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Chemistry Student's Conceptual Understanding and Creative Thinking Skills Development Through Inquiry Models in Learning of Colloid System

Rafiuddin and Ibrahim
Department of Chemistry Education, Universitas Halu Oleo, Jalan Kampus Bumi Tridharma,
Kendari, 93232 Sulawesi Tenggara, Indonesia
rafiuddin.fkip@uho.ac.id

Abstract: The purpose of this study is to determine the effectiveness of an inquiry learning models to improve student mastery of concepts and their creative thinking. This research was conducted in a class of year 12 students at a vocational school using a pre-test and post-test control group design. Data collection was conducted using pre-test, post-test, observation and questionnaire. Improvement of creative thinking skills for the group of students has the highest control on the indicators of building knowledge that has been possessed by students with N-gain 0.40 with the medium category, the lowest on the indicator of seeing limited information with N-gain 0.15 with the low category. Increased mastery of concepts and creative thinking skills of students caused by the use of inquiry learning models in effective colloidal subject matter with a sig. (2 tailed) value <0.05, namely there are differences in the increase in mastery of concepts and creative thinking skills after the application of inquiry learning models compared to the control class. Students and teachers respond positively to the learning process with the inquiry learning model.

Key words: Mastery of concepts, creative thinking skills, learning models of direct learning model inquiry, colloidal principles, learning process, colloidal

INTRODUCTION

In order to continute to develop, human civilization requires a level of mastery of science and technology. Science and technology has developed out of mathematics and natural sciences. One branch of natural sciences is chemistry. Natural science or general science is a collection of knowledge that is arranged systematically. Learning science is not only marked by a collection of facts but is also, marked by the emergence of scientific methods that are realized through a series of scientific works, values and scientific attitudes.

Along side the chemistry learning process, students must have a variety of creative thinking skills in order to be able to creatively solve problems that occur in daily life. Creative thinking is synonymous with the capacity to generate new ideas, devise novel solutions and expressing oneself in a unique manner (Abraham, 2013).

Abraham *et al*. (2012) reported that creative conceptual expansion was associated with activity in brain regions such as the left anterior inferior frontal gyrus, lateral frontal polar cortex and temporal pole which are known to play a critical role in the retention, retrieval and integration of semantic information. Dissociation between creative potential and creative accomplishment with regard to gender has been attributed to socio-cultural and environmental factors such as gender inequality in society and differing levels of social support accorded to each gender (Baer and Kaufman, 2008; Pagnani, 2011 and Runco *et al*., 2010). Behavioral studies on gender differences in creative potential have been inconclusive thus, far with half the investigations reporting no significant differences while the other half are characterized by mixed findings that, on average, favor females (Pagnani, 2011).

Conceptual expansion is an operation that particularly critical when formulating new ideas as it refers to the ability to widen the conceptual boundaries of acquired concepts to include novel elements (Ward, 1994). This process is assessed using Gilgert's (date) alternate uses task, a widely employed task of creative thinking (Abraham and Windmann, 2007; Wallach and Kogan, 1965) where participants are required to generate multiple uses for common objects (e.g., shoe). Colloid solutions are one of the main materials in chemistry learning in vocational schools. The characteristics of subject matter learning in science requires the use of a relevant model for developing thinking skills. A characterization of the colloidal subject matter is needed to determine an appropriate model to be used. An inquiry learning model is one model that can be identified to effectively address the requirements of the colloidal

Corresponding Author: Rafiuddin, Department of Chemistry Education, Universitas Halu Oleo, Jalan Kampus Bumi Tridharma, Kendari, 93232 Sulawesi Tenggara, Indonesia, rafiuddin.fkip@uho.ac.id

subject matter. Sanjaya concurs with this conclusion, stating that inquiry learning models are able to develop the ability to think systematically, logically and critically and to develop intellectual abilities as part of the learning process. The inquiry technique presents a manageable transition from traditional transmissive lectures to more active student engagement and it provides a methodology to move from a sole focus on content to a consideration of learner self-development (Moog and Spencer, 2009). In line with this thinking, the Ministry of Education and Culture stated that the scientific inquiry process aims to foster the skills of thinking, working and being scientific and communicating as an important aspect of life skills. During the learning process students must be able to explore and develop creative ideas, rather than being limited to memorizing concepts that have been presented by the teacher. According to Jauhar (2011), inquiry learning models relate to the word to inquire which means participating or engaging in asking questions, seeking information and conducting investigations.

