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Students' Science Generic Skills Using K*NoS*–KGS Model in Biology Learning

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***Abstract*—Science learning through science generic skill can provide generic science skills for students as the development of higher level thinking skills. Each individual basically and intuitively tends to do scientific activities (problem solving). The skills can be trained through learning at the school using learning model that makes students undergo a process of how knowledge is constructed. One of the goals in the learning assessment is to determine the position of the students in the classroom. Based on discussions with the biology teachers in SMA PGRI Banjarmasin, the implemented learning at schools was lecture as well as question and answer session, while the assessment made by the teacher always led to the cognitive aspect. Therefore, the other domains (affective and psychomotor) were abandoned. This study aimed to determine science generic skills of students as a result of KNoS–KGS collaborative learning model. The data of students' science generic skills in this study were obtained, and the data from the assessment from the observations during the learning process were also obtained. The results showed that average value of students' science generic skills was 86.82, and the observation result of students' science generic skills was 80.14.**

Keywords—Biology; Generic Skills; KNoS–KGS Learning Model; Science

I. INTRODUCTION

Education is a conscious and planned effort to create an atmosphere of learning and learning process. Education is intended to enable students to actively develop their potential to have the spiritual power of religion, self–control, personality, intelligence, esteemed character, and skills. These potentials are needed by them, the community, the nation and the state [1].

National education serves to develop students' ability, form their character, and create the dignity of nation civilization in the context of the education for the enrichment of a nation. It aims to develop students' potentials to become faithful citizens with fear to God Almighty, esteemed character, and good health, and are knowledgeable, skillful, creative, independent democratic and responsible.

The more a person has interactions through objects and environment, the more knowledge and understanding about the objects and environment they can reach.. Biology education is expected to become a medium for students to learn about themselves and the natural surroundings, which emphasizes at providing direct experience. To achieve an effective biology learning, the correct learning is required so the cognitive, affective, and psychomotor aspects can be developed by students. One of learning models that could lead to those three aspects is a Biology learning model named K*NoS*–KGS [2].

K*NoS*–KGS model provide more space and opportunities for students to engage predominantly in solving biological problems. This model is designed to improve learning outcomes. These learning outcomes are students' understanding of *NoS* and being trained in generic science skills. This model is characterized by cooperation between students and teachers and between students and other students in creating knowledge. Students can interact each other, sharing respect, sharing knowledge to complete each other, and help each other [3].

K*NoS*–KGS learning model is designed as more student-centered model. Students are more active in learning, do activities together in a group, give feedback and solve problems collaboratively and learn the Biology materials [3]. By using K*NoS*–KGS model, the study is expected to encourage more students' participation in the learning process and produce higher student achievement.

The assistance obtained by using this model may come from their peer in a group or their peers in other groups, or come from the teacher. The high student-centered pattern in the implementation syntax of K*NoS*–KGS model is designed to practice generic science skills. The activities that practice generic science skills in student centered pattern challenge students to think actively, seek and find the concept [3].

Generic science skills are skills that can be used to study a variety of concepts and solve various problems of science. A scientific activity, such as the activity to understand the concept, consists of several generic competencies. The characteristic of science learning through generic science skills is supplying generic science skills to students as the development of higher order thinking skills [3].

Based on the background, the researchers proposed a research question as follows: "How are generic science skills of students in the learning process using K*NoS*–KGS Biology

Learning Model?" This study aimed to determine the generic science skills of students in the learning process using K*NoS*–KGS Biology learning model.

II. Literature Review

Learning is the development of term from teaching. This term can be argued, or we could just ignore the significant importance of it. Learning is an effort which is made by someone.

One of the learning objective is to build a scientific idea after students have interactions with their environment, moments, and information from their surroundings community. Basically, all students have an idea or prior knowledge that has been built in the specific shape. From the preliminary knowledge and experiences, students use the information that is derived from the environment in order to reconstruct their personal interpretations and its meanings. The meaning has been built when the teacher gives the relevant issues with the knowledge and experience that are already presented, providing an opportunity for students to find and apply their ideas.

