

IMPLEMENTATION OF INQUIRY LEARNING MODEL TO TRAIN PROCESS SKILL IN ACID BASE MATTER FOR GRADE XI STUDENT OF SMA NEGERI 15 SURABAYA

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Abstrak

Tujuan penelitian untuk mengetahui keberhasilan penerapan model pembelajaran inkuiri untuk melatih keterampilan proses pada materi pokok asam-basa. Keberhasilan pembelajaran ini dinilai dari: 1) Keterlaksanaan model pembelajaran inkuiri, 2) Kemampuan keterampilan proses siswa selama dan setelah penerapan model pembelajaran inkuiri, 3) Kemampuan keterampilan psikomotor siswa setelah penerapan model pembelajaran inkuiri, dan 4) Respon siswa terhadap penerapan model pembelajaran inkuiri. Rancangan penelitian yang digunakan dalam penelitian ini adalah *one shot case study*. Hasil penelitian penerapan model pembelajaran inkuiri menunjukkan bahwa: 1) Persentase rata-rata kemampuan pengelolaan model pembelajaran inkuiri dari pertemuan 1 hingga pertemuan 3 secara berturut-turut sebesar 80% (Baik), 89% (Sangat Baik), dan 93% (Sangat Baik), 2) Rata-rata nilai keterampilan proses siswa dari pertemuan 1 hingga pertemuan 3 secara berturut-turut sebesar 58, 75, dan 79 dengan ketuntasan kompetensi keterampilan proses secara klasikal sebesar 71%, 3) Kemampuan keterampilan psikomotor siswa secara keseluruhan sangat baik. Rata-rata nilai keterampilan psikomotor siswa secara keseluruhan sebesar 89, 4) Respon siswa terhadap penerapan model pembelajaran inkuiri untuk melatih keterampilan proses adalah positif.

Kata Kunci: Model Pembelajaran Inkuiri, Keterampilan Proses, Asam Basa

Abstract

The aims of the study are to know the success of inquiry learning model implementation to train process skill in matter of acid-base. The success of implementation is evaluated based on: 1) the enforceability of inquiry learning model, 2) the ability of student's process skill during and after implementation of inquiry learning model, 3) the ability of student's psychomotor skill after implementation of inquiry learning model, and 4) student's response after implementation of inquiry learning model. The research design used is one shot case study. The result after implementation of inquiry learning model shows that: 1) The average percentage of teacher's ability to manage class through inquiry model for meeting 1 is 80% (Good), meeting 2 is 89% (Excellent), meeting 3 is 92% (Excellent), 2) The average score of student's process skill for meeting 1 is 58, meeting 2 is 75, and meeting 3 is 79 with classical score reached 71%, 3) The average score of student's psychomotor skill for the whole component is 89, 4) Student's response after implementation of inquiry learning model is positive.

Keywords: Inquiry learning model, science process skill, acid base.

INTRODUCTION

Chemistry is a science that is acquired and developed based on experiments that seek answers to the question of what, why, and how the indicators of a reaction in nature. Chemistry learning in schools should emphasize the provision of experience to develop the competencies so students are able to explore and understand the universe scientifically. Therefore, assessment and learning in chemistry should pay attention to the characteristics of

chemistry as products and processes. Based on the statement above, to learn chemistry students need to be given experience conducting scientific activity as the embodiment of science as a process. The learning process can be done with an emphasis on science process skills approach. Science process skills approach emphasizes the process of learning, activity, and creativity of the students, including the involvement of physical, mental, and social skill in acquiring the knowledge, skills, values, and

attitudes to apply it in daily life for achieving a goal.

Chemistry learning that took place during this time emphasizes chemistry as product, the characteristics of chemistry as a process is often overlooked. This is consistent with the results of pre study that has been conducted on October 25, 2012 by a student of class XI IA 1 SMA Negeri 15 Surabaya. There are 78.6% of students could not mention the steps in the scientific method correctly, as many as 92.1 % of students could not explain the types of variables, and as many as 85.7% of students could not mention the name and function of lab equipment properly. Although it has been taught and explained earlier about the steps of scientific method, students are still confused and do not understand about the variables used in the experiment. Especially in the subject matter of acid-base that has indicators of competence achievement (1) Identify the nature of the acid and base solutions with various indicators through laboratory experiments, (2) Estimating the pH of unknown solution by observation of trajectory color changing of acid and base various indicator through laboratory experiments.