Inquiry learning models are based on the discovery of information by formulating a hypothesis or by making observations or conducting experiments to find answers or conclusions and to solve problems using creative and logical thinking skills by asking 'big' questions. Inquiry learning models are defined by Piaget by Robert and Trowbridge (1973) as learning that prepares the environment for children to conduct their own experiments. By contrast, teacher-centered learning models eliminate student's creativity which hampers students when dealing with problems that demand creative thinking and problem solving. An additional impact of teacher-centered instruction is the low adoption rates of concepts as indicated by the low percentage of mastery of chemistry vocational learning, especially, in learning the colloidal subject matter.

When learning through inquiry learning models, students do not have to memorize concepts and as Rusche and Jason explain using inquiry learning is the first step in self-reflective practice. Students can use questions based on processes that occur in the surrounding environment to raise their own new ideas or develop an analysis of existing phenomena. Students can use questions for developing deeper processes obtained from the results of their reflection. Rusche and Jason (2011) further state that inquiry and reflective learning models can improve creative thinking skills while the self-reflection process not only improves creative thinking skills but helps students build their knowledge and understanding of concepts independently. When learning through the inquiry model students are expected to be able to improve mastery of the colloid system using creative thinking skills. Keefer (1998) states that there are six stages in the application of inquiry learning.

Orientation: At this stage the teacher takes steps to foster an atmosphere or climate conducive to learning. The things that are done in this orientation stage are: explain the topic, goals and learning outcomes that are expected to be achieved by students. Explain the main activities that must be carried out by students to achieve goals. At this stage explained the steps of inquiry and the purpose of each step, from formulating the problem to formulating a conclusion. Explain the importance of learning topics and activities. This is done in order to provide student learning motivation.

Formulating problems: Formulating problems is a step to bring students to a problem. The problem presented is a problem that challenges students to solve it.

Formulating hypothesis: Hypothesis are temporary answers to a problem being examined. As a temporary answer the hypothesis needs to be examined. One way the teacher can help develop the ability to hypothesize is where each student asks various questions that can encourage them to form a temporary answer or formulate various estimates of possible answers to a problem being studied.

Collecting data: Collecting data is the activity of capturing the information needed to test a proposed hypothesis. In the inquiry learning model, collecting data is a mental process that is very important in intellectual development. The process of collecting data not only requires strong motivation for learning but also, requires perseverance and ability to use the potential for thinking.

Testing hypothesis: Testing hypothesis is determining the answers that are considered acceptable, according to the data or information obtained based on data collection. Testing hypothesis also, means developing rational thinking skills. That is the truth of the answers given is not only based on argumentation but must be supported by data that is found and can be accounted for.

Formulating conclusions: This is a process of describing findings obtained based on the results of testing hypothesis. To reach an accurate conclusion the teacher should be able to show students which data are relevant. Based on the literature review, it can be concluded that the inquiry learning model can improve the mastery of concepts and creative thinking skills of students, therefore, it is necessary to do research to find out the application of inquiry learning models to improve student's mastery of concepts and creative thinking skills of the colloidal system subject matter. Based on the above background, the research problem formulated is: "How effective is the use of an inquiry learning model in increasing the mastery of concepts related to the colloidal subject matter and the creative thinking skills of students in class XII of a vocational school?" To facilitate data collection in answering the problem, the following research questions we prepared.

What are the characteristics of the concepts covered in the colloidal system subject matter? How can mastery of colloidal subject matter and concepts and the creative thinking skills of XII grade students of a vocational school be improved using an inquiry learning model compared to a direct learning model? What is the effectiveness of increased student's mastery of colloidal subject matter concepts and creative thinking skills caused by the use of an inquiry learning models in compared to a direct learning model? What is the response of teachers and students to using an inquiry learning model to develop mastery of colloidal subject matter concepts?

Based on the background and literature review, inquiry model learning is actually not new in the world of education. Even, so, there are still many teachers who are unwilling and unable to apply its principles in classroom learning activities. Most teachers still persist in using the dominant direct-teaching model with teacher-centered activities. In doing so, students are immediately confronted with a fully formed concept that has been made without them being given the opportunity to gather information and find out answers for themselves. As a result, the mastery of concepts and creative thinking skills is still relatively low in the research. A vocational school is required to apply learning in accordance with scientific inquiry curriculum content standards in order to foster the attitudes, knowledge and communication skills as important aspects of life skills. Inquiry can be seen as a student-centered learning approach. Inquiry, if viewed as a model has several advantages such as:

- Encouraging students to think and work using their own initiative
- Creating an academic atmosphere that supports student-centered learning
- Helping students develop positive self-concepts
- Increasing expectations, so that, students develop ideas to complete tasks in their own way
- Optimally developing individual talents and
- Avoiding students learning from memorizing

Therefore, if applied in the science classroom, the inquiry learning model is expected to improve the mastery of concepts and creative thinking skills in students.

