The Implementation of *Testlet* Assessment Instrument in Solubility and Solubility Product Material for Measuring Students' Generic Science Skills

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ABSTRACT

Science generic skills cannot be separated from conceptual learning. In order to measure the science generic skills that had by student, it is needed the assessment instrument that easily used and appropriately to measure science generic skills. The aim of this study is to measure students' science generic skills using *testlet* assessment instrument. The Science generic skill indicators have been defined with 9 experts using Focus Group Discussion technique. The indicators of Science Generic Skills were analysis, critical thinking, problem solving, communication, and team work. The *Testlet* assessment instrument consisted of 10 stems and 30 questions in the form of multiple choices and was given to 305 students from three different schools. The *testlet* assessment instrument was made to measure students' science generic skills in solubility and solubility product material. The result of this study showed that most of the students have science generic skills at medium level. In addition, analysis skill was the most mastered by the students.

Keyword: Science Generic Skill; Testlet Instrument; Solubility and Solubility Product

INTRODUCTION

Students are expected to have scientific skill based on the step of scientific approach in which it does not only measure the result of knowledge concept mastery but it must also have skill of attitude and spiritual. Students' scientific skill must be appropriate with the criteria of scientific skill and proof of observation result with specific and measurable reasoning.

The development of scientific skill in scientific approach is not only on chemistry subject but it can also be applied on all subjects. The steps of scientific approach are observing, questioning, negotiating, attempting, and communicating.
Those steps are used to train students to build knowledge and skill that can increase students' critical thinking in analyzing a problem and be able to work together in solving it.

The solution is expected to be communicated politely to the publics. This approach constructs students to have science generic skill.

According to Maknun [1], Science generic skill can be developed with awareness in building concepts continuously. Therefore, generic skill is a skill of mature individual. Hoddinott [2] states that generic skill commonly belongs to a solution with critical thinking. The ability of generic skill more focuses on the skill of solving problem critically and thoroughly from the result of analyzing phenomenon or data of a teamwork. Furthermore, the result can be informed and communicated correctly by using technology skill. Science generic skill is a skill produced by some structures of learning process using scientific approach. Therefore, to obtain the maximum result, it must use the correct instrument.

A research conducted by Badcock, Pattison and Harris [3] was focused on examining the relation between an important aspect in education and an assessment in university using generic skill. This research measured four generic skills, namely critical thinking, interpersonal understanding, problem solving and written communication.

Generic skill has many complex issues. Firstly, the issue is about the definition of the generic skill itself. The definition about generic skill has various views and synonyms. In such cases, this skill has some identified levels. This skill has different definitions among the workers, the academicians, and the government about the interpretation of skill that can significantly define the generic skill.

Secondly, separating the generic skill and the knowledge discipline skill has been asked theoretically and empirically. In the university, there is no tradition that has developed the using of independent assessment in generic skill. On the contrary, generic skill is usually assumed to be developed with the development of knowledge and skill in knowledge discipline. Meanwhile, the assessment task possibly encloses the generic skill explicitly. Separating the result of the generic skill and knowledge is not commonly conducted.

Thirdly, there is a challenge in teaching using generic skill in the university. There are many lecturers consider some generic skills such as writing skill and critical thinking to become the learning center of the knowledge. The challenge is how to balance the teaching of knowledge discipline and the development of the generic skill that can be transferred and integrated with the curriculum in university.

Science generic skill can be measured its indicators by using *Testlet* instrument. According to Tissen and Wainer [4] *Testlet* is a group or item group (questions) related to a certain topic that is developed into a unity and consists of some steps that can be followed by the participants. The development of *Testlet* instrument belongs to a test arranged by a stem that can describe natural phenomenon through data graphic. It can also be a work at laboratory/ industry that can be used to result more than one respond. Furthermore, *Testlet* has relative graded respond (hierarchy) in the relation to knowledge *(construct)* that will be measured.