Based on indicators of learning outcomes achievement and data of pre study above, the subject matter of acid-base can be taught with the inquiry learning model. This is supported by Indrawati in Trianto[1] that learning is more effective when organized through information processing learning models such as inquiry. Inquiry learning model is a learning model that allows students to use the way scientists are thinking and working in finding something. National research council[2] stated that the inquiry is a multifaceted activity that involves making observations, posing questions, examining books and other sources of information to see what is already known, planning investigations, collecting evidence, using tools and materials to collect evidence, analyzing and interpreting data, answering questions and explaining, making predictions, and communicating the results.

The aims in this study are to determine:

- (1) The enforceability of inquiry learning model,
- (2) The ability of student to master the process skills after the implementation of

inquiry learning model, (3) The ability of students to master psychomotor skills after the implementation of inquiry learning model, (4) Students' response to the implementation of inquiry learning model.

The enforceability of inquiry learning model in this study is based on the syntax of inquiry learning model according to Eggen and Kauchak[3]. The stages of the inquiry learning are as follows.

Table 1 Syntax of Inquiry Learning Model

Phase	Teacher Behavior
1. Presenting Question	Teachers guide students to identify the problem and written on the board.
2. Making Hypothesis	Teachers provide opportunities for students to discuss in making hypothesis
3. Designing Experiments	Teachers provide opportunities for students to determine the procedure consistent with the hypothesis that will be done.
4. Conducting Experiments to Obtain Information	Teachers guide students get information through trial.
5. Collecting and Analyzing Data	Teachers provide opportunities for each group to present the results of processing the data collected.
6. Making Conclusions	Teachers guide students in making conclusions.

Students' process skill is expected can be trained through syntax of inquiry learning model above. Paidi[4] describes the process skill as an activity in thinking, measuring, solving problems by using reasoning skills so students need to have a process skill that includes the simplest ability as observing, measuring, until the highest capabilities is the ability to experiment. The teaching and learning of process skill is emphasized to develop the basic skills of students. Interaction between capabilities and concepts through the process of teaching and learning will further develop the attitudes and values on students, such as critical thinking, creativity,

thoroughness, and the ability to solve problems.

Scientific process or scientific method is a basic concept that can be broken down into a number of components of process skills. The components of the process skills practiced in this study were (1) Observing, (2) Asking a Question, (3) Making hypothesis, (4) Designing Experiments, (5) Collecting Data, (6) Analyzing Data; (7) Making Conclusions and (8) Communicating in writing.

The observation skill is the most basic skills which is needed to acquire knowledge in process and it is the cornerstone for developing the skills of another process. According to Nur[5] observation is using one or more senses to gather information. Observations can be qualitative or quantitative. Qualitative observations are descriptions without using numbers, for example reported color, odor, taste, texture, or sound. While quantitative observations enter the numbers on the observations made, for example, count or measure objects.

The ability to ask questions is an advanced skill in the process skills. According to Nur[5] the question as a scientific questions when the question can be answered by observations or evidence.

The ability to make hypothesis is an essential part of science. A hypothesis is a possible explanation for a set of observations or answer to a scientific question. In science, a hypothesis must be testable. The way a hypothesis is written can show you how to test that hypothesis.

The ability to design experiments is the ability to create an organized plan to test a hypothesis. An experimental design generally follows a certain pattern. When designing the experiment, students will use a lot of science process skills including planning a procedure. The Procedures describe what is planned to be done and identify the data to be collected.

Ability to collect the data is the ability to record observations result and state the changes that occurred in the product. The steps that can be taken in the data collection is recording measurements, writing units of measurement, making sufficient investigation to reduce errors, presenting data using tables, maps, or graphics, drawing, sketching, photographing the final product on the report, and giving the name or stating the physical changes that occurred in the picture or final product of the experiment.