MATERIALS AND METHODS

An experimental pre-test post-test control group design research method was used to determine the increase in mastery of concepts and creative thinking skills while an overview of student's responses to inquiry-based learning was done descriptively. Because both the experimental and control groups came from the same student population, the experimental group and the control group, were determined randomly. Furthermore, the pre-test was carried with both groups, after which the experimental group was exposed to learning using an inquiry learning model while the control group used a direct learning model.

This research was carried out at vocational school, Kendari, Southeast Sulawesi, in the 2014/2015 academic year even semester in February, XII using SPM B class (control class) and XII SPM A (experimental class). Primary data collection techniques consisted of: learning outcome data, concept mastery data, student's creative thinking skills and teacher and student response data on inquiry learning models. The research began with the preparation, research, data analysis and conclusions stages. The research process was divided into three stages: preparation, implementation and completion.

Research instruments determination of concept characteristics consists of: concept analysis format in the form of tables include: concept labels, concept definitions, types of concepts, concept attributes (critical attributes, variable attributes), concept positions (subordinates, coordinates, super-ordinates), examples and non-examples. The concept map format is in the form of braided boxes between concepts and conjunctions in the colloidal subject matter.

The instrument used for determining concept characteristics aimed to find out abstract concepts with concrete examples, concepts that state processes, abstract concepts, concepts of symbol states, concepts that state the nature and names of attributes and concepts that state attributes or attributes. The concept that has been characterized in the colloidal subject matter is useful in the selection of models and learning media that are suitable for use that teach it. Shulman (1987) concurs that the learning model must be in accordance with the characteristics of the concepts studied. The instrument used to measure the mastery of concepts and creative thinking skills was a multiple-choice form consisting of 11 questions. To measure the student's concept attainment and creative thinking skills before receiving treatment, the inquiry learning model was introduced pre-test while to measure the concept of students after receiving instruction, a post-test was done. The concept test items were developed in consultation with the supervisors, validated by experts and tested.

A questionnaire was used to capture student responses to the inquiry learning model in mastering colloidal subject matter. The questionnaire Likert scale consisting of 10 statements was used in this study. The scope of the statements in the student questionnaire included: shows interest in learning, shows agreement on student activity in the inquiry model inquiry, compatibility with the competencies to be achieved and the compatibility between inquiry learning models and creative thinking skills.

RESULTS AND DISCUSSION

Characteristics of concepts of colloidal principles: The characteristics of the concept, the concepts contained in the colloidal subject matter can be seen in Table 1. Based on Table 1 above, it appears there are 24 concepts identified in the respective subject matter colloid each has a concept that can be defined and has attributes. To find out the results of concept analysis that shows the characteristics of the colloidal subject matter can be seen in Table 2.

Based on Table 2 above, concepts such as the concept of colloid, Tyndall effect, Brown motion and coagulation are including abstract concepts with concrete examples with percentage of 16.67%. The concept of dispersion, condensation, aerosols, soles, emulsions, gels, electrophoresis, foam, solid emulsions, mechanics including the concept that states process with a percentage of 50%, concepts such as the concept of displacement reactions, hydrolysis, redox reactions including concepts that express symbols because the concept contains a symbolic representation with a percentage of 12.5%, concepts such as adsorption, liophile, liofob are critical attribute concepts and the variable attribute with a percentage of 12.25%, concepts such as dispersion medium including the concept that states the attributes and attributes with a percentage of 4.16% and the concept of dispersion phase is a concept that states the attributes or attribute size 4.16% (Herron *et al*., 1977).

Average pre-test, post-test and N-gain improved mastery of concepts and creative thinking: Score analysis of the average score of pre-test, post-test and N-gain mastery of the concept of the experimental class students and control class students in colloidal subject matter can be seen in Table 3.

