



Full Length Research Article

LEARNING TOOLS DEVELOPMENT FOR CHEMOENTREPRENEURSHIP-BASED HYDROCARBON AND PETROLEUM IN INCREASING THE STUDENTS' SOFT SKILLS AND INTEREST IN ENTREPRENEURSHIP

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ARTICLE INFO

Article History:

Received 07th May, 2014

Received in revised form

05th June, 2014

Accepted 22nd July, 2014

Published online 31st August, 2014

Keywords:

Learning Tools;

Chemoentrepreneurship;

Soft Skills and

Interest in entrepreneurship

ABSTRACT

This research was the learning tools development research for chemoentrepreneurship-based hydrocarbon and petroleum materials which was valid and effective in increasing the students' soft skills and interest in entrepreneurship. Pretest-posttest control group design was used as the research design and was conducted outside of the classroom. N-gain test was used to analyze the data of students' achievement, meanwhile the percentage technique was used to analyze the students' soft skills and interest in entrepreneurship. The result of this research showed that learning tools for chemoentrepreneurship-based carbon and petroleum was valid and effective in increasing the soft skills and interest in entrepreneurship of X-2 Graders of SMA PGRI, Jepara.

INTRODUCTION

Background

Seeing the fact in reality that among the graduates of senior high school (SMA/MA), they do not have a chance to attend the education in the university level for some reasons; instead they have to go to the work world, although they were not given the vocational subjects at school. Related to the aforementioned problem, there should be an emphasis on a subject that can give provisions to the students in order to be ready to socialize in the society; one of them is by emphasizing the entrepreneurship-based learning. The entrepreneurship-based learning tends to have a direct relation to life skills; besides those skills, it needs the development of soft skills for learning process. One of the ways in developing the students' soft skills is through the character education at school. This is in line with the Article 3 of the Law No. 20 Year 2003 about the National Education System, stating that the function of national education is to develop the skills and to build the character as well as the prestige value of nation civilization in order to educate the nation living.

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Hydrocarbon and petroleum is one of the topic in chemistry subject which emphasizes the natural phenomena and has a lot of applications in daily life. Based on the questionnaire distributed to the students of SMA PGRI Jepara, it showed that the learning materials for hydrocarbon and petroleum are needed to be related to the daily life. By learning the chemistry materials at school, the students are expected to be able to apply them in their daily life in order to be the students' provisions of being the entrepreneurs when they cannot attend the university education. The chemistry teachers, therefore, need to have learning tools which do not only contain the materials, but also offer the chemistry application for entrepreneurship world; this will be useful for students during either during study or after graduating from that school. This chemistry learning model is what so called chemoentrepreneurship (CEP) learning. Supartono (2006) stated that chemoentrepreneurship (CEP) learning is an approach in learning chemistry contextually, i.e. the chemistry approach which relates the materials being learned to the real objects. Based on the data and result of initial research conducted in SMA PGRI Jepara, it demands an innovative learning which involve the students and can be proposed as the provisions to face the globalization. The writer, therefore, decided to develop the learning tools for chemoentrepreneurship-based hydrocarbon and petroleum; it is expected to improve the students' understanding of

hydrocarbon and petroleum competence as well as to improve the soft skills and interest in entrepreneurship which can propose the provisions to face the globalization era.

Research Problem

The research problems of this research are how valid and effective the learning tools, and its implementation for hydrocarbon and petroleum materials are as well as the students’ responses to this learning model.

Objectives

The objective of this research are to know the validity, effectiveness, and implementation of chemistry learning tools for chemoentrepreneurship-based hydrocarbon and petroleum in increasing the students’ soft skills and interest in entrepreneurship.

MATERIALS AND METHODS

Research and development method was used in this research. The development of learning tools in this research adopted the research and development model by Plomp (1997) which consisted of 5 phases, namely initial investigation phase, design phase, realization/construction phase, test phase, evaluation, revision, and implementation phase. The subjects of this research were students of X-2 graders of SMA PGRI, Jepara becoming the experiment class and students of X-3 graders of SMA PGRI, Jepara becoming the control class. The samples were determined by using random sampling technique. The research design used here was Pretest-Posttest Control-Group Design.

Technique and Instrument of Data Collection

Technique and instrument of data collection are shown in Table 1.