Reference [4] stated that generic skills are very useful for continuing education and successful career. Generic skills have three characteristics as follows:

(1) Generic skills that are examined in the working field are very dependent on the values and personal attributes. For example, a person's communication skills are related to integrity, ethical values, understanding of the topic, honesty, self–confidence, and attention to detail and follow–up.

(2) In the working field, generic skills are similar to technical skills. For example, in "preparing a report", someone will use the technical skills and generic skills.

(3) Generic skills tend to be "context–dependent". For example, planning and coordination for most employee are generic skills; but for the manager, a technical skill that involves scheduling techniques and technical computer applications is needed.

The research results of [4] showed the components of generic skills which are related to employment and lifelong learning as follows:

(1) the skills of socio–cognitive, including communication skills, problem solving, creativity, and interpersonal.

(2) academic skills, including language and numerical skills.

(3) self-skills / personality, including a sense of responsibility, initiative, effort, and self–learning.

Generic science skills are skills that can be used to study a variety of concepts and solving various problems of science, in one scientific activity. For example, activities to understand the concept consist of several generic competencies. The different scientific activities could contain the same generic competencies. According Brotosiswoyo as quoted by [5], the characteristic of science learning through generic science skills is supplying generic science skills to the students as the development of high order thinking skills.

Reference [6] suggests that to determine the scientific knowledge to be learned by students, first, teachers need to carry out the analysis of scientific concepts students want to learn. The further analysis is done to show the relationship between the types of scientific concepts with the developed generic science skills. Reference [7] state that the generic science skills are the academic skills, skills of social–cognitive and self/personal skills.

K*NoS*–KGS model is characterized by cooperation between students and teachers, and other students to create knowledge. Based on the students' experience, they make effort to develop their own strategies for responding the problem, by avoiding the dependence on a teacher either on the subject which are taught or in the learning process.

The syntax of K*NoS*–KGS model that is developed consists of five phases, namely phase I as background problems, phase II as case study discussion, phase III as training Inquiry, phase IV as collaborative writing, and phase V as presentation. A general description about the syntax of knos-KGS model is described as follows.

Phase I, background problems, involves issues introduction or biological problems related to the material. This material will be studied and packaged in the PowerPoint form, video, animation or macromedia flash to bring the environmental classroom. Students are faced to the unknown but interesting issues. These issues are related to the material that they are going to discuss about (the orientation into the case). The aim is to motivate the students in learning. Through these activities, students can practice their generic science skills (identification of issues/problems, formulating the problem).

Phase II, case study discussion, involves the information from phase I used as students' preliminary knowledge. Then, students at collaborative groups are involved in discussions about real-life scenarios that become dilemma according to identified biological problems. In this stage, students are directed to find what the problem is and what causes the problem. Discussions are carried out in this phase, could trigger the conflict and curiosity of students to formulate hypotheses, look for the theories that support the hypothesis (formulating hypothesis, devising how to test the hypothesis, and collecting data).

Phase III, inquiry training, involves testing the hypothesis by doing the observation, experiment or investigation which are guided by students' worksheets (responsibility, initiative, problem solving). This phase is obtained by following the design that is developed from the previous phase.

Phase IV, collaborative writing, involves the results of inquiry training in the next stage in which students in collaborative group are analyzing the results of experiment/investigation data, preparing the report in workshop/demo or presentation paper/PowerPoint from their

work. This will be put in a document. The document is already checked in terms of its content and clarity to ensure interesting opening for the readers, strong hypothesis, and the conclusion that could give the readers a clear understanding about the writer's viewpoint including grammar, spellings, punctuation mark, written communication, and creativity.

Phase V, presentation, is done to give students the opportunity to present their work at a communication forum (verbal) with collaboration, and creativity. Students are given time to describe the results of discussion/ observation /investigation /their experiments with presentations, tournament, exhibition, or demonstration. The other group is given time to respond. This activity provides a framework for collaborative groups to engage in depth discussions, exchange and investigate ideas brought by the group as a result of their research. This activity is repeated for the next presenter.

