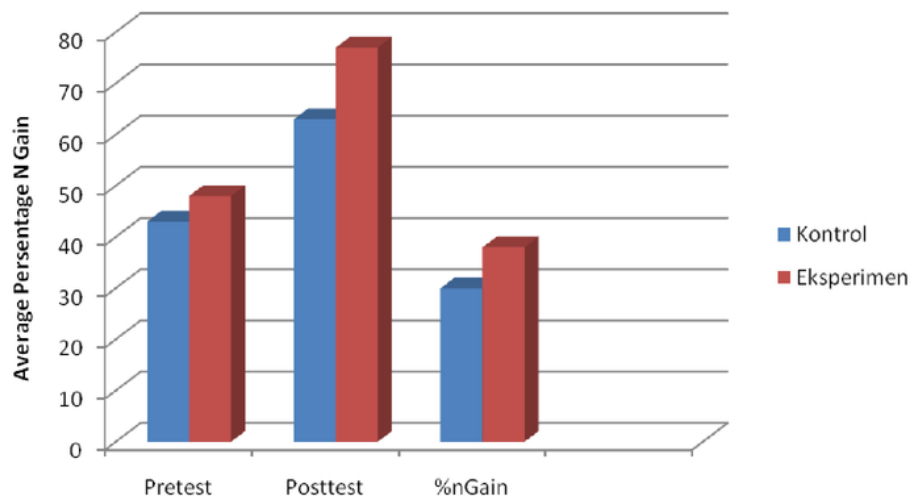
Through a written test marker character values, either experimental or control class class has increased. Pre-test mean score marker values character control class is 36.04, while his post-test 40.04, so we get its N-gain 22.00% is low. As for the experimental group mean scores of pre-test and posttest marker Nili character values are 35.00 and 45.04 to obtain its N-gain 48.00% were moderate. The results showed the application of the Class-Based Environmental Chemistry Problems can enhance the character values in the students behave in participating solve environmental problems. Figure 1 shows an increase in markers of character values or experimental class students who take the classes with pembelajaran based green chemistry problems better vision (N-gain = 48%) than the control class students (N-gain = 22%). This is due to the students in the class ekseperimen actively involved in the lectures and expressing ideas to participate resolve the existing problems, especially related to environmental pollutants. Granting openended problem also demands to use the data to draw conclusions (Cooper et al., 2008). Open-ended problem is an activity that can encourage and challenge students to determine the essential environmental issues of interest to be able to resolve the issue. This is in line with the opinion of Lickona of the components of this character when combined as a single continuous dynamics of the formation of morality is in the child's moral development. Santrock (2008, p. 316) [9].



**Figure 1.** The enhancement of students' character values in the control and experimental class

### 3.3. The Increasing mastery of subject matter

Mastery of subject matter value taken from the results of tests mastery of subject matter all lectures topics chemistry chemical environment consisting of air, air pollution and how to overcome them; soil chemistry, soil contamination and how to overcome them; water chemistry, water pollution and how to overcome them; chemical problems for public health. Multiple-choice test consisting of 20 questions with the results as in Figure 2.



**Figure 1.** The enhancement of students' character values in the control and experimental class

Pre -test mean score mastery of subject matter the control class is 50.33, while his post-test 64.57, to obtain N-gain its 33% were moderate. As for the experimental group mean scores of pre-test

and posttest mastery of subject matter is 55, 33 and 77.28 to obtain its N-gain 40.00% were moderate.

Increasing the value of mastery of control classes including medium category (N-gain = 33%). The experimental class the increase in value also includes the medium category (Ngain = 40%). Piaget explained that the development of cognitive structure is influenced by the interaction of learners with learning and social environment [10]. Vigotsky also argued that the learning activities and the development of a person's intelligence is influenced by the interaction with other people and the social environment [11]. Environmental support and adequate facilities for the group investigation activities, field studies, literature studies, discussions, consultations, presentations, evaluation will give better results. Therefore, it is necessary to arrange models that facilitate problem-based lectures as possible, ranging from the identification of the problem, determine the source of the problem, learn to consider the settlement of the existing problems, improve problem solving continuously.

### 3.4. Relevance of Character with concept mastery enhancement

Product Moment Correlation analysis results for the class of experiments demonstrating the value of  $r = 0,814$  with significant value is  $0,052$  more than  $5\% = 0.05$ , so, it shows that there's no significant relationship between character values and mastery of environmental chemistry concept enhancement. Calculations can be seen in Table 4.

**Table 4.** The relationship between character and mastery of concept matter enhancement

<i>Correlations</i> Mastery of subject matter enhancement		Character enhancement
Concept mastery enhancement		0.052
	Pearson Correlation	0.814
	Sig. (2-tailed)	0.052
Character enhancement	N	23
	Pearson Correlation	0.814
	Sig. (2-tailed)	0.052
	N	23

Result of correlation analysis shows that students who have a good concept mastery values do not necessarily have the marker values of good character as well.