Testlet instrument is designed by showing description stem as question item step hierarchically. These questions have been commonly used on psychology test, diagnostic test and national exam test since 2007. Nevertheless, there are still many teachers and students who have not recognized that the test belongs to *Testlet* instrument. Furthermore, *Testlet* has not been recognized as an instrument to measure science generic skill. Therefore, the aim of this study is to optimize *Testlet* instrument for measuring science generic skill.

RESEARCH METHOD

The *Testlet* assessment instrument consisted of 10 stems and 30 questions in the form of multiple choices and was given to 305 students from three different schools. The science generic skill indicators have been defined with 9 experts using Focus Group Discussion technique. The indicators of science generic skill were analysis, critical thinking, problem solving, communication, and team work. Paper and pencil test named main field test ware performed to the student using *Testlet* assessment instrument for measure students' science generic skills in solubility and solubility product material. This test is the part of research and development cycle.

RESULT

The use of *Testlet* instrument was tested to 305 students. It is expected that the instrument can be used to measure science generic skill with these skill indicators: problem solving, critical thinking skill, analyzing, communicating and team work. The result of the research shows indicators of science generic skill at Figure 1.

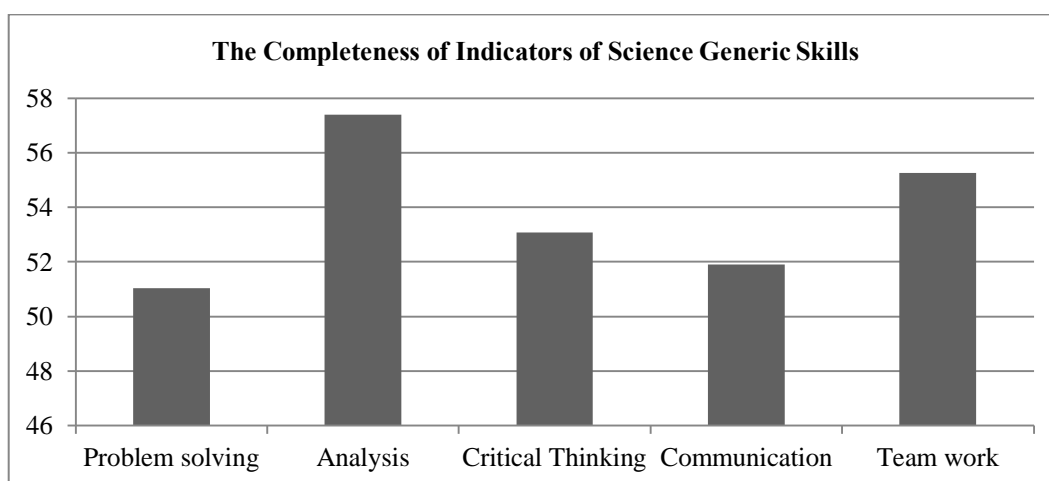**The Completeness of Indicators of Science Generic Skills**

