

# IMPLEMENTATION OF CHEMO-ENTREPRENEURSHIP TEACHING APPROACH FOR IMPROVING STUDENTS' LIFE SKILLS

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**Abstract: The Implementation of Chemo-entrepreneurship (CEP) Teaching Approach in Improving Students' Life Skills** The study aimed at developing an innovative teaching method. Chemo-entrepreneurship (CEP) approach is a method in Chemistry teaching which relates the theory with everyday objects. This method provides the knowledge as well as the skills of Chemistry in order to transform raw materials into valuable products. The focus of the study was the improvement of students' achievement and the development of students' life skills. The subjects of the study were 39 students from the Chemistry Education Department of Universitas Negeri Semarang (UNNES). The data were obtained from the observation of the subjects, which were finally analyzed descriptively. The results of the study showed that the CEP teaching method was successfully implemented, and the students got better achievement. The study also revealed that the means of students' life skills were also improved. Students' achievement of learning was increased. Students' average life skill score was also improved.

**Keywords:** life skill, Chemo-entrepreneurship (CEP) Teaching Approach, Organic Chemistry.

The attempts made for improving education quality in Indonesia has been conducted by changing the paradigm of management in the education area, in which lecturers are expected to implement a teaching model with a characteristic of student centered learning and utilize various methods of instruction. The role of the teachers/ lecturers in the teaching and learning process is not only providing information, but also directing and facilitating the learning. To achieve an approach condition of teaching and learning process, it is important to determine the right strategy, optimal use of media, and excellent design of instruction (Thonthowi, 1993).

A better method and strategy of instruction is necessary to be applied in teaching all kinds of subjects. However, a greater effort is sometimes required when lecturer delivers a lecturing matter that is considered abstracts by most students. In the primary teacher education, it is found that some subjects are unfavorable; among those kinds of subjects is Chemistry.

Chemistry, as a part of the material of science education to be taught in primary teacher education, is commonly considered a difficult subject due to its abstract characteristic. Hence, teaching chemistry faces

challenges with visualization of the theory. Regarding this problem, lecturers are expected to implement such an innovative teaching method that will raise students' interest and understanding in chemistry. One innovative teaching method introduced in this paper was Chemo-entrepreneurship (CEP) approach. CEP approach is a method of chemistry teaching by correlating theories objects in daily life. In this approach, the students are also provided a knowledge and skill in turning raw material into valuable product by applying chemistry theories. It is a way of visualization that is expected to enhance students' understanding in chemistry concepts. In this research, the effectiveness of CEP approach for improving the quality of chemistry teaching was examined for the students of Organic Chemistry I at the Chemistry Department of UNNES. The result of this research was considered suitable to be adapted for running teaching and learning process on chemistry subjects in the primary teacher education.

CEP teaching approach is a method of chemistry teaching by directly correlating the theory in chemistry with the real object/phenomenon around the human's life. Therefore, beside educating, application

of CEP approach in the instruction process will enable the students to understand the basic concepts of chemistry theory more easily. It gives the students an opportunity to learn the process of turning raw material into valuable products based on the chemistry concepts. Hence, it will motivate the students to enhance their entrepreneurship spirit. Implementation of CEP instructional approach makes chemistry teaching interesting and joyful (Supartono, 2006). One out of several developments of CEP concepts in chemistry education is in the form of life skill as content on the relevant subject. Life skill is a typical skill needed by someone to survive, wherever he lives and whatever his profession. Hence, to realize it, it necessary to aim CEP instructional approach not only at academic and vocational aspects, but also at practicing daily life's problem solving (Bently, 2000).

The problem faced by the students of the Chemistry Department of UNNES, based on the evaluation and reflection on the teaching and learning process all this time, the problem faced by the students of the Chemistry Department of UNNES has demanded the lecturers to act for finding the solution. Intensive discussion among the research team brought about a design of instruction utilizing CEP approach for improving the students' academic achievement and life skills. This instructional approach was considered in line with the principle of student centered learning.

