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The Chemistry Teaching Program for Developing the Senior High School Students' Entrepreneurial Attitudes

Nancy Susianna
Universitas Pelita Harapan, Tangerang, Indonesia

The objectives of this research were to identify the characteristics and effectiveness of chemistry teaching programs that increase students' entrepreneurial attitudes, chemistry concepts understanding and creativity. The research design application refers to the R & D (Research and Development) Design. Seventy-three senior high school students were involved in this research. The research data were collected through questionnaire, test, interviews and field notes. The data analysis used descriptive and inferential statistics. It has been concluded that: (1) the chemistry teaching program consists of laboratory activities, classroom activities, products-making activities, presentations, mind map activities and written tests. These activities are believed to develop students' leadership and self-confidence and direct them to task and result-oriented, future, risk-taking and originality-oriented. The evaluations in this program consist of self-assessment, peer assessment and teacher assessment; (2) the program has developed students' entrepreneurial attitudes, creativity and chemistry concepts understanding; (3) teachers and students responded the program positively; and (4) the implementation of the program shows that it takes much time. Based on the conclusions, it was suggested that: (1) the mind mapping activity should be carried out individually; (2) promotion program should be expanded so that students know the needs of the society; (3) further research should be done to find out whether this program can be conducted on lower grades and other topics of chemistry, biology and physics; and (4) further research should be conducted in various areas, such as in mountainous and beaches, so that the products will use the natural resources of the areas.

Keywords: the chemistry teaching program, mastery chemistry learning, creativity, entrepreneurial attitudes, colloid and carbon compound product, self and peer assessment

Introduction

The Indonesians are currently facing unemployment rate-related problems. The data of the National Labor Force Survey (2000) indicated that 34.4% of junior high school graduates and 88.4% of senior high school graduates did not continue their studies. In 2002, the unemployment rate percentages of elementary school graduates, junior high school graduates and senior high school graduates reached respectively 21.9%, 28% and 41.1% (National Labor Force Survey, 2002).

Youth unemployment from the age group of 15 to 24 years old is one of the serious problems currently faced by the Indonesians. There is a need for the Indonesian youth to get a job or create proper and productive job opportunities through entrepreneurship.

Based on the field study conducted in four schools comprising of two private senior high schools in

Nancy Susianna, Dr., lecturer, Faculty of Education, Universitas Pelita Harapan.

Bandung, one private senior high school in Cirebon and one state senior high school in Bandung, the following data can now be obtained: 58% of 144 students stated that job opportunities promising proper life were civil servants and 64% of 79 parents expected that their children become civil servants. The above-mentioned data shows that most of students' ambitions and parents' expectations against their children are to become civil servants, notwithstanding their very limited capacities. This is substantiated by the data of the National Labor Force Survey (1997; 2000; 2001; 2002) indicating that the number of young Indonesian entrepreneurs was lower than that of those who are not entrepreneurs. The number of young entrepreneurs in cities was lower than that of young entrepreneurs in villages, whereas the percentages of young entrepreneurs originating from junior and senior high school graduates reached respectively 70.3% and 12.1% (National Labor Force Survey, 2002). A number of senior high school natural science teachers in the above-mentioned four schools also said that they were not sure that they could directly work and get proper incomes after graduation.

The above-mentioned data show that being an entrepreneur has not become an option for youth. However, changing the viewpoint of most people who have considered entrepreneur as a profession that does not require high education is not easy, because this viewpoint has been implanted in the mind of most Indonesian people who prefer office work (Alma, 2005). No wonder, Brower named Indonesia as an employee country (Sumahamijaya, 2003). Even this effort is made difficult with the low skill and expertise of the Indonesian youth to become entrepreneurs.

Unemployment is the result of not only the limited job opportunities, but also the job seekers' incapability of meeting the requirements and qualifications required by the business sector. Therefore, any job seeker needs to be equipped with certain knowledges, skills and attitudes. The attitudes needed by anyone intending to become an entrepreneur and a job seeker are entrepreneurship attitudes.

In view of the above-mentioned condition, natural science education, particularly chemistry study, is currently expected being able to equip students both intending to continue their studies to a higher level and not intending to continue their studies. Based on the above-mentioned consideration, problem definition in this research is "How can the characteristics and effectiveness of chemistry study program grow the entrepreneurship attitudes of senior high school students?".

Based on the above-mentioned problem definition, problems can be identified through research questions as follows:

(1) How can the characteristics of chemistry study program grow the entrepreneurship attitudes of senior high school students?

(2) Can the implemented chemistry study program grow the entrepreneurship attitudes of senior high school students?

(3) Can the implemented chemistry study program improve students' mastery of the concept of chemistry?

(4) Can the implemented chemistry study program grow students' creativities?

(5) What are teachers' and students' responses on the developed study program?

Theoretically, the results of this research were expected able to give contribution to the development of the wealth of chemistry pedagogy in growing entrepreneurship attitudes. Practically, the results of this research were expected able:

(1) To be used as materials of consideration for policy-makers in the context of developing senior high school curriculum in the future;

(2) To give inputs for teachers to grow entrepreneurship attitudes through chemistry study program;

(3) To encourage other researchers to conduct follow-up research with the effort of growing entrepreneurship attitudes through chemistry study.

Research Methodology

The research design used refers to the modified R & D (Research and Development) Design of Borg and Gall (1983). This research was conducted in a private senior high school in Bandung municipality on chemistry subject in odd semester for four months. The subjects of this research were the class 12 of senior high school students, namely, 36 students during trial and 73 students during program implementation.