Table 1: Identification of concepts in colloidal material

Concept	Concept can be defined	Having attributes
Colloid	√	√
Tyndall effect	√	√
Brown motion	√	√
Adsorption	√	√
Coagulation	√	√
Electrophoresis	√	√
Liophile	√	√
Liophob	√	√
Dispersion	√	√
Condensation	√	√
Aerosol	√	√
Soles	√	√
Emulsion	√	√
Foam	√	√
Gel	√	√
Froth	√	√
Solid emulsion	√	√
Dispersion phase	√	√
Medium dispersions	√	√
Mechanical	√	√
Peptizing	√	√
Displacement reactions	√	√
The hydrolysis reaction	√	√
Redox reactions	√	√

Table 2: Characteristics of colloidal concepts

Type of concept	Label concept	Number	Percentage
Abstract concept with examples of concretes	Colloid, effects of tyndall, brown motion and coagulation	4	16.67
Concepts that state the process of	Dispersion, condensation, aerosols, insoles, emulsions, gels, electrophoresis, foam, froth, solid emulsion, mechanical and peptization	12	50.00
Abstract concepts of	Adsorption, liofil and liophob transfer	3	12.50
Concept of symbol states	Reaction, hydrolysis and redox reaction	3	12.50
Concepts stating the properties and names of attributes	Dispersion medium	1	4.16
Concepts stating properties or size of attributes	Dispersion phase	1	4.16

Table 3: Summary of average scores pre-test, post-test and N-gain mastery of concepts and creative thinking skills class students experiment and control class

Mastery of concepts and creative thinking skills	Pretest		Posttest		N-gain	
	Control class	Experiment class	Control class	Experiment class	Control class	Experiment class
Maximum score	36	42	63	74	1.00	1.00
Average score	28.95	28.21	51.73	64.21	0.34	0.53

Table 4: Determination of N-gain mastery of the highest and lowest concept of the experimental class

Indicator of mastery of concepts concept	Label	No. problem	Mean pre-test score	Average post-test score	N-gain
Grouping colloid	Colloid and not colloid, discretionary phase, medium dispersion	1.2.3	20.63	36.67	0.87
Colloidal properties	Froth, solid emulsion, smoke, brown motion	4.5, 6, 10	3.83	14.54	0.44
The role of colloids in daily life	Adsorption condensation	7 9	1.30	6.25	0.31
Colloid dressing	Coagulation transfer reactions	8 11	2.42	6.75	0.30

Table 5: Determination of N-gain mastery of the highest and lowest concept of control class

Indicator mastery of concept	Label	No. problem	Mean pre-test score	Average post-test score	N-gain
Grouping colloid	Colloid and not colloid, discretionary phase, dispersion medium	1.2.3	20.18	31.27 froth	0.58
Colloidal properties	Solid emulsion, smoke	4.5, 6, 10	3.27	27.36	0.40
The role of colloids in daily life	Motion brown adsorption of condensation	7 9	1.36	22.41	0.09
Producing colloid	Coagulation reactions	8 11	3.09	Transfer 15.86	0.25

Table 6: N-gain determination of the highest and lowest creative thinking skills improvement in the experimental group

Indicators of creative thinking skills	Question	Average pre-test score	Average post-test score	N-gain
Building knowledge possessed by students	1,3,5, 9,10	14.63	34.08	0.58
Generating curiosity	6,7,11	3.38	9, 54	0.28
Viewing information from a different perspective	2.4	9.71	18.75	0.98
Limited information forecasting	8	0.50	1.38	0.18

Based on Table 3 above, it can be seen that the average score pre-test of the experimental group was 28.21 and the control group 28.95 from an ideal score. While the average post-test score for the experimental group was 64.21 and the average post-test score of the control group was 51.73 from the ideal score. The increase in N-gain for the experimental group was 0.53 in the medium category and the average score N-gain for the control group was 0.34 in the medium category. This shows that the use of an inquiry learning model can improve student's mastery of colloidal subject matter concepts and creative thinking compared to a direct learning model. Sudjana and Rivai (2015), state that students are motivated to learn, if educators not only teach verbally but also, give interesting and fun learning activities. AAL. (2004) and Ibe (2013) agree that contextual learning environments are able to create meaningful learning experiences, since, students can study, build knowledge and develop skills themselves.

Increased mastery of concepts in colloidal subject matter: The results of the analysis of pre-test, post-test and N-gain increased mastery of the concepts referred to in this study and consisted of concept labels namely: colloid grouping, solid characteristics, application of colloids in daily life and colloid manufacture. The average score N-gain on each concept label is clearly shown in Table 4.

Based on Table 4 above, it looks N- the highest mastery of concepts in the colloidal grouping indicator 0.87 and the lowest in the colloid making indicator 0.30. Determination of the N-gain mastery of the concept of the highest and lowest control class can be seen in Table.5.