Based on that consideration, the problems formulation of the research was: "could the application of CEP instructional approach promote the academic achievement of the students on the Organic Chemistry I Course and develop their life skill capability?". The purposes of this classroom action research were promoting the academic achievement of the students on the Organic Chemistry I Course and developing their life skill capability by applying CEP teaching approach.

Life skill is a typical skill owned by someone to be brave and ready to face the problems in life naturally, without a feeling of stress, and an attitude to be proactive and creative in overcoming the problem (Broad Based Education Team, 2001). Generally, there are two types of life skills, i. e. general life skill and specific life skill. General life skill is grouped into: (1) personal skill and (2) social skill. A personal skill consists of self-awareness skill and thinking skill. Meanwhile, specific life skill also consists of two skills: academic skill and vocational skill (Depdiknas, 2003).

## METHOD

Development conducted in this research was implementation of CEP instructional approach on Organic Chemistry I Subject provided on the even

semester. Subject of the development were the 39 students of II B Class in the Chemistry Education Study Program, Chemistry Department of UNNES. This work was a Classroom Action Research carried out in three cycles. Each cycle consisted of planning, action, observation, and reflection. Focuses of the research were the students' achievement (academic result) on Organic Chemistry I Course and development of the students' life skills capability. Data obtained were analyzed using descriptive method to evaluate the improvement of the students' achievement in organic chemistry theory and their life skills capability.

Development of the students' life skills capability was observed using classroom sheets of observation, which consisted of 4 types of skills: (1) Personal-skill including consciousness as the God's creature, consciousness of self-existences, and consciousness of self-potency, as well as capability to inquire (about a piece of information), to analyze information, to make decision, and to solve the problem; (2) Social skills including capability in communication both orally and in written, and also capability to collaborate; (3) Academic Skills, including competency to identify, to correlate, to formulate a hypothesis, and to run researches; (4) Vocational skills, including capability to find the life skills products related to the lecturing matter, capability to make, to design, and to determine the life skills products. When determining the learning experience, it was necessary to consider the type of life skills to develop on each basic competency.

Data were analyzed using qualitative descriptive method. Descriptive analysis would provide the clear illustration about the instruction process and achievement. Qualitative analysis performed using triangular method (data reduction, data explanation, and verification/process of drawing conclusion) was intended to choose and sort the suitable data to be used for reporting the the result of this classroom action research. All data were analyzed simultaneously therefore the result was reliable.

## RESULT AND DISCUSSION

### Result

The low grade of the students' achievement in chemistry indicated that students found difficulty in learning chemistry concepts. It was because some concepts in chemistry had abstract characteristic. Beside that, the teaching method performed by the lecturers were usually monotonous and had no variation, meaning that lecturers dominated the teaching and learning process through speech method and did not involved the students actively. Due to this condition,

it was considered necessary to employ such a teaching method that could raise the students' interest and make them more active in the learning process. Application of CEP approach of instruction was one among the strategies to improve the students' creativity and activity.

### *Cycle I*

The research team prepared the subject matter of alkenes and alkynes, as well as facility and equipment for running the CEP instructional approach, including observation sheets and examination that were in line with the CEP principles.

Lecturers then ran the teaching process of Organic Chemistry I Course, focusing on the topic of alkenes and alkynes by applying CEP approach. The researchers gave the students assignment to produce life skill product that was in line with the topic of organic compound identification, i. e. making virgin coconut oil (VCO).

By using observation sheets, the research team monitored the process of teaching and learning. The aspects examined, in accordance with the research instrument, consisted of four types of skills, i. e.: intrapersonal skill, thinking skill, social skill, academic skill, as well as vocational skill. Observation was also conducted to evaluate the quality of the life skill products resulted in this activity and also the activity as well as collaboration among the students in producing VCO. Teaching and learning process on Cycle I was presented on Figure 1. On Cycle I, the average achievement of the post-test on the subject matter of alkenes and alkynes was 64.62 and the thoroughness of learning was 44%. This result was still far from the expected indicator (> 85%).