The research instruments used were questionnaires, test equipment, assessment sheets, interview guidance and field notes. There were three kinds of questionnaires used in this research. The first questionnaire was intended to collect data related to entrepreneurship and distributed among senior high school students, parents and chemistry teachers in four schools. The second questionnaire was intended to collect data on the growth of entrepreneurship attitudes and distributed prior to study, after study on colloid and after study on carbon compound. The third questionnaire was intended to know students' responses on the implemented study program.

There were two kinds of test equipment in this research. The first test equipment was used during study on colloid and the second test equipment was used during study on carbon compound. Each test equipment was used to measure the mastery of the concept of chemistry and entrepreneurship. Tests were conducted prior and after study on colloid and carbon compound.

There were three kinds of assessment sheets in this research: (1) assessment sheets on students' presentation capability; (2) assessment sheets on the products made; and (3) assessment sheets on mind map. The first and second assessment sheets were filled out by students to assess peers' presentation capability and the product made by each group, whereas the third assessment sheets were filled out by teachers during study on colloid and carbon compound.

Interview guidance was used to collect data on chemistry teachers' responses on the implemented study program. Field notes were researchers' notes on findings from various aspects found during research. These notes did not have certain format.

Data collecting during preliminary study was conducted through the filling out of questionnaires by senior high schools' students, chemistry teachers and students' parents. Data on the mastery of the concept of chemistry were collected through test on the mastery of the concept of chemistry. Data on the growth of entrepreneurship attitudes were collected through the filling out of questionnaires and assessment sheets on presentations and products. Data on the growth of creativity were collected through the filling out of assessment sheets and data on students' and teachers' responses on the developed program were collected through the filling out of questionnaires and interviews.

Data Analyses and Discussions

Data analyses, findings and discussions refer to research questions.

Characteristics of Chemistry Study Program

The objectives of the developed chemistry study program are: (1) growing the entrepreneurship attitudes of senior high school students through chemistry study; (2) growing students' capabilities in relating the concepts of chemistry to entrepreneurship opportunities; (3) growing students' interests in becoming entrepreneurs; (4) growing students' interest in becoming entrepreneurs; (5) stimulating students' interests in

and student's like of studying chemistry; and (6) understanding the concepts of chemistry and the interrelation thereof, as well as their application for solving problems in daily life.

This developed chemistry study program consists of several activities, namely laboratory activity, face-to-face activity, product-making activity, presentation activity and mind map making activity. The assessments used in this research are self-, peer and teacher assessments.

Finding in this research was the improvement of students' verbal communication capabilities. It conforms to the research of Vrchota's (2004) finding that verbal communication capability can be improved through presentation activity in food chemistry study.

Finding in this research was that the students could make a product that conforms to the concept taught so that they gained deep understanding of the concept of chemistry in real life. In product-making, the students used the skills they have acquired in class, for example, the students conducted field observation to determine the products having high selling values. It conforms to the research of Furger's (as cited in Duffrin, 2003) finding that project-based activities help students to use all the skills they get in classroom in real life situations outside class and place students in situations similar to those they are likely to face in real life.

It was also found in this research that through mind map activity, the students understood that the products made were combinations of the concept of chemistry and entrepreneurship, so that the concept of chemistry and entrepreneurship in the students' minds became one unity of concept which could be used as a facility to practice higher thinking skill. It conforms to the research conducted by Mavropoulos (2004) that interdisciplinary study can improve critical thinking, problem-solving and decision-making skills.

The assessments used in this program were self-assessment, peer assessment and teacher assessment. Peer assessment was used to know peers' attitudes, because from the aspect of time, the students' intensity of interacting with their peers is greater than that with their teachers who were acting as the assessors. In this research, there were several activities that must be conducted in groups, namely, laboratory, product-making, mind map making and presentation activities. The entire activities required ten weeks of time and during such time period the students observed their peers' attitudes.

Some of the students said that these questionnaires using self- and peer assessments made them become more honest in assessing themselves, because there were comparisons based on their peers' assessments. This statement was substantiated, because when these questionnaires were used only for self-assessment in different groups, there was a tendency that the students only chose the most favorable points of option. This phenomenon is in line with the level four need hierarchy according to Abraham Maslow's stating the occurrence of need for self-appreciation and self-esteem (Passer & Smith, 2007), so that students do not want to be considered bad by other people.

Furthermore, Amabile said that one of the assessments that can grow students' creativities is an assessment that involve students to assess their own works and if students often feel watched and assessed by teachers, their motivations and creativities are likely to decrease (as cited in Munandar, 2004). Based on the above-mentioned reasons, self-assessment and peer assessment can be used to know the change of entrepreneurship attitudes during chemistry study.

Entrepreneurship Attitudes

The data analyzed in order to obtain a picture of the students' entrepreneurship attitudes were the results of questionnaires on entrepreneurship attitudes during early study, after study on the concept of colloid and carbon

compound, presentation score and product score. The data used were based upon self-assessment and peer assessment.

Questionnaire on the scale of entrepreneurship attitudes. Class A-1 and class A-3 were the classes for revision product field test. Class A-1 consisted of 37 students and the data that could be processed in this research came from 33 students. Class A-3 consisted of 36 students and the data that could be processed came from 33 students. Hence, the entire data that could be processed from the questionnaire on entrepreneurship attitudes came from 66 students.