The ability to analyze the data is the ability to interpret the observations. According

to Kheng[6] in analyzing data required to use scientific knowledge to explain and interpret the data. Data analysis can also be an explanation of the consequences if one of the variables used disappears. It means that after collecting data had been done, interpretation is needed to find the meaning of significance in the data by looking for patterns or trends.

The ability to make conclusions is the ability to make a statement which summarizes what has been learned from an experiment or observation. Conclusions of an experiment are generally associated with the hypothesis because the hypothesis is a temporary explanation that can be tested by experiment.

Ability to communicate the results of the experiment is to convey the results of scientific studies activities, both directly (orally) or indirectly (in writing), either individually or in groups. Oral communication is done through various ideas in person and by phone. While written communications made in the form of printed reports, generally in scientific journals and lab reports. The lab report generally contains the following sections, in order: a problem or question, hypothesis, list of tools and materials, procedures, observations, analyzes, and conclusions.

Psychomotor skills are practiced in this study includes four components: (1) Skills of using a pipette, litmus paper, and universal indicator, (2) Skills of measuring the volume of the solution by using graduated cylinder. According to Bloom's taxonomy psychomotor domain includes physical movement, coordination, and use of motor skills. Psychomotor learning outcomes appear in the form of individual skills and the ability to act. According to Mills (in Sullivan[7]) skills learning will be effective when done using the principle of learning by doing. Exercises are done repeatedly will give you a huge influence on mastering skills. Psychomotor skills learning outcomes can be measured by (1) direct observation and assessment of the behavior of learners during the learning process takes place, (2) after the following study, by giving tests to students to measure knowledge, skills, and attitudes, (3) after the study is completed and later in the work environment.

METHOD

Research design used in this study was One Shot Case Study, where students is given treatment that was the implementation of the learning process by using inquiry learning model. Populations of this data were all class XI students of SMA Negeri 15 Surabaya, while the sample used was class XI IA 1. Acquisition of the data in this study was done through three methods: observation, tests, and questionnaires. Observation made during the study. This method was used to determine the enforceability of inquiry learning model during the learning process and assess psychomotor and process skill of students. Test method was used to obtain quantitative data as a test score of learning outcomes and process skills of the students. Data collection of student learning outcomes using objective tests about acid and base material. Process skills test score data collection using a test essay. While the questionnaire method used to determine students' responses after the implementation of inquiry learning model. All the learning and research instrument in this study has been reviewed by the Unesa lecture and validated by Unesa lecture and chemistry teacher of SMAN 15 Surabaya. In this study, researchers act as teachers implement inquiry learning model to train process skills to students. Observer who helped in making the data on this is study is Unesa chemical education students. The experiment was conducted at SMAN 15 Surabaya for five sessions. Each meeting lasted 90 minutes.

The data analysis technique used was descriptive quantitative. Data of inquiry learning model enforceability is analyzed with interval scale and processed in the percentage form. Enforceability of inquiry learning model is quite good when the percentage obtained achieving $\geq 61\%$. Data of student process skills acquired in two stages, during the learning process through observation and at the end of the meeting through a test. During the learning process, process skills assessment of students seen from the scoring rubric which has 4 value range based components that must be met. Score for each criterion is obtained from the number of criteria obtained divided by the number of students who studied multiplied by 100%. The evaluation at the end of the meeting was measured using essay questions test item covering all components of process skill except the skill to communicate. Student process skills said complete if the student individually obtains values ≥ 67 and classically considered if there are 67% of students achieving grades \geq

67. Data assessment of students psychomotor skills seen from scoring rubric for each of the psychomotor skills with a range of different values. Then score each criterion is obtained from the number of criteria obtained divided by the number of students who studied students multiplied by 100%. Ideal limit for students in mastering the skill is if individually obtaining value ≥ 67 . Data analysis for student response questionnaire is obtained by changing the frequency to a percentage. If there are $\geq 61\%$ students who answer positively, so it can be said that considered all student agree to the implementation of inquiry learning model.