Table 1. Subject, Type, Technique and Instrument of Data Collection

| No. | Data Type Measured | Technique of Data Collection | Instrument of Data Collection | Subject |
|-----|-------------------------------|---------------------------------------|--|----------------------|
| 1. | Initial observation | Questionnaire, Interview, Field study | Questionnaire Sheet, Interview Guidelines, Field Notes | Students and Teacher |
| 2. | Tools validation | Questionnaire | Questionnaire Sheet | Students |
| 3. | Cognitive learning result | Test | Test Worksheet | Students |
| 4. | Interest in entrepreneurs hip | Questionnaire | Questionnaire Sheet | Students |
| 5. | Students’ responses | Questionnaire | Questionnaire Sheet | Students |
| 6. | Soft skills | Observation | Observation Sheet | Students |

Technique of Data Analysis

Technique of data analysis is shown in Table 2.

Table 2. Technique of Data Analysis

| No. | | |
|-----|------------------------------|---|
| 1 | Trial test | Validity, reliability, difficulty level, discrimination index, (Arikunto, 2006) |
| 2 | Learning tools | Validity by validator, effectiveness in terms of percentage results of classical learning thoroughness reaching 80% |
| 3 | Interest in entrepreneurship | (Mulyasa, 2009) |
| 4 | Soft skills | Percentage technique (Arikunto, 2006) |
| 5 | Students’ responses | Percentage technique (Arikunto, 2006) Category of students’ response degree in learning (Rochmad, 2009) |

RESULTS

The initial investigation phase was conducted to know the exact condition data in the field namely the students’ condition being studied, soft skills needed and learning processes previously used. The initial observation results showed that the students’ interest in entrepreneurship was relatively low and the soft skills needed were creativity, learning will, responsibility, confidence, cooperation, and leadership. Design phase included designing the learning tools and the instruments studied were Lesson Plan, learning materials, cognitive aspect evaluation sheet (pretest and posttest questions), soft skill observation sheet and questionnaire of interest in entrepreneurship. In the evaluation and revision phases, there were some validation processes by the validator to be exactly valid. The validators were Prof. Dr. Supartono, M.S, Dr. Sudarmin, M.Si, and Siswanduri, S.Pd. The recapitulation result of validation measure toward the chemoentrepreneurship-based learning tools showed that the validators put the learning tools into valid criteria. The recapitulation results of validation measured toward the chemoentrepreneurship-based learning tools are shown in Table 3.

Table 3. The Recapitulation of Validation Measure toward the Chemoentrepreneurship-based Learning Tools

| Learning Tools | Total average (Va) | Note |
|---|--------------------|------|
| Syllabus | 3,65 | High |
| Lesson Plan | 3,71 | High |
| Learning Materials | 3,8 | High |
| Questionnaire of Interest in Entrepreneurship | 3,7 | High |
| Soft skill observation sheet | 3,8 | High |
| Questionnaire of students’ responses | 3,7 | High |

Pretest and posttest data were used to examine the effectiveness of learning tools. The learning result of wide trial class is shown in Table 5.

Table 5. The Cognitive Learning Result of Wide Trial Class

| Criteria | Experiment class | | Control class | |
|---------------|------------------|----------|---------------|----------|
| | Pretest | Posttest | Pretest | Posttest |
| Highest score | 45 | 85 | 45 | 85 |
| Lowest score | 20 | 65 | 20 | 50 |
| Average | 30,83 | 76,28 | 30,89 | 71,17 |
| Thoroughness | 0% | 83% | 0% | 56% |
| N-gain | 0,7 | | 0,6 | |
| Criteria | High | | Medium | |

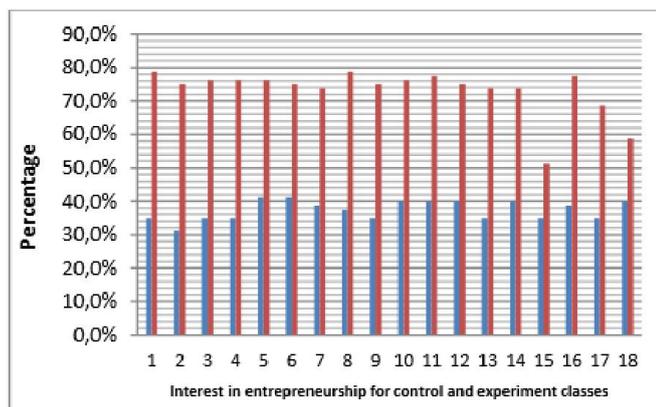
The learning tools can be said effective when about 80% students have gained the classical thoroughness. Based on the Table 5, it can be seen that the experiment class gained the

classical thoroughness at 83%, meanwhile the control class gained the classical thoroughness at 56%. Based on the Table 5, it can be concluded that chemoentrepreneurship-based learning tools were effective. The right-hand t test was used to show that the experiment group was better than the control group. The result of the right-hand t test is shown in Table 6.