Every student conducted self-assessment and two peer assessments during early study, after study on colloid and carbon compound. Henceforward, early study shall be symbolized by "I", post-study on colloid shall be symbolized by "II" and post-study on carbon compound shall be symbolized by "III". During learning process, from pre-test, laboratory activity, face-to-face activity in class, product-making, presentation, mind map making to post-test, every student observed peers' attitudes.

Questionnaire on the scale of attitude consisted of seven options. The growth of average scores of entrepreneurship attitudes during I, II and III has been statistically tested using the Wilcoxon test to know whether or not this growth was significant. $Z_h < -1.96$ was obtained at the significant level of 0.05, therefore, it can be concluded that the average scores of entrepreneurship attitudes during I-II, I-III and II-III differed significantly based on both self-assessment and peer assessment.

The growth of average score for each entrepreneurship attitude based on self-assessment and peer assessment is illustrated in Figure1.

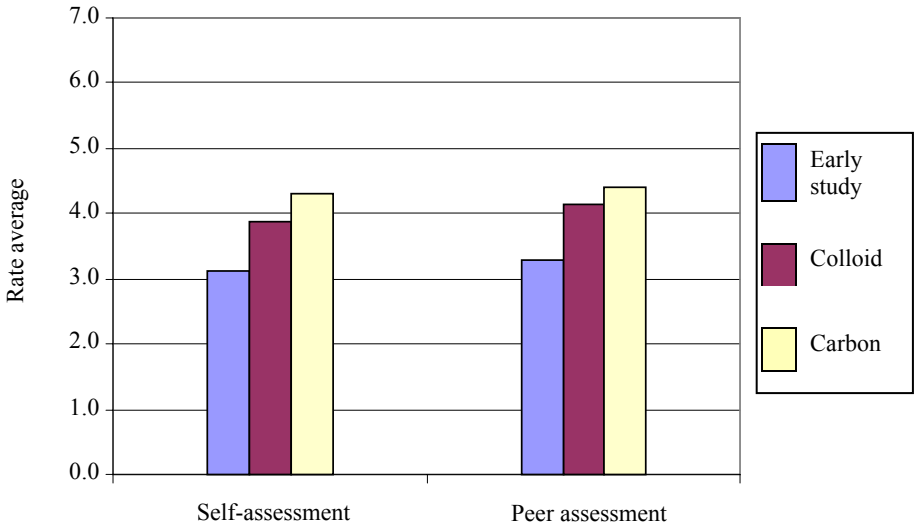

Figure 1. Growth of entrepreneurship attitudes.

From Figure1, it is obvious that the average score of entrepreneurship attitudes during III was higher than that of entrepreneurship attitudes during I and II, based on both self-assessment and peer assessment. The biggest normalized gain increase occurred during I to III study pair based on both self-assessment and peer assessment.

The growth of average score for each entrepreneurship attitude during I, II and III was statistically tested using the Wilcoxon test. Based on self-assessment, $Z_h < -1.96$ was obtained during pairs I-II and I-III for each entrepreneurship attitude and also during pair II-III for leadership, duty and result-oriented, future-oriented, risk-taking and originality attitudes at the significant level of 0.05, therefore, it can be concluded that the

above-mentioned pairs differed significantly. In addition, $-1.96 \leq Z_h \leq +1.96$ was also obtained during pair II-III for confident attitude at the significant level of 0.05, therefore, it can be concluded that the above-mentioned pair groups did not differ significantly.

Based on peer assessment, $Z_h < -1.96$ was obtained during pairs I-II and I-III for all entrepreneurship attitudes and also during pair II-III for leadership, duty and result-oriented, risk-taking and originality attitudes at the significant level of 0.05, therefore, it can be concluded that the above-mentioned pairs differed significantly. $-1.96 \leq Z_h \leq +1.96$ was also obtained during pair II-III for confident, future-oriented attitudes at a significant level of 0.05, therefore, it can be concluded that the above-mentioned pairs did not differ significantly. The biggest normalized gain increase occurred on duty-oriented and result-oriented attitudes based on both self-assessment and peer assessment.

Based on analysis on questionnaire on the scale of attitude, it indicated that the students' entrepreneurship attitudes could be grown through this chemistry study program. The results of this research were in line with the opinion of Shefsky (as cited in Astamoen, 2005) that entrepreneurship attitudes are not merely abilities from birth or field experiences, but can also be learned and taught (Hisrich & Peters, 1992).

Confident attitudes during II-III based on self-assessment and peer assessment did not differ significantly. Based on the results of interviews with a number of students were found several reasons of the students' lack of confidence, namely: (1) the students were more familiar with the products related to the concept of colloid than those related to the concept of carbon compound, because the term of colloid had been discussed in class X, therefore, when the students decided to make a product related to the concept of carbon compound, they had lack of confidence; (2) the concept of carbon compound is more difficult than that of colloid, therefore, the students were not quite sure that they could relate the concept of carbon compound to the product made; and (3) when a group had decided a product to be made, the group's opinion could be easily affected by the opinions and suggestions of peer from other groups.

Future-oriented attitudes during pair II-III did not differ significantly based on peer assessment. Based on the results of interviews with a number of people, the information was obtained that when the students were given duty to make a product for the first time, the students felt their minds opened that there was an opportunity to become entrepreneurs in relation to the chemistry subject and this topic became a material of discussion with peer, but when the students made carbon compound product, this topic was not discussed again because the group focused on product making. After making a carbon compound related product, the students became more aware that there are many products related to the chemistry subject.

Presentation score. Every group presented the product made and every student had the opportunity to give presentation. Presentation was assessed by all students in the class.