On Cycle I, the lecturers gave life skill assignment; i. e. students had to make VCO from one type of feedstocks (coconut). Follow up of this activity was an assignment in the form of writing experiment report. In this condition, students were only given a certain assignment from the lecturers, without being given an opportunity to explore their creativity in making life skills products. Students have not reached their capability in communicating, both orally and in written, as well as developing cooperation with other people. Based on this evaluation result, it was necessary to do improvement on the further cycles. Hence, on next cycle, students were ordered to make a fermented food (*tapai*) from various feed-stocks. The using of various raw materials was expected to be a medium for implanting the students' creativity in applying CEP concept. Beside that, students were also ordered to write their experiment reports then conduct

such a presentation activity related to their life skill products. Therefore, their communication ability would be improved.

### *Cycle II*

The action carried out on the cycle II was based on the result of the reflection on the cycle I. Improvement on the cycle II were, among the others: students were assigned to prepare the subject matter of alcohols and ether and making life skill product (*tapai*) from various feed-stocks containing carbohydrate. The examples of raw materials were white cassava, yellow cassava, breadfruit, purple sweet potato, and yellow sweet potato.

As conducted on Cycle I, the investigator team prepared the lecturing matter of alcohols and ether as well as facility and equipment for conducting CEP instructional approach, including observation sheets and problems that were in line with CEP principles.

The lecturers carried out the Organic Chemistry I course, with the subject matter of alcohols and ether, using CEP model of instruction. The lecturers provided the students a task related to those lecturing topic. Students were ordered to make *tapai* from various sources of carbohydrate in groups. Each group had to use different feedstocks, such as white cassava, violet cassava, sweet potato, white sticky rice, and black sticky rice. Having performed the experiments, students had to present their life skills products.

Observation was also carried out as conducted on Cycle I. The investigator team learned and evaluated the students' life skill assignments by using classroom sheets of observation. This team observed the students' capability in making *tapai*, their participation in the classroom activity, and their capability in presenting their invention in the teaching and learning activity using CEP. The aspects observed, in accordance with the research instrument (observation sheet), consisted of: intrapersonal skill, thinking skill, social skill, academic skill, and vocational skill. The students' average achievement on the cognitive aspect (posttest on alcohol and ether topic) was 75.85%. It exhibited the students' thoroughness of learning of 82%. This result have not indicated the success of the indicator (>85%).

The life skill assignment provided on the Cycle II, in the form of making *tapai* from various types of carbohydrate sources, had improved the students' creativity compared with the task given on Cycle I. Students had gained their capability in communicating, both orally and in written and in running cooperative work. However, they were not competent yet in producing life skill product. To improve the students'

capability in producing life skill products, on Cycle III, such an improvement would be performed. On this cycle, students were ordered to run experiments to produce various kinds of home industry product on their own idea and creativity. The students then had to sell their product to the society. This activity was expected to implant their entrepreneurship spirit and skill. On the other hand, this life skills assignment has also motivated the students to learn the organic chemistry lecturing matter. Hence, it promoted the students' academic achievement in organic chemistry theory.

### Cycle III

The action on Cycle III was run based on the result of the reflection on Cycle II. As performed on Cycle I and II, the team of the lecturers prepared material for carboxylic acid and derivatives as well as facility and equipment for implementing CEP teaching and learning process, including observation sheet and a couple of problems that were in line with CEP rules.

Lecturers ran the teaching and learning process of Organic Chemistry I Course, for carboxylic acid and derivatives topic, using CEP instruction approach. On Cycle III, the lecturers gave an opportunity to the students in groups to make various types of life skills products that were related to Organic Chemistry Course materials. Lecturers also assigned the students to sell their life skill products to the society.

Observation was conducted as it had been done on Cycle I and II. The investigator team learned and evaluated the students' life skill assignment by using observation sheet. The team observed the students capability in making life skill products, their participation in the classroom activity, and their competency in presenting their invention in the teaching and learning process using CEP approach in the classroom.