Table 6. Result of the Right-Hand t Test

| Group | Variants | Dk | t _{values} | t _{tables} | Conclusion |
|------------|----------|----|---------------------|---------------------|------------------------------------|
| Experiment | 34,0948 | 36 | 2,0631 | 2,0322 | There was a significant difference |
| Control | 77,0850 | | | | |

Based on Table 6, $t_{values} > t_{tables}$ therefore H_0 was denied meaning that there was an improvement difference of learning result between two groups; as a result it can be concluded that there was a significant difference between two groups, i.e. the experiment groups was better than the control group. The improvement of interest in entrepreneurship among the students was one of the objectives of this research and development in chemoentrepreneurship-based learning tools. The percentage technique was used to measure the students' interest in entrepreneurship. Questionnaire of interest in entrepreneurship measured 8 indicators of interest in entrepreneurship. This questionnaire consisted of 20 question items. The analysis result of interest in entrepreneurship is shown in Figure 1.



Note:
 : Control Class; : Experiment Class

Figure 1. Distribution of Interest in Entrepreneurship of Wide Trial Classes

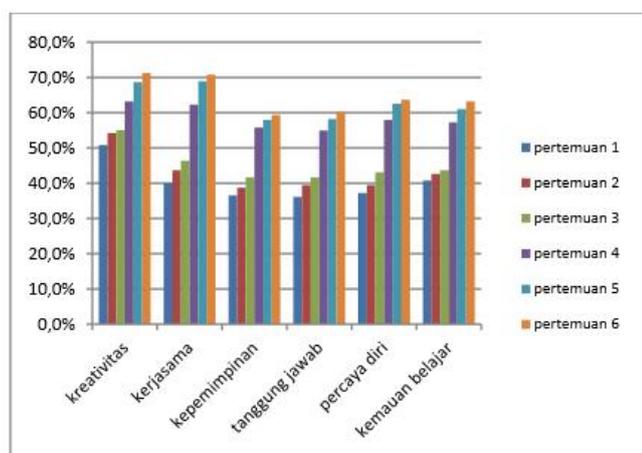


Figure 2. Percentage Distribution of Each Soft Skills Indicator for Experiment Class

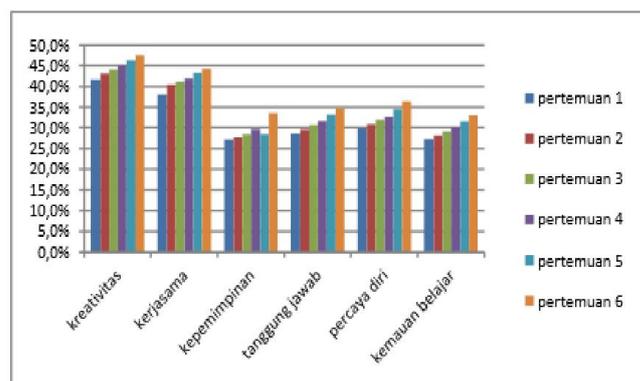


Figure 3. Percentage Distribution of Each Soft Skills Indicator for Control Class

The measurement of students' soft skills was collected from the observation result during learning processes by using the soft skills observation sheet. The percentage of the students' soft skills data analysis result for the class implementing the chemoentrepreneurship-based learning tools is shown in Figure 2. The instrument of the students' responses questionnaire was used to measure the students' responses towards the learning which implemented the chemoentrepreneurship-based learning tools for chemistry. Students of the experiment class gave positive responses of 3.3 at average and in the very enjoying criterion towards the learning which implemented the chemoentrepreneurship learning tools.

DISCUSSION

Interest in Entrepreneurship

The interest in entrepreneurship grew in the learning processes which implemented the chemoentrepreneurship-based learning tools. This was in line with the explanation by Purnomo (2005) which stated that interest in entrepreneurship among the students can be improved through education. The education conducted through the learning processes which related the materials taught to the students' daily life and were directed to be ready to work. The development of chemoentrepreneurship-based learning tools sets out the contextual ways; it, therefore, makes the students' understanding about the hydrocarbon and petroleum materials as well as chemoentrepreneurship better. This is in line with Supartono (2006) which stated that chemoentrepreneurship (CEP) approach concept is an approach in learning chemistry contextually, i.e. the chemistry learning approach which relates the materials being learned to the real objects. Besides Supartono (2005), Rannis and Walter (2004) stated that learning which implements entrepreneurship approach is a contextual learning enabling students to be able to learn the process of the material production to be useful products that have economic values and improve the interest in entrepreneurship. Boocock et al. (2005) stated that through entrepreneurship-based education, the educators should always improve the experiences. Therefore, the chemoentrepreneurship-based learning processes lead students to have practicums making products related to the hydrocarbon materials, such as making briquette and aromatherapy candle. The objectives of practicum are to train students in order to make products related to the materials they are studying as well as the chance to improve the interest in entrepreneurship.