The range of score used in this presentation assessment was one to five. The average scores of presentation capability on the concept of colloid and on the concept of carbon compound were respectively 3.77 and 4.37. The growth of average scores of presentation has been statistically tested using the Wilcoxon test in order to know whether or not this growth was significant. Based on the processing of 71 data, $Z_h = -7.323$ was obtained because $Z_h < -1.96$, therefore, it can be concluded that the average scores of presentation capability differed significantly between study on colloid and study on carbon compound.

The growth of presentation score for all indicators is illustrated in Figure 2. Based on Figure 2, it is obviously clear that the average score for the concept of carbon compound was higher than that for the concept of colloid.

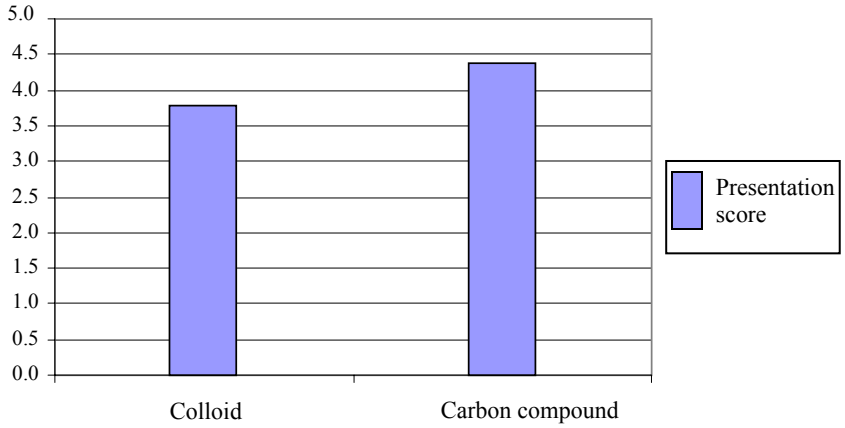

Figure 2. Presentation average score.

The growth of presentation average score for each indicator has been statistically tested using the Wilcoxon test in order to know whether or not this growth was significant. Based on the processing of 71 data, $Z_h < -1.96$ was obtained for each indicator. It can be concluded that the average score of presentation capability for each indicator differed significantly between study on colloid and carbon. The entrepreneurship attitudes intended to be developed in this presentation activity were leadership, confident and risk-taking attitudes. The indicator of leadership was the capability to communicate, whereas the indicator of risk-taking was the capability to convince audiences. The average scores of presentation capabilities on the concept of colloid and the concept of carbon compound were respectively 3.77 and 4.37, and presentation capabilities on the concept of colloid and carbon compound differed significantly.

According to Maxwell (1995), leadership is the capability of a person to influence others or, in other words, leadership is capability to acquire followers. One of the capabilities that must be owned by a leader in order to acquire followers is capability to communicate. The results of this research showed that leadership attitude differed significantly between study on colloid and carbon through presentation activity. This conforms to the opinion of Maxwell's (1995) stating that leadership can be taught.

An indicator used in this research to measure risk-taking attitude was the students' capability to convince audiences. During this presentation, the students used their entire capabilities to convince audiences in order that they were willing to buy the product made. During this activity, the students giving presentation received responses from other students acting as consumers. Responses from other students could be in the form of sentences containing lack of confidence in the effectiveness of a product, laughter and even indifference. According to Overton (2002), one of the activities that can bear risks is readiness for being laughed by others. Even though the students knew that there was a big change for being laughed, they did not become afraid or yield. Based on the results of this research, it was found that the students' risk-taking capabilities could be improved through presentation activity in chemistry subject.

Confidence can be improved through presentation activity. Based on the results of interviews with a number of students, it was revealed that when the students must give presentation for the first time in order to promote their products, they were not confident that they could do it, but when they promoted carbon compound product, they were optimist that they could do it, because they had had previous experience. This conforms to the opinion of Suryana (2003) that a person with confidence is a person who tends to be optimist and has strong belief on his/her capability to succeed. Based on the results of the observation conducted by the

observers and researchers, an improved confidence was monitored when presentation on carbon compound product was given both on the students giving the presentation and other students acting as consumers because they raised many questions, denials and doubts on the use of the products made. The interesting thing after the completion of this presentation activity was the occurrence of sale and purchase transaction among the students in class, if they were really interested in the products made by other groups.

Product score. The range of product value was one to five. Based on the assessment of 33 students, the average scores of colloid product and carbon compound product were respectively 3.63 and 4.28.

The increase of average score has been statistically tested using the Wilcoxon test in order to know whether or not this increase is significant. Based on the processing of 24 date, Z_h = -4.286 was obtained. Since Z_h < -1.96, conclusion can now be drawn that there was a significant difference between the average scores of colloid product and carbon compound product. The increase of average scores of colloid product and carbon compound product for all entrepreneurship attitudes is illustrated in Figure 3. From Figure 3, it is obvious that the average score of carbon compound product was higher than the average score of colloid product.