FIGURE 1. THE INDICATOR RESULT OF SCIENCE GENERIC SKILL IN THE FIELD TEST

After students conducted *Testlet* instrument on the material of solubility, the result showed its level of instrument difficulty. 95 students considered that *Testlet* was easy, 152 students thought medium and 58 students thought difficult. The comparison of its difficulty level was that 50% of students considered that it was medium, 31% was easy and 19% was difficult. The result can be seen at Figure 2.
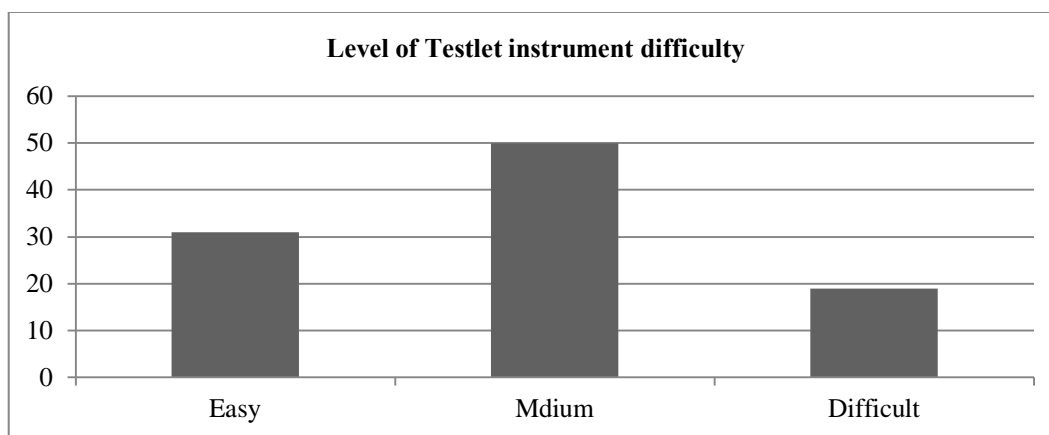
FIGURE 2. LEVEL OF DIFFICULTY

The research showed that *Testlet* instrument is difficult enough for students. It was considered as a difficult instrument because they have not been accustomed to use it. Besides, there has no enough preparation in understanding competence of solubility and solubility product material.

DISCUSSION

Besides giving easiness in correcting, *Testlet* can also result cognitive indicator that can be used to measure indicators of science generic skill. *Testlet* is designed with multiple choices. The development of *Testlet* questions with some indicators developed by Shidiq [5] to measure the indicators of science process skill consists of; understanding concept, observing, controlling variable, interpreting data and making conclusion [5,6].

According to Sumarni [7], generic skill is a skill to show direct and indirect observation, sense of scale, symbolic language, logical self-consistency from natural law, logical inference, causality, mathematical modeling, concept formation and spatial. Direct and indirect observation will ease in building concept logically that based on causality.

The result of the research conducted by Komattil [8] has an aim to investigate how students take a decision to increase knowledge and skill of generic and attitude. The research was conducted to medical students that were expected to have knowledge ability and skill of generic and attitude in a learning process based on problem. This education strategy uses a real problem as students' context to learn and to have content and generic skill and competence. Learning based on problem is not only influenced by interpersonal and cognitive competence, but it is also related to skill work in the success of professional practice. Students who are given learning based on problem believe that interpersonal skill is better. They are also good at solving problem, learning independently, collecting information and having a better skill on working and planning. Generic skill trains to solve problems by better working and planning independently. The making of program and planning by collecting data independently can create creativity and critical thinking.

Science generic skill is effective as a reflection of successful learning process that applies curriculum 2013. In this curriculum, students are demanded to have good

attitude skill in talking, concept mastery, and creativity. From the development of science generic skill, the indicators that have been validated by 9 validators on discussion forum are developed. The indicators of science generic skill consist of problem solving, critical thinking, analyzing, communicating ethically, and working in team. For example, an entrepreneur places high score to the graduate who can communicate effectively and work in team, be a self-starter, critical thinker and problem solver.

The generic skill of the workers, the researchers in the university and the government has been familiar. However, the generic skill of the students at school and the education staffs has not been commonly familiar. A research conducted by Laggett, Kinnear, Boyce, and Bennett [9] stated that based on the survey towards the students' skill, there were some important skills to be owned such as obtaining information, mastering technic and laboratory, organizing ideas, thinking critically, working in team effectively, working with numbers and graphic and writing. Meanwhile, the education staffs should have some skills such as thinking critically, organizing ideas, finding information, writing, reading, working in team, working with numbers and graphics, communicating verbally, and answering questions.

A research conducted by Hoddinott and Young [2] showed that based on the interview, the observation, and the assessment towards the students at class, the generic skill that was mostly needed by the students was solving problems and thinking critically. Besides that, there were also other skills needed. However, it got few respond from the participants. Those skills were analyzing, communicating, mastering information technology and working in team. The difference of the students' assessment about this kill was based on the knowledge discipline they had learned. This matter could be used as the curriculum development that was based on the