The aspects observed, in accordance with the research instrument (sheets of classroom observation), consisted of four types of skills, they were intra-personal skill, thinking skill, social skills, academic skill, and vocational skill. The average mark on the students' achievement test (post test) for the lecturing matter of carboxylic acid and derivatives was 79.77. It showed that the students' thoroughness of learning was 87%. This result has indicated the success of the indicator (>85%).

On Cycle III, students were assigned to make various kinds of life skills products (home industry products) on their own idea and method. This made the students more creative to explore their capability and knowledge, compared with the assignments given

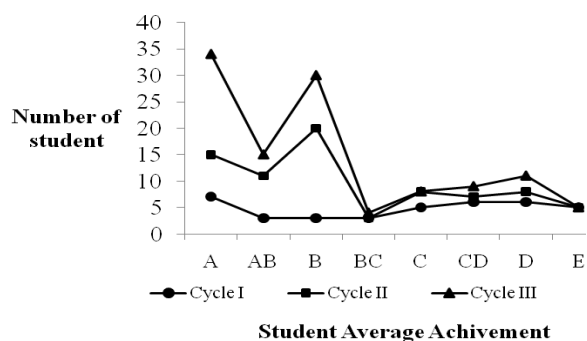
on Cycle I and II. Students were capable to communicate, both orally and in written, to cooperate with other people, and competent to produce as well to sell their life skills products. This assignment on making various life skills product was obviously effective to raise the students' interest in learning the Organic Chemistry I lecturing matter.

### Discussion

On the Cycle I, the students' achievement of learning was only 44% and the students' academic as well as their vocational skill had not been springing up. However, the students had been motivated to produce life skills' products. There were four groups of students that had not conducted their assignments optimally yet. Beside that, the packing and wrapping of the product had become another obstacle. It was considered important to encourage the students to well pack and wrap their products in order to make the products look attractive and to improve their selling point.

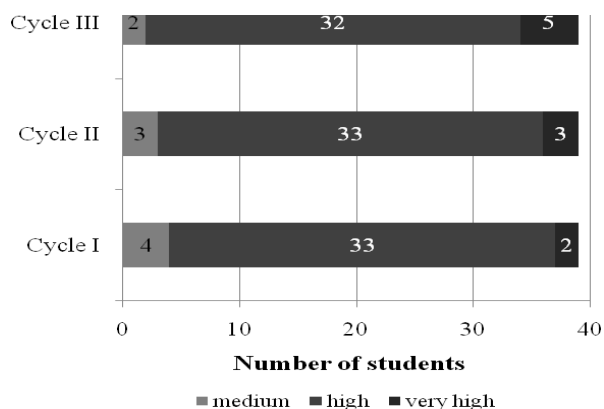
On Cycle II, one problem emerged. There were two groups of students that could not successfully conduct their assignments in making *tapai* yet. Those two groups failed to make delicious and good-looking *tapai*. On this cycle, the achievement of learning raised to 82%. It indicated that students were motivated to better learn organic chemistry theory. Generally, on Cycle II, academic skill in the form of, among the others, capability of communicating (both orally and in written) have appeared, but the students' competence in cooperating as well as producing and selling life skills products have not been developed. Finally, on Cycle III, the obstacle was overcome and the classroom achievement of learning reached 87%. It had shown that the students could improve their capability in individualized learning with excellent academic result on the Organic Chemistry Course. It meant that the first purpose of this research had been obtained. In this last cycle, students were able to communicate, both orally and in written. They were also capable to cooperate with other people and competent to sell their life-skill products.

During the program the students were able to cooperate successfully, naturally, and smoothly. Students were able to share and discuss their idea well and orderly. Generally, the students expressed positive response on this program. Students exhibited their high interest, indicated by their high activity in discussion and giving questions. It meant that the students paid attention to their peer's presentation and idea. The students' average mark on the cognitive aspect was shown on the Figure 1.



**Figure 1. Histogram of the Average Cognitive Achievement**

Figure 1 also indicated the improvement of the students average achievement (cognitive aspect) from Cycle I to Cycle III. The average marks on the test were 64.62, 75.85, and 79.77 on Cycle I, II, and III, respectively. The Classroom achievement of learning has raised, i. e: 44% (Cycle I), 82% (Cycle III), and 87% (Cycle III). On the other hand, the average result of the students' life skills increased from Cycle I (77%), Cycle II (80%), and Cycle III (92%) (Figure 2).