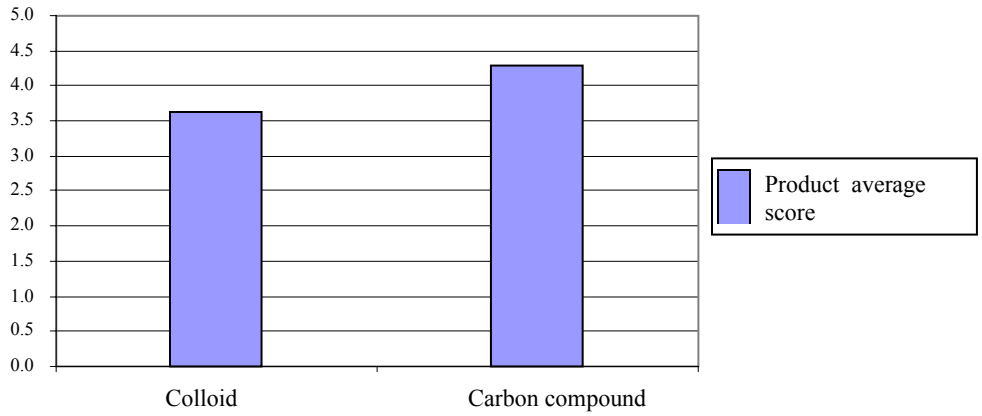

Figure 3. Average scores of colloid product and carbon compound product.

The entrepreneurship attitudes grown in this product-making were duty and result-oriented and originality attitudes. The indicators of duty and result-oriented attitudes were product use, product uniqueness, product package, suitability with consumers, price compatibility and purchase interest, whereas the indicator of originality attitude was the uniqueness of product.

Forty-two point nine percent of the students were interested in purchasing colloid product, whereas 79.8% of the students were interested in purchasing carbon compound product. The product-making average scores for product use, product uniqueness, suitability with consumers and price compatibility indicators have been statistically tested using the average difference test (*t*-test) in order to know whether or not these average scores were significant. It is concluded that the product-making average scores for product use, product uniqueness and price compatibility indicators differed significantly.

The product-making average scores for product package, suitability with consumers and product purchase interest indicators have been statistically tested using the Wilcoxon test. The conclusion showed that the average scores for product package, suitability with consumers and purchase interest indicators differed significantly. The colloid product-making average score and carbon compound product-making average score differed significantly. Based on interviews with a number of students, it was found that after the students received feed back from colloid product assessment, they concluded that besides producing creative products,

there were other things that needed to be given attention. For example, production cost must be suppressed as low as possible that the selling price could be as cheap as possible. The students further concluded that the products interested by potential consumers were food and beverage products because all consumers needed food and beverages. These results of interviews conformed to the types of products made by the students, wherein 12 groups made food and beverage products on the concept of colloid and 14 groups made food and beverage products on the concept of carbon compound. This conforms to the theory of Abraham Maslow that the primary needs constitute physical needs including food, drink and air (Passer & Smith, 2007). When the students listened to the promotion of a product, their physical and mental conditions had declined considering that they had studied for three hours at a minimum, so that food and beverage products were the products liked the most by the students. The quite interesting thing was that when study on carbon compound was commenced, the students started to think of the product to be made by their group and it became a material of discussion within the group, even though they had not been assigned to make any product.

The results of this research showed that there was a significant difference for each indicator. The students realized that in order to make a product that was interested by consumers, the things that must be given attention were product use, product package, product uniqueness, product suitability with consumers and price compatibility. Based on the results of this research, it can be concluded that entrepreneurship attitudes, namely, duty and result-oriented and originality attitudes, can be improved through the activity of making a product having a high selling value.

Students' Concepts Mastery

The data analyzed to obtain a picture of concept knowledge were pre-test and post-test scores with the score range from zero to 100. In order to see whether or not there was a significant difference between pre-test and post-test scores on the concept of colloid and carbon compound, the Wilcoxon test was used. $Z_h < -1.96$ was obtained for the pair of pre-test and post-test scores on the concept of colloid and carbon compound at the significant level of 0.05, therefore, it can be concluded that the above-mentioned pair differed significantly.

The increased pre-test and post-test scores on the concept of colloid and the concept of carbon compound are provided in Figure 4.

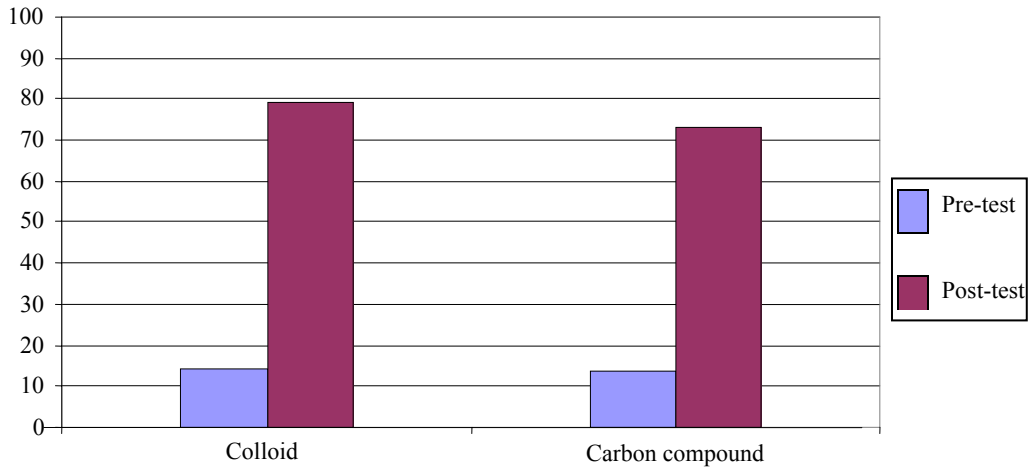

Figure 4. Pre-test and post-test average scores on the concepts mastery.

Figure 4 obviously show that the post-test score was higher than the pre-test score, and the post-test score on colloid was higher than that on carbon. The concepts to be improved in this research were the concept of chemistry and entrepreneurship.