III. METHOD

The type of research in this study was CAR (Classroom Action Research). Classroom action research includes activities carried out in the classroom. The researcher / teacher could see the learning practice directly or together with the other teachers to do research on students from the aspect of interaction in learning process. Teachers could analyze reflectively and synthesize what is done in the classroom. This means that by doing CAR (Classroom Action Research), the instructional learning practices can be revised to be better and more effective ones.

The aspects of Class Action Research (CAR) are as follows.

(1) Preparation Plan/Planning. In planning, an action plan is developed to solve the problems happened. Classroom action research plan should be structured and should be prospective in action. It should be a forward–looking plan. CAR plan should be flexible enough to be adapted to the unpredictable influences and constraints that have not yet been seen. Planning is based on the hypothesis issue of actions that are tested empirically. So, the changes are expected to identify the aspects and the results of learning process, as well as uncover the supporting factors and the inhibition of research activities.

(2) Action. The action in this study is the conscious and controlled act, which is a variation of an accurate and expedient practice. Practice is recognized as the idea into action and the action is used as a foundation for the development of further actions. They are the acts with the intention to improve the situation.

(3) Observation. Observations is done at the time when the action is running. So, the observation and implementation phases occur at the same time. The data collection is done with the help of observation format that has been prepared, including the accurate monitoring of the action implementation from time to time and its impact on processes and student learning outcomes.

(4) Reflection. Reflection was the act of reminding and contemplating an action exactly as it is recorded in the observation. In reflection, researchers usually try to understand the process, problems, issues, and constraints which are real in the strategic action.

This study was conducted at SMA PGRI 6 Banjarmasin. The subjects of this research was students of class XI. The implementation of this study was approximately for 4 months of the 2016/2017 school year at SMA PGRI 6 Banjarmasin.

IV. RESULT AND DISCUSSION

A. Graph of Students Generic Science Skills on First Cycle

The assessment of student's academic skills included: (1) formulating the problem, (2) formulating the hypotheses, (3) doing observation/investigation, (4) analyzing the experimental results, and (5) formulating conclusions. The assessment of students' generic science skills included: socio–cognitive skills (including teamwork, creativity, and communication), self skills/personal skills (initiative, responsibility, independent).

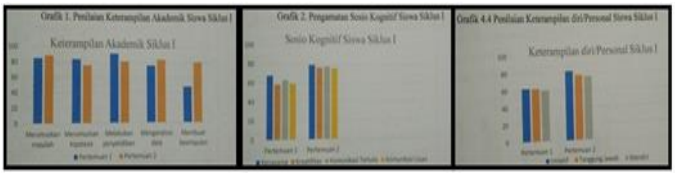

Fig 1. The Graph of the Results on First Cycle of this Study

B. The Reflection of Cycle I

The academic skill of students in the first cycle and the first meeting was 77.04. This was on C category. Then it increased in the second meeting. It was 82.27 and on B category. At the first cycle, the average value of academic skills that has been acquired was 79.65. It was on C category (fair) and it has reached the indicator of success. In the first cycle, the obstacles were encountered especially when the first meeting was held. In formulating the problem, students made the problem formulation incorrectly and have not fully showed the level of problem understanding. Hypotheses that have been formulated by the students were still not in accordance with the formulation of the problems they have created. During investigation/observation, the students were still making a lot jokes. There were still many of them who were being lazy to do observations. Only some parts of them who did observation/investigation. In the analysis of the experimental results, at this stage the students were still not doing the problems appropriately and there were some students who did not participate in the investigation/observation. In formulating a conclusion, at this stage, the students have not yet formulated conclusions that cover all the issues which has been discussed at the presented material. Based on the results obtained at the assessment of students' academic skills in cycle I, though the results have achieved the indicators, the researchers continued the classroom action research to see the

development of students' academic skills in the second cycle. The obstacles that have been faced in the first cycle become consideration for improvement in the second cycle.