RESULT AND DISCUSSION

A. Enforceability of Inquiry Learning Model

Data of enforceability inquiry learning model observation presented in Figure 1 below:

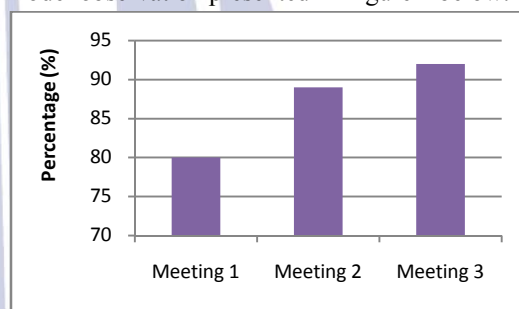


Figure 1 Percentage of Inquiry Learning Model Enforceability

From the figure above, it is evident that an increase in inquiry learning model management capability of meeting 1 to meeting 3. The average percentage of capacity management on meeting 1, 2, and 3 respectively was 80% (good), 89% (very good), and 92% (very good). Thus, the ability of management learning model can be said to be effective.

According Gulo[8], inquiry is a learning model that allows students to use the way scientists think and work in finding something. Seen from the characteristic of chemistry that was developed based on experiments, then in studying chemistry students need to be given experience conducting scientific as the embodiment of science as a process. Inquiry learning model is considered able to train process skills so it can be a way out to meet the characteristics of the chemical sciences. Especially in some aspects such as syntax inquiry learning model that is similar to the basic process skills that must be mastered by the student, such as questioning phase, formulating hypothesis phase, designing

experiments phase, carrying out experiments phase, analyzed data phase, and make conclusions phase.

B. Process Skill

Assessment data of process skill is presented in Figure 2 below:

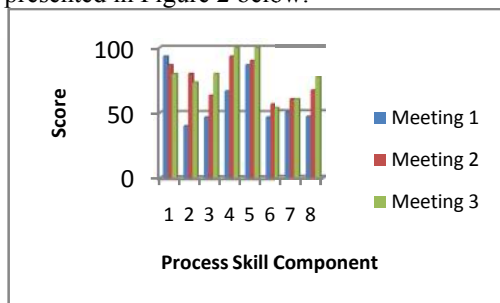


Figure 2 Average Score of Student Process Skill

Explanation::

1. Observing
2. Asking question
3. Making Hypothesis
4. Designing Experiment
5. Collecting Data
6. Analyzing Data
7. Making Conclusion
8. Communicating

Based on the figure above, it can be seen that there is a decline in the value obtained by the students on the skills of observing. According to Nur[5] observation is the use of one or more senses to gather information. Activities of the observations made by the students at the meeting 1 is kind of simple observation that only requires a sense of vision alone, while at the third meeting of the observations observing skills become more complex and demand more senses are used, therefore, natural that the score of students decreased from meeting 1 to meeting 3.

Asking questions process skill of students has increased from meeting 1 to meeting 2, but decreased again at the meeting 3. According to Nur[5] the question said scientific questions when it can be answered by observations or evidence. To be able to answer scientific questions by observation, the variables used in the experiment should be clear. Decline that occurred at the meeting 3 is caused by many variables must be used in the experiment so it made students confused to ask questions properly.

For the other components of process skills such as making hypothesis, designing experiments, collecting data, analyzing the data, making conclusions, and communicating

has increased from meeting 1 to meeting 3. It is also supported by data on the increasing ability of classroom management by teachers.

The average score of the overall students' process skills in meeting 1, 2, and 3 respectively are 58,75,79. While the classical completeness of student assessment of process skill after the written test by 71%. Thus, it can be said that the implementation of inquiry learning model for training process skills is very effective.

C. Psychomotor Skill

The assessment data of psychomotor skills are presented in Figure 3 below:

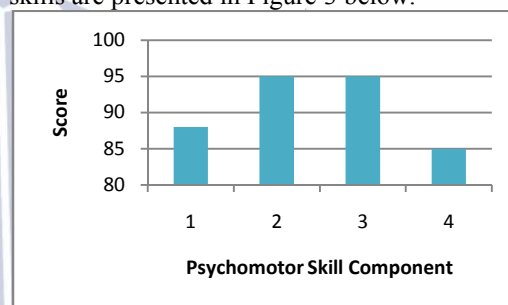


Figure 3 Average score of Psychomotor Skill

Explanation:

1. Skills to use pipette
2. Skills to use litmus paper
3. Skills to use universal indicator
4. Skills to measure volume

From the figure above is known that the average value of the psychomotor skills of students is more than 67 in each component. That is to say the application of this model of inquiry learning can improve students' psychomotor skills.