The intended concept of entrepreneurship was the concept of business plan. The data analyzed to obtain a picture on the concept of business plan were the pre-test score and post-test score with the score range for colloid from zero to 50 and the score range for carbon compound between zero and 40.

In order to see whether or not there was a significant difference between the business plan pre-test score and post-test score on the concept of colloid and carbon compound, the Wilcoxon test was used. $Z_h < -1.96$ was obtained for the pair of pre-test and post-test scores on the concept of colloid and carbon compound at the significant level of 0.05, therefore, it can be concluded that the above-mentioned pair differed significantly. The increased business plan pre-test and post-test scores on the concept of colloid are provided in Figure 5, whereas those on the concept of carbon compound in Figure 6.

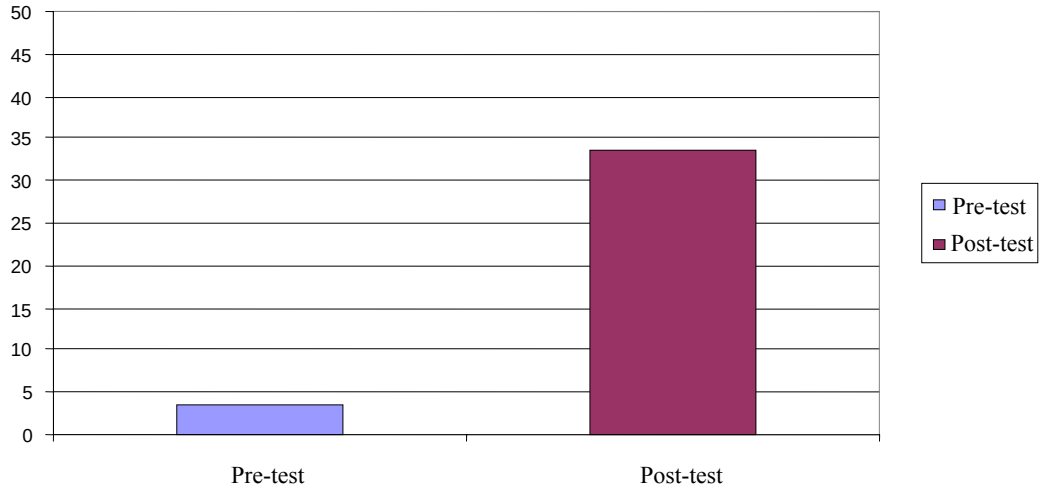

Figure 5. Business plan pre-test and post-test scores on colloid.

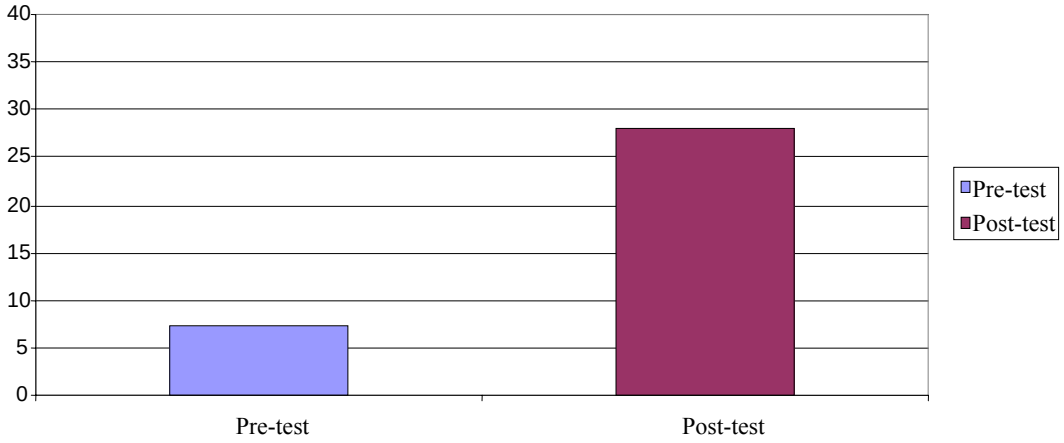

Figure 6. Business plan pre-test and post-test scores on carbon compound.

Written test on colloid consisted of three questions. The first and second questions were combinations of the concept of colloid and a product existing in market and the third was on business plan. Written test on carbon compound consisted of four questions. The first question was a combination of the concept of carbon

compound and a product existing in market. The second and third were on the concept of carbon compound. The fourth was on business plan.

The form of test used in this research was essay, since essay test can reveal students' thinking process (Hamm & Adams, 1992) and avoids students from guessing the answers (Jacobs & Chase, 1992). Here, the students must firstly understand the basic concepts of colloid and carbon compound in order to answer the questions in test related to the concept of entrepreneurship.

In this research, each concept was related to a product existing in market so that chemistry study became real. This was substantiated by the statements of a number of students and a research observer that students are likely to have a greater motivation to study chemistry, because chemistry is close to their environment. Based on the above-mentioned finding, it can be concluded that a chemistry study program that includes examples of products existing in market can improve students' concepts mastery.

The mastery of concept on business plan also differed significantly. Based on interviews with a number of students, it was found that natural science major students have never thought of business plan, let alone relating it to chemistry study. It was further found that in the beginning, students felt that business plan was only the subject of social science major and natural science students did not consider studying business plan as important. After the students had real experience of producing products, their mindset changed. They felt that there are many entrepreneurship opportunities related to chemistry study, and making business plan is important in running entrepreneurship.