**Figure 2. The Result of the Students' Life Skills Development Criteria**

The basic thinking of CEP teaching approach development is in line with the constructivist philosophy, which states that each individual are able to actively develop his own knowledge when he interacts with his environment and society. Hence, it was expected that, when entering the classroom and laboratory, the students were not absolutely at zero point, but they had had their basic knowledge of chemistry. The result of this research demonstrated that application of the CEP instructional approach had raised the students' interest in learning the lecturing matter (Organic Chemistry theory). Therefore, this instructional

approach was effective for improving the students' average academic result.

Development of the CEP concept in the teaching process of Organic Chemistry Course was in the form of: (1) Developing the students' and lecturers' creativity; (2) To develop a better innovation in lecture activities that would relate the theories and the reality. It would make the lecture more significant and valuable. Structured assignments were provided to train the students to be persistent, diligent, tough, and responsible. It would also be beneficial to relate the content of the knowledge with the real problem in the daily life; (3) Creating an opportunity of collaborative work between the students and the lecturers, interpersonal of the students, and a partnership work with external institution; (4) To develop an innovation in the form of economical practical work due to increasing price of chemicals, limited laboratory equipments, limited funding sources. It would also be a great challenge for the students to develop creative thinking; (5) To develop entrepreneurship: Implanting entrepreneurship spirit and creating an opportunity to develop business enterprises related to chemistry and chemistry education knowledge, for example: applying well-applied chemical process technology; (6) It became a real problem solving, motivation, and information to create a business enterprise should the students could not straightly get a job after their graduation. It would also be a solution against the limited opportunity of employment in this country (Widodo, 2006).

Based on the above-mentioned data, it was revealed that the teaching method through CEP approach on Organic Chemistry Course played an important role in facilitating the students to understand the subject matter. It would be necessary as a foothold to be successful as high school teachers in the future, in where the instructional materials of the chemistry subject at high school should be provided in line with the indicators requirements in KTSP. Beside that, the using of speech method in the classroom activity should be reduced. It was suggested that, in the teaching and learning process, the teachers act as advisers or facilitators. On the other side, students needed to be more intellectually-emotionally independent and active in learning activities.

This result has proved the effectiveness of applying CEP approach for promoting the students' academic achievement in chemistry course and life skills. Using such life skill oriented, it was found that a number competences and the more interesting teaching-learning process were reached. The focused and motivated students, also for further knowledges and the more meaningful learning achievement were

reached (D'amore *et al*, 2003). CEP approach contributes the increase of students' creativity and learning achievement. (Mursiti, *el al*, 2006). CEP approach contributes the increased of students' motivation, innovation, creativity, learning and entrepreneurship spirit achievement (Supartono, 2007).

Thus, it is better to implement this instructional approach for the other subjects. Most importantly, this CEP teaching approach is proposed to be adapted for conducting the chemistry teaching in the primary teacher education.

## CONCLUSION AND SUGGESTION

### Conclusion

Based on the result of the research and discussion, it was concluded that the academic achievement of the students taking Organic Chemistry I (theory) Course has been promoted. The students' average achievements (cognitive aspect) were 64.62, 75.85,

and 79.77 on Cycle I, II, and III, respectively. Life skills capability of the students could be improved through CEP teaching approach. The average result of the students' life skills that had fulfilled the high and very high criteria had increased from the Cycle I (77%), Cycle II (80%), and Cycle III (92%).

### Suggestion

To improve the students' interest in the lesson, capability in individualized learning, and self-confidence, it was suggested that lecturers should apply CEP instructional approach for other topics in chemistry. This will give benefit as a variation in the teaching method. Beside that, students should be given some information related to their strength and weakness in learning, as a basic for improving themselves in the future. In general, CEP method is proposed to be adapted for conducting the chemistry teaching in the primary teacher education.

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