Based on Table 5 above, the highest N-gain is seen colloidal N-gain grouping indicator was 0.58 with the lowest and medium category indicators of the role of colloids in daily life. N-gain 0.09 with low category. This shows that the highest N-gain in the experimental group is 0.87 higher than 0.58 in the control group. Thus, mastery of concepts in the experimental group is higher than in the control group.

Improvement of student's creative thinking skills: Analysis of pre-test, post-test and N-gain improvement of

Table 7: N-gain determination of the highest and lowest creative thinking skills in the control group

Indicator creative thinking skills	No. problem	Mean score pretest	Mean scorepos t-test	N-gain
Building the knowledge that students have	1,3,5,9.10	14.41	27.91	0.40
Arouse curiosity	6,7,11	3.61	8.14	0.21
Viewing information from different perspectives	2,4	9.73	13.32	0.38
Limited information forecasting	8	1.18	2.32	0.15

Table 8: Summary of normality test mastery of concepts and creative thinking skills control class, the experimental class, n-gain experimental class and n-gain control class

	Control class			Experiment class			
Variables	Pre test	Post test	N-gain	Pre test	Post test	N-gain	Conclusion
Asymp. Sig. 0.778 0.609	0.664	0.926	0.778	(2tailed)	0.934	0.694	Data is normally distributed
conclusion	Ho accepted			Ho is accepted			

Table 9: Summary of homogeneity test mastery of concepts and creative thinking skills of students

Variables	Levene's test for equality of variances	Conclusion
Sig.	0.358	Homogeneous data
Conclusion	Ho is accepted	

Table 10: Test summary T mastery of student's creative concepts and thinking skills

	Equal variances assumed	Conclusion
Sig (2-tailed)	0.000	Significant
Conclusion	Ho is rejected	

student's creative thinking skills referred to in this study consisted of indicators of student's creative thinking skills: building knowledge possessed by students, viewing information from a limited angle, arousing a sense of desire to know and predicting from limited information. Average score N-gain on each indicator of student's creative thinking skills.

N-gain determination, the highest and lowest improvement of creative thinking skills in the experimental group can be seen in Table 6. Based on Table 6 above, it can be seen that the highest N-gain of creative thinking skills in the experimental group on the indicator looked at information from a different perspective 0.98 while the lowest was 0.18 in the limited indicator of information forecasting.

N-gain determination improvement of the highest and lowest creative thinking skills in the control group in Table 7. Based on Table 7 above, the highest N-gain in the control group for the indicator of building knowledge that students have is 0.40 in the medium category, the lowest indicator is the limited information forecasting that the student's N-gain is 0.15. This shows that the highest N-gain in the experimental group is 0.98 higher than 0.40 for the control group. Thus, the improvement of creative thinking skills in the experimental group is higher than the control group. This result shows that the study affects student's creative thinking skills in high percentage.

Effectiveness of increasing mastery of concepts and creative thinking skills of students with inquiry learning models: To test the effectiveness of increased student mastery of concepts applied in inquiry learning models (in the experimental group), data normality was first tested using SPSS 19. Results of normality mastery of concepts and skills. Creative thinking of students in the control group and experimental group can be seen in Table 8. Table 8 above shows the normality test pre-test and post-test control group received the Ho for both p-value of 0.664 and 0.926> 0.05. This reflects that both data from the pre-test and post-test are normally distributed. To test the normality of the pre-test and post-test the experimental group accepts Ho because both p-values are 0.609 and 0.934>0.05. This suggests that both data from the pre-test and post-test are normally distributed.

Furthermore, the N-gain of the control group and the N-gain of the experimental group is given Ho because both p-values are 0.778 and 0.694>0.05. Therefore, N-gain data from both the control group and the experimental group are normally distributed. A test of homogeneity was conducted with Levene's test which can be seen in Table 9.

Based on Table 9 above, we can see the results of the homogeneity test with a sig. value of 0.358>0.05 or Ho accepted, meaning homogeneous data variance. The homogeneous test was followed by a different test to determine the effectiveness of inquiry learning models and can be seen in Table 10.