Creativity

The activity used for developing creativity in this research was making mind maps mapping the concepts of chemistry and business plan. Mind map making activity was conducted in groups, where each group consisted of three or four persons.

The mind maps made were assessed by the teachers, in this case, the researchers. The range of assessment on mind map was 50 to 80. The average score of mind map on the concept of colloid for all indicators was 68.3, whereas that on the concept of carbon compound was 70.7.

The increase of average scores of mind maps has been statistically tested using the *t*-test in order to know whether or not this increase was significant.

Based on the processing of 24 data, it was obtained that $t_{count} = -2.636$, because of $t_{count} < t_{table}$, it can be concluded that the average scores of mind map differed significantly.

The increase of average scores of mind maps on colloid and carbon compound for all indicators is illustrated in Figure 7.

The average score of mind map on the concept of carbon compound was higher than that of colloid.

The characteristics of creative thinking capability are fluent thinking, flexible thinking, original thinking, elaborating and assessing skills.

This research used four characteristics of creative thinking capability. The indicator for fluent thinking skill was discretion, the indicator of original thinking skill was the originality of idea, and the indicators of elaborating skill were depth, relation (arrow), symbol and color.

The average scores of mind maps on discretion and depth indicators have been statistically tested using the Wilcoxon test in order to know whether or not this increase was significant. It is concluded that the average scores of mind maps on discretion and depth indicators differed significantly.

The average scores of mind maps on the originality of idea, color, symbol and arrow indicators have been statistically tested using the average difference test (*t*-test). Based on the processing of 24 data, it is concluded that the average scores of mind maps on the originality of idea, color, symbol and relation (arrow) indicators were the same and did not differ significantly. One of the activities used to increase the students' creativities in this research was making mind map. Here, the students related the concept of chemistry to the concept of entrepreneurship on a sheet of paper and worked on it in groups.

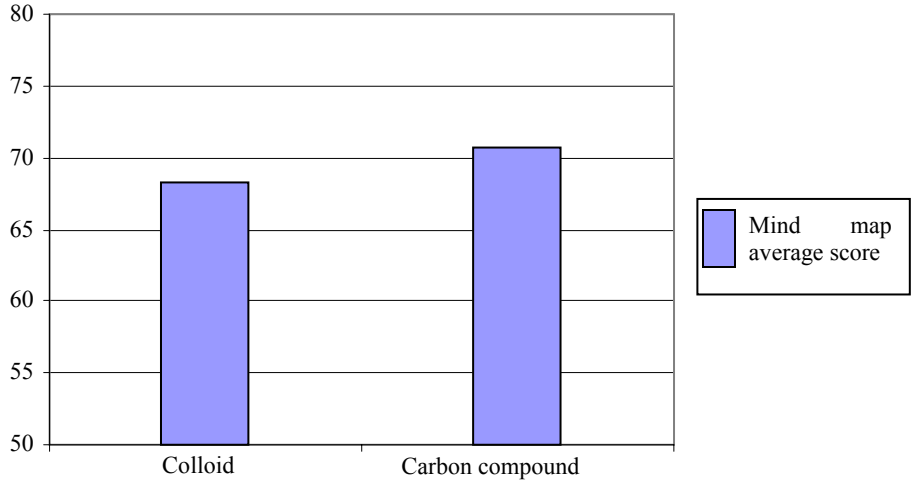

Figure 7. Average scores of mind maps on colloid and carbon compound.

Based on data analysis, the conclusion can now be drawn that the students' creativities in mind map on the concept of colloid and carbon compound differed significantly. The existence of feed back in colloid study made the students more creative in making mind map on carbon compound study. Carbon compound mind map was wider and deeper than colloid mind map.

The elaboration of the concept of entrepreneurship included: (1) background for the production of a selected product; (2) target consumers including sex and age; (3) product use; (4) small-scale and large-scale product production cost; (5) product production process including materials, tools and production method, failures experienced while making product and the effort made to overcome such failure; (6) selling price; (7) promotion including selling place and form of promotion; and (8) strengths and weaknesses of the products made if compared to the products existing in market.

Based on the results of interviews with a number of students, it was found that the students were used to making notes using straight or linear lines, without color. Therefore, the students were not used to using various colors and symbols when making mind map for the first time. It was also found that using mind map made it easy for the students to remember, understand entirely about the concept of chemistry and understand better about the existence of entrepreneurship opportunity in chemistry study.

Based on the above-mentioned finding, fluent thinking skill, flexible thinking skill and elaborating skill could be improved through mind map activity relating the concept of chemistry to entrepreneurship opportunity.

Teachers' and Students' Responses on Chemistry Study Program

The class 12 chemistry teachers of the relevant schools became observers in this research. A number of positive responses given by the relevant teachers on this study program were as follows: (1) this study program is

able to train students in making products having high selling values; (2) mind map making activity can improve students' creativity; (3) class presentation activity can build students' confidence so that the quality and quantity of presentation discussion become increasingly higher; (4) the peer assessment used for evaluating students' attitudes really helps teachers; (5) this study program can be implemented on other concepts of discussion; and (6) this study program can be implemented by all teachers both on chemistry subject and other subjects. Another response on this study program is the great amount of time required for implementing this study program.

According to the class 12 chemistry teachers who were also the observers in this research, this study program requires greater amount of time. Based on the results of discussions with observers, it was found the methods to overcome the above-mentioned matter, namely: (1) discussion between students and teachers on the product to be made can be conducted outside study hours; (2) group presentation can be conducted on extracurricular hours; (3) using electronic media, such as projector in delivering concepts; and (4) it is unnecessary to conduct all activities in this study program for each point of discussion. In one semester, students can implement this study program twice for class 10 and class 11 and once for class 12 on odd semester.