Students from experiment class were expected to improve the procedure of making the products (briquette and aromatherapy candle) which had been provided. By doing so, it would lead students to take benefit of the waste stuffs to be products with economic values. The activities students did had similar purposes to the essential of entrepreneurship, i.e. the innovation of creation with economic values (Starcher, 2003). The first practicum conducted was making the briquette. Briquette is an alternative fuel as the substitution of oil. It is one of our effort as the members of society in cope with and reduce the garbage mountain, especially in the scope of household. In chemistry, briquette is solid fuel containing carbon; it has high calorie values and can lit up for a long time. Biocharcoal is the charcoal that is formed by burning the dry biomass without air (pyrolysis). Biomass, meanwhile, is an organic material made of microorganism. During the process of pyrolysis, there are gases produced, such as CO, CO₂, CH₄, H₂, and light hydrocarbon.

Another product produced in this research was aromatherapy candle. By making the aromatherapy candle, the students were expected to develop their creativity. They can make various shapes and aromas for the aromatherapy candles. Candle is a thing easily found in our daily life. It is not only for the lighting, nowadays it is commonly used as the aromatherapy medium as well as a product which has a high value of art. It is generally made of paraffin. In chemistry, paraffin is the general name for alkane hydrocarbon formulated in C_nH_{2n+2}. Paraffin candle refers to the solid object with n=20-40. The solid form of paraffin, called paraffin candle, is made of the weightiest molecule ranging from C₂₀H₄₂ to C₄₀H₈₂. By practicing in making those products, it was expected that the students had more understanding about the relation between the materials they are learning and the real example or real product in their daily life. The briquette and aromatherapy production conducted by the students was also expected to improve the interest in entrepreneurship among the students. This objective was in line with Rannis and Walters which stated that chemoentrepreneurship approach is a learning approach in chemistry which is related to the real object or phenomena around the human life; beside educating the students, it, therefore, made students learn the process of material production to be useful products that have economic values as well as improved the interest in entrepreneurship among the students.

The chemoentrepreneurship-based learning tools were expected to be able to improve the entrepreneurship spirit since at the very early stage. This is in line with Rasheed (2005) stated that the importance of educational system to plant the investment in developing and constructing the entrepreneurship spirit since at the very early stage is because the entrepreneurship investment has positive effects in economic development and global competition in creating the entrepreneurship culture for young people. The interest in entrepreneurship in this research was measured using percentage technique; the students, therefore, were measured in terms of the entrepreneurship spirit they had. The interest in entrepreneurship of the experiment class (implementing the chemoentrepreneurship-based learning tools) had higher percentages compared to the control class (implementing the learning tools commonly used in SMA PGRI Jepara). This was because the learning tools used for control class did not relate

to the daily life in detail. After measuring the interest in entrepreneurship among the students, the percentage of each indicator of interest in entrepreneurship was also measured using percentage technique. This measurement was expected to know which indicators extremely needed to be an entrepreneur. Three indicator aspects which had very strong category in this research were the belief of self-strength, future-oriented, and risk-taking. This is in line with Hamzah (2009) stated that the strong belief in running the entrepreneurship will help students become a figure of entrepreneur. This is because the strong belief will build the strong spirit, i.e. the spirit that is not afraid of fail. The entrepreneur has to be brave to take the risk in creating the job in various conditions (Kasmir, 2007). Therefore, the entrepreneurs will grow time to time which lead the entrepreneur to think creatively and innovatively. The creative and innovative attitude will come up when the entrepreneurs have future-oriented vision. Based on the comparison result of the interest in entrepreneurship from control and experiment classes, it can be concluded that the chemoentrepreneurship-based learning tools was effective in improving the interest in entrepreneurship among the students.