### 3.5. Student response to the implementation of Chemical environment lecturing based problem

The response of students to lectures conducted in the study were collected using a closed questionnaire that used to express the students consent of the statements contained in the questionnaire. Collecting student feedback is also done through open questionnaire to complete the data obtained from the closed questionnaire. Statement in the questionnaire grouped into two aspects, they are: I) a statement about the lecture component of environmental chemistry; II) A statement of the stages of the environmental chemistry lecture-based problem; III). Statement of sustainability-based environmental chemistry lectures problems; and IV) a statement about the feelings of students in working on those items in the student worksheets. Tabulation of data from filling the questionnaire distributed to students can be presented in Table 5. In the questionnaire was also provided public statement that can accommodate



suggestions on the implementation of the presentation of the group in particular and improve the implementation of problembased learning in enhancing the value of character in the future.

**Table 5.** Recapitulation of Student Response to the Chemical environment lecturing based problem

No	Question description	Recapitulation of student response			
		Very Interested	Interesting enough	Less Interesting	Not interesting
Ia	How is your opinion on the Following components?				
	1. Chemical environment topic	10 <sup>4</sup>	13	0	0
	2. Chemical environment lecturing based problem	14	9	0	0
	3. Student guidance	12	11	0	0
	4. Student worksheets	12	11	0	0
	5. Learning environment	11	10	2	0
	6. Lecture teaching method	15 <sup>1</sup>	8	0	0
Ib	Do you identify new things in the following components?	Novelty enough	Novelty enough	Less enough	Unnovelty
	1. Chemical environment topic	4	13	3	3
	2. Chemical environment lecturing based problem	14	9	0	0
	3. Student guidance	16	7	0 <sup>9</sup>	0
	4. Student worksheets	17	6	0	0
	5. Learning environment	16	7	0	0
	6. Lecture teaching method	20	3	0	0
Ic	Ease understood the following components?	Very Easy	Easy enough	Less Easy	Not Easy
	1. The language of chemical environment topic	13	10	0	0
	2. The language in the learning tools	12	10	1	0
	3. Chemical environment topic	6	16	1	0
	4. Chemical environment lecturing model	9	12	2	0
	5. Student worksheet	8	15	0	0
	6. Student guidance	8	12	3	0
	7. Lecture teaching method	10	11 <sup>3</sup>	2	0
II	The use of problem-based lectures	Very agree	Agree	Less agree	Not agree
	1. How do you respond if the subject Of further use problem-based Learning	14	9	0	0

2. How would you respond if all subjects are taught with a problem based approach

Very Interested	9	11	3	0
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**Table 5.** Recapitulation of Student Response to the Chemical environment lecturing based problem (cont.)

No	Question description	Recapitulation of student response			
		Very Interested	Interesting enough	Less Interesting	Not interesting
3	What would you say if other Subjects are taught with a problem-based approach	5	7	9	6
III	Question description	Very clear	clear	Not clear enough	Unclear
1	How does the lecture explanation when the PBL on going	17	6	0	0
2	How does the lecture guidance from your investigation activity to the ready-presented paper preparation	16	7	0	0
3	How does the lecture guidance when you doing the presentation	10	13	0	0
IV	Do you feel happy in answering the items on student worksheets	Very happy	Happy	Not happy enough	Unhappy
		12	6	11	0

Almost all the students gave a positive response to the chemical components of the course in the implementation of the existing environment problem-based learning model. Of interest, novelty and ease, then in terms of material, model, student guidance, student worksheets, the learning environment and the way professors teach in environmental chemistry lectures almost all responded very interested, interested, very new, quite new, very simple and quite easy. From the 23 students, only three students who answered less new (less novelty) material, and 3 students answer is not new (unnovelty). One student replied that the language in the lectures is less easy to understand, one student stated that the chemical material is less easy to understand environment. There are two students who claimed the model of problem-based lectures are less easy to understand, three students expressed guide students in doing tasks, especially investigative group is less easily understood. 2 student also stating how the lecture teach less easily understood.

## 4. Conclusions and suggestions

### 4.1. Conclusions

Based on the research and discussion that has been raised, it can be concluded as follows:

- a. Lecturing model of chemical environment based problem that has been developed has the following characteristics: Syntax lectures include Introduction, Planning, Investigation, Confirmation, and Evaluation, which also integrates learning activities with the investigative group, open ended problem, centered on students, as well as the idea of action to solve the problem is done in groups. Lecturing model of chemical environment based problem can increase the character of students insolving environmental problems.
- b. Lecturing model of chemical environment based problem can increase the concept mastery, but there's no a significant relevance with the character enhancement.
- c. The implementation of chemical environment based problem lecturing get a positive response from students. The positive response was also reflected a positive attitude when students attend the lecture, which was shown among other tasks, the group investigation, mostly hard work, responsibility, enthusiasm, perseverance, discipline, teamwork, respect the opinions of others, critical, and creative.
- d. The problem faced in this research is the facility equipment and materials must be taken when investigating problems in the field. As the chemical study program, then the selection of the environmental problem is related contaminants. We can overcome the problem must be passed: the identification of the problem, looking for the source of the problem, consider the settlement of the problem by the government / previous researchers, communicating ideas and evaluation.

### 4.2. Suggestions

Based on the implementation of chemical environment based problem lecturing in a public campus in Semarang suggested as follows:

- a. Model with open-ended problems can be developed further in other subjects, but not all are suitable for development.
- b. Study program of chemistry education should not only equip students with the content knowledge and pedagogical abilities, but also equips students with high-level thinking skills and a number of other skills.

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