Based on Table 10 above, it can be seen that the t test of sig (2 tailed) value<0.05 means that Ho is rejected. This means that the mastery of concept scores and creative thinking skills using an inquiry learning model are better than using a direct learning model. Overall, both the mastery of concept scores and creative thinking skills achieved by using an inquiry learning model are better than before the model was introduced or compared with direct learning models. An inquiry learning model effectively increases the score of mastery of concepts and creative thinking skills in the learning process with a 95% confidence level. Curiosity is a stimulus toinquiry, since, each discovery raises newquestions and suggests new undertakings. Therefore, students should show great

Table 11: Summary of questionnaire data teacher's responses to inquiry learning model

Statement	Score	Conclusion
Use of inquiry learning models help students to increasing their learning motivation	4	Positive
Use of inquiry learning models help students in absorbing colloidal concepts	4	Positive
Use of the inquiry model as a learning medium motivates students to be more active in learning activities	5	Very positive
Use of inquiry learning models helps improve student's creative thinking skills	4	Positive
Use of inquiry learning models facilitates learning	4	Positive
Use of inquiry learning models does not interfere with learning activities	4	Positive
Use of inquiry learning models do not take up much time	3	Neutral
I will use an inquiry learning model in teaching the colloidal subject matter	4	Positive
I will use the subject inquiry learning model in addition to colloidal material	4	Positive
I am interested in using an inquiry model	4	Positive
Average	4	Positive

Table 12: Summary of student responses questionnaire data to inquiry learning model average

Statement	Score	Conclusion
Learning colloidal system with fun inquiry learning model	80	Positive
Learning colloidal system with inquiry learning model motivates me to dig for further information	80	Positive
Learn about system concepts colloid using inquiry learning models can gain a real learning experience	75	Positive
Learning the concept of a colloidal system with inquiry learning models helps me understand the concepts being studied	85	Positive
Learning the concept of a colloidal system using an inquiry learning model makes me interested in learning more about chemistry	75	Positive
Learning by using this inquiry learning model encouraged me to discover for myself the concepts and principles in the material being studied	90	Positive
Learning the colloidal system material with the inquiry learning model expanded my creative thinking skills	80	Positive
learning using an inquiry model made it easier to understand chemistry	85	Positive
The questions contained in the student activity sheet helped me to reflect on the learning activities carried out	70	Positive
The learning objectives of the inquiry learning model were clear and focused	80	Positive
Total	800	Positive
Average	80	

curiosityfor the science courses and by using inquiry based learning teachers are enabling curiosity to be stimulated (Erdogan, 2017).

Teacher and student responses about the developed inquiry learning model: The teacher's response this learning model being used in the classroom was measured based on the results of the analysis of the questionnaire which containseda set of teacher responses and assessments during the learning process. Questionnaires were given to teachers aimed at finding out the response and assessment of teachers to the inquiry learning model. The summary results of the analysis of the teacher's response to the inquiry learning model can be seen in Table 11.

Based on the data in Table 11 above, the average questionnaire data shows 4 positive teacher responses. The teacher agreed that the mastery of colloidal subject matter concepts use the inquiry learning model.

A student response questionnaire sheet contained aspects that show student's responses to the implementation of learning. Questionnaire sheets were given to determine their responses to the use of an inquiry learning model and the response data were analyzed to determine the level and percentage of student responses to the application of the learning model. The results of the student response questionnaire data analysis in detail can be seen in Table 12. Based on the data in Table 12 above, there is an average score of 80 positive student responses. Students agreed that mastery of the concept of colloidal subject matter occurred when using an inquiry learning model. In general, inquiry learning engaged students in constructing their knowledge and developing their understanding by engaging in new learning experiences.

CONCLUSION

Based on the formulation of the problem and the research that has been conducted on the implementation of an inquiry learning model to improve the mastery of concepts and creative thinking skills of students class XII vocational school in the subject matter of colloids it can be concluded as follows:

The characteristics of the material concept of colloid composed of 50% concept stated the process, 16.67% concepts which expressed abstracts with concrete examples, 12.5% abstract concepts, 12.5% concepts that expressed symbols, 4.16% concepts stated the properties and names of attributes and 4.16% concepts which stated attribute properties or size.

The increase in mastery of concepts and creative thinking skills in the experimental class can be seen from the average a N-gain for the experimental class of 0.53 with the medium category compared to the average a N-gain for the control class of 0.34 with the medium category. Increased mastery of concepts and creative thinking skills of students caused by the use of inquiry learning models in effective colloidal subject matter. With a smaller significance level of 0.05 indicating a significant increase in mastery of concepts and creative thinking skills between inquiry learning models compared to direct learning models with a 95% confidence level.

Teachers and students gave positive responses to the application of an inquiry learning model in teaching and learning colloidal subject matter.

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