Based on the above-mentioned finding, it can be concluded that this study program receives positive responses from teachers, because it can improve students' entrepreneurship attitudes and can be applied by teachers on other subjects.

The students considered this study program as fun. The most fun activity was product-making, so that the students expected this activity to be conducted twice in one semester, while the least attractive activity was mind map making. The costs of product and mind map making were not borne by the students. Activities that were conducted in groups made them more familiar with their peers' habits and behaviors. Eventually, the students increasingly realized that chemistry subject is closely related to entrepreneurship and that they have interest in entrepreneurship.

This chemistry study program was fun for 95% of the number of students. Fun here did not have the meaning of creating clamorous and turmoil atmosphere, instead, it had the meaning as defined by Meir (2002) where study that can arouse students' interests, full involvement, and the creation of meaning and understanding of the concept studied and scores that are satisfactory to the students.

Based on questionnaires and the results of interviews with a number of students, data showed that various activities in this study program made this study not monotonous so as to grow the students' interests in science and made all the students actively involved in any activity existing in this study. This study program was commenced with laboratory activity in order that the students obtain knowledge on the concept of chemistry. This activity required the seriousness, orderliness, accuracy and full concentration of the related students in order to obtain maximum experiment results. Thereby, the students could not make jokes or chat with their friends and students felt that their room to maneuver is limited. An activity requiring full concentration, orderliness and seriousness also occurred when the students obtained knowledge on the concept of carbon compound in class. Further activities were product-making and mind map making in groups. In these activities, the students' room to maneuver started to be opened. Presentation listening activity could release pressure from the students, because their room to maneuver was wider where the students were allowed to taste testers to determine whether or not the products made were likely to be interested by potential consumers.

This study program was ended with written test in order to know how far the students have mastered the knowledge of concepts. In this activity, the students were again required to study diligently and seriously in order to obtain maximum results. From the above-mentioned, students' opinions were seen different moods that made this activity fun. The students further stated that with product-making activity, this study became more

meaningful because the students realized that this study is closely related to entrepreneurship. With various assessments, there was a greater opportunity for the students to get better scores. The most fun activity for the students was product making, whereas the least attractive activity was mind map making.

Conclusions and Suggestions

Conclusions

Based on data analysis results, findings and discussions in this research, the following conclusions can eventually be made:

(1) The characteristics of this study program are as follows. This study program consists of several activities, namely, laboratory activity, face-to-face activity in class, product-making, presentation, mind map making and written test. Entrepreneurship attitudes that can be grown through this study program are leadership, confident, duty and result-oriented, future-oriented, risk-taking and originality attitudes. The assessments used in this research are self-, peer and teacher assessment;

(2) This study program can grow senior high school students' entrepreneurship attitudes. Activities that can grow entrepreneurship attitudes are: presentation activity that can grow leadership, confident and risk-taking attitudes; product-making activity that can grow duty and result-oriented and originality attitudes; self- and peer behavior observation that can improve leadership, confident, duty and result-oriented, future-oriented, risk-taking and originality attitudes;

(3) This study program can improve the mastery of the concept of chemistry and entrepreneurship. The intended concept of chemistry is the concept of colloid and carbon compound, whereas the intended concept of entrepreneurship is business plan;

(4) This study program can improve students' creativity through mind map making activity. Creativity capability that can be developed includes fluent thinking, flexible thinking, original thinking and elaborating skills;

(5) The implemented study program receives positive responses from teachers, because this activity can open students' mind on entrepreneurship and make students active. Students give positive responses on this study program due to its fun activities. The most fun activity for students is product-making, whereas the least attractive activity is mind map making.

Suggestions

Based on the results of this research, the following suggestions can be put forward.

For policy-makers in the context of developing senior high school curriculum in the future:

(1) Each curriculum is expected being able to equip students intending to work as employees and entrepreneurs. The attitudes needed by anyone intending to become an entrepreneur and a job-seeker are the entrepreneurship. Therefore, emphasis shall be put into curriculum on the importance of the development of entrepreneurship attitudes through study in schools;

(2) Disseminating the result of this research to become an example of chemistry study that can improve students' entrepreneurship attitudes;

(3) Analyzing responses on this study program implementation from a number of schools, as the preliminary step of development of entrepreneur-minded curriculum.

For educational institutions and teaching personnel:

(1) Including entrepreneurship subject that emphasizes more on entrepreneurship attitudes point of

discussion as foundation for developing study that can develop entrepreneurship attitudes;

(2) Training candidate teachers to think and act creatively through study on any subject, because basically creative thinking skill can be practiced, so that teachers have thinking skill in designing entrepreneur-minded study.

For regental and municipal national education:

(1) Organizing seminar on entrepreneurship attitudes, so that school principals, teachers and parents realize the importance of entrepreneurship attitudes for students;

(2) Organizing training on entrepreneur-minded study, so that teachers have a full picture of entrepreneurship attitudes.

For teachers:

(1) Implementing this study program, as a preliminary step in chemistry study that can improve students' entrepreneurship attitudes;

(2) Designing similar study program on other chemistry materials;

(3) The products made use natural sources in their respective regions;

(4) Expanding promotion activities so that students get mode detailed viewpoint of public needs, for example, by way of entrusting the products made through school cooperatives or selling the products in school fair.

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