According to Mills (in Sullivan [9]) learning skills will be effective when done using the principle of learning by doing. In the application of this inquiry learning model, at each meeting of the skills students are trained to perform a skill to use pipette properly. Exercises are done repeatedly will give you a huge influence on mastering skills.

D. Student Response

Responses of students in inquiry learning model implementation can be shown in Figure 4 below:

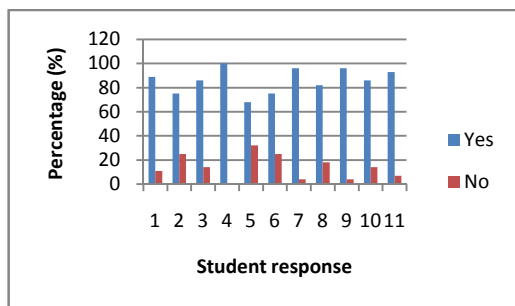


Figure 4 Percentage of Student Response

Explanation:

1. Students feel happy during the study.
2. Students feel a lot of exciting new things at this time of learning.
3. Students feel learning model is easier to understand the material.
4. Students find it easier learning model in determining the scientific steps
5. Students find this learning model makes them more active
6. Students feel by using this model of learning chemistry is becoming increasingly easy.
7. With this learning model, students are asking questions research more easily.
8. This inquiry learning model allows students to master the process skills to make the of hypothesis.
9. Students find it easy to design an experiment using the learning model
10. Learning models like this makes the students more active in analyzing experimental data
11. With this learning model, students felt conclude the trial was getting easier.

Based on these data it can be proved that the implementation of inquiry learning model can make teaching more enjoyable. In addition, the application of inquiry learning model can facilitate students in understanding the learning material. The percentage of the data obtained can be seen that teaching chemistry using inquiry learning model can facilitate students in determining scientific procedure or science process skills.

CLOSURE

Conclusion

Based on the results of the data analysis and discussion, it can be concluded as follows:

1. Enforceability of inquiry learning model for training process skills in the matter of acid-base class XI student of SMAN 15 Surabaya is excellent with the average

percentage of inquiry learning model management capabilities at the first meeting by 80% (good), at the second meeting by 89% (Excellent), and at the third meeting of 92% (Excellent). It shows that teachers have implemented appropriate learning stages in the inquiry learning model.

2. Implementation of inquiry learning model to train process skills in the subject matter of acid-base can improve student process skills. This is evidenced by the average value of the overall skills of the students at the first meeting by 58, the second meeting at 75, at the third meeting at 79, and the skills competencies classical completeness reaches 71%.
3. Implementation of inquiry learning model on acid-base material is managed to make students master the psychomotor skills that are taught. Psychomotor skills which consists of four components can be mastered by students with criteria excellent. This is evidenced by the average value of the psychomotor skills of students as a whole by 89.
4. Students' response to the implementation of inquiry learning model to train process skills in the subject matter acid-base on each question get positive response greater than 61%, so it can be said implementation of inquiry learning model to train process skills in the subject matter acid-base received a positive response of students.

Suggestion

Based on the discussion and the conclusions that have been made, the overall problem formulation has been answered. However, there are still things that need to be suggested again in future studies include:

1. In the implementation of inquiry learning model was found that students get enough value on the skills of analyzing data, this is because to be able to master the analyzing data skills student must master the inferencing and interpreting skill. Therefore important to perform basic level of process skills before training advanced process skills.
2. Teachers should provide examples of lab report format in advance to the students so that they can write a good report with the lab results.

3. In the implementation of inquiry learning model, the value obtained by students in the cognitive product, cognitive processes, and psychomotor turns out there is a difference. Students who get good grades on tests of cognitive products, it did not get a good grade on a test of cognitive processes as well. So that more research is needed so that both domains can be mastered fully by the students.
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