Based on this research, factors that affected the high and low interest in entrepreneurship were internal factors, namely demography (age, education) and personality, and external factors, namely the family background and place where they lived. The external factor especially family background tended to give a big effect for interest in entrepreneurship. This is in line with Mulyana (2010) stated that there are personal and external environment factors to the interest in entrepreneurship. Besides the personal and environmental factors, according to Crow in Dharma (2002), emotional factor also affects the interest in entrepreneurship. The emotional factor is the factor that relates to the feeling of happiness, emotional, satisfaction owned by individual; therefore there is a self-satisfaction when someone becomes an entrepreneur. The chemistry learning in this research, setting out the habit of growing the belief through the skills and independence to solve problems, to cultivate the knowledge and external experiences beyond the target field, to reduce the fear of fail, and to be able to change time to time, will improve the students' competences in terms of the ability and mastery of chemistry materials, attitude as well as creativity. The chemoentrepreneurship-based chemistry learning gave positive responses to the students. This was indicated by the result of positive responses given by the students from limited and wide trial classes.

Soft skills

The objective of this research was to improve the interest in entrepreneurship and soft skills. Nowadays, people success cannot be determined merely by the hard skills, it needs soft skills as well. Therefore, it is important to develop the soft skills through education. This is in line with Eko (2010) stated that learning processes must include the soft skills aspect. The soft skills developed in this research were cooperation, leadership, learning will, creativity, responsibility, and self-confidence. They can be developed through the learning processes by implementing discussion method (doing the exercise), giving the group task (developing the production procedures) and practicum (making briquette and aromatherapy candle). Based on the result of soft skills analysis conducted for wide trial class, especially for

experiment class, it showed that the soft skill students mostly interested in was creativity. The soft skills measurement was taken from the discussion and practicum activities. Creativity, in this research, was intended to yield something new (Simonton, 2000) such as in the process of making briquette and aromatherapy candle. Making these products were not something new anymore, although, for students, the learning process of product making was a new experience. Besides, the creativity also led students to think in solving the problems they faced (Craft, 2000). This could be seen in the process of discussion they made, i.e. the students was about to be brave to state the ideas they had.

One of the factors that affected the high creativity among the students was because through chemoentrepreneurship-based learning, the students were asked to develop the product which was in line with the potentials they had. In addition, students were very challenged and interested in making the product of chemoentrepreneurship for that learning materials. This is in line with Roger (in Munandar, 2004) stated that creativity is highly affected by the intrinsic motivation (self-motivation) and extrinsic (external motivation). Cooperation was also interesting for students in this research, showing the high solidarity among the students. This was because there was closeness of one student to the others, fight to be the best, and competitive spirit, as well as responsibility among them. The students, however, have different background, social and culture, they were united in the cooperation to achieve the goal they wanted (Shakir, 2006). Cooperation is also related to the responsibility (Waggoner, 2004). Therefore, when there was not responsibility, the cooperation among the members would not run well. This research, however, showed the very different result in which the percentage for cooperation was 70% while for responsibility was merely 60%. This difference became the restrictiveness of this research. This restrictiveness was because the soft skills measurement in this research was conditional, therefore the students' condition affected the measurement in this research. In addition, the restrictiveness factor that the researcher had while observing the students also affected the result of soft skills measurement. The soft skills that the students were mostly not interested in was leadership. The leadership aspect was relatively low since to grow the leadership attitude was extremely difficult. This is related to the students' responsibility, the lower the responsibility the students had the lower the leadership attitude the students had. This is not easy to be a leader, since to be a leader, one needs the ability to lead and solve the problems (Shakir, 2006). It was quite different for the soft skills grew in control class, i.e. the soft skills the students were mostly interested in was creativity, while the soft skills the students were not interested in was learning will aspect. This was because the learning was not interesting, making students less motivated in learning.

Based on the analysis result, it was proved that the implementation of chemoentrepreneurship-based learning tools was more effective in improving the students' soft skills. The development of soft skills in the learning processes can be done through the contextual learning. This is in line with chemoentrepreneurship learning. Supartono (2006) stated that chemoentrepreneurship (CEP) approach concept is the chemistry approach which relates the materials being learned to the real objects. The research of developing soft skills was also conducted by Dadan Rosana. His research also stated that

the development of soft skills can be developed through contextual learning (Rosana, 2011). However, the contextual learning applied were *constructive, questioning, inquiry, modelling, and learning community*. The developmental research of chemoentrepreneurship-based learning tools was quite similar to the research conducted by Dadan Rosana, however, the learning implementation was different. Based on the aforementioned explanation, it can be concluded that the soft skills developed were directed to the improvement of interest in entrepreneurship among the students, so that the students will have provisions of entrepreneurship when they graduate later.

Conclusion

Based on the analysis of research result and discussion related to the development of chemoentrepreneurship-based learning tools, it can be concluded that the chemoentrepreneurship-based learning tools for hydrocarbon and petroleum materials meet the valid and effective criteria in increasing the students' soft skills and the interest in entrepreneurship. In addition, the students give positive responses to the chemoentrepreneurship-based learning.

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