The observations of students' generic science skills included: socio–cognitive skills (teamwork, creativity, written communication, and oral communication), self-skill / personal (initiative, responsibility, and independence). In the assessment of generic science skills at the first meeting, the socio–cognitive of students was 60.79 in the D category (poor). In the second meeting, the socio–cognitive has increased to 77.28 on C category (fair). Therefore, the average value of generic science skills in socio–cognitive aspects of first cycle was 69.03 on D category (poor). It has not yet reached the indicators of success. This is because during the learning process has done, some students preferred to learn on their own. The creativity of students in solving the problems still only focused on students' books. The written communication of students was still not yet well–structured and the oral communication of students was still not optimal. This might have been seen during presentation in which some students were still shy in presenting their opinion. Self-skills / personal skills at first meeting was 61.73 in D category (poor) and the second meeting was 78.86 in C category (fair).

Therefore, the average value of generic science skills on the aspects of self-skill / personal was 70.29 on D category (poor) and it has not yet reached the indicators of success. Although it has increased during the learning process, some students still did not yet have an excellent initiative in cooperation. So, only some students had the initiative in doing the task that had been given. Only a small percentage of students was responsible in collaborative groups, and the independence of students has not yet been seen well. This is because during the learning process, the students still asked many questions to the teacher or still asked questions to the other friends of other groups.

C. The Graph of Students' Generic Science Skills on Second Cycle

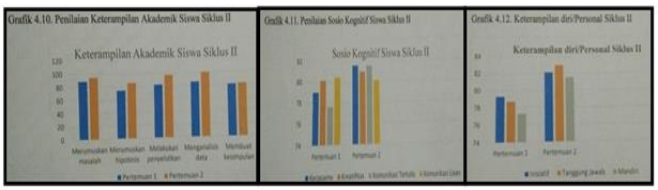

Fig 2. The Graph of the Results Study on Second Cycle

Based on those data in the graph, the academic skills of students in the second cycle have increased from first meeting to the second meeting. The improvement of students' academic skill in the second cycle was seen from the categories that have been obtained on first meetings. It was 82.05 average on B category (good). At the second meeting, it was 91.59 on A category (very good). Thus, the average value of students' academic skills in the second cycle was 86.82 on B category.

Based on the collected data, it could be seen that in the second cycle, the generic science skills of students increased slowly, yet in exact manner. At the first meeting, the average value of students' generic science skills in socio–cognitive aspects was 79.25 on C category (enough). It has increased at the second meeting. The average value was 81.03 on B category (good). Therefore, the results of the average value from generic science skills at the second cycle for socio-cognitive aspect was 80.14 on B category (good).

In the aspect of self-skills/personal skills, the average value obtained in the first meeting was 78.40 on C category (fair) and it has increased in the second meeting, namely 82.19 on B category (good). Therefore, the average value on the aspect of self-skills/personal skills at the second cycle was 80.29 on B category (good).

V. CONCLUSIONS

Generic science skills are assessed on a students' academic skills on the first cycle which result in the average value. The average value was 79.65. This was on the C category (fair). In the second cycle, this value increased. The average value in the second meeting was 86.82. This was on the B category (good) and this has already achieved the indicators of success that have been set.

Generic science skills of students were also observed in the first cycle on socio–cognitive aspects. The average value of socio–cognitive aspects was 69.03. This was on the D category (poor). The average value on the aspect of self-skill / personal skill was 70.29, whichwas on the D category (poor).

In the second cycle, the value has continued to increase. The average value of the socio–cognitive aspects was 80.14. This was on the B category (good). The average value of self-skill/personal skill aspect was 80.29 on the B category (good).

Learning outcomes have been observed. They were the positive attitude of students in the first cycle. The average value of the students' positive attitude was 3.12. This was on the B category (good). At the second cycle, it increased. The average value obtained by the students was 3.44. This was on B category (good). The results were obtained in the second cycle reached the indicators of success that have been set.

Psychomotor observation of students in the first cycle had the average value of 80.21 on the B category (good). At the second cycle, it increased. The average value, obtained by students was 83. This was on B category (good). The results were obtained in the second cycle has reached the indicators of success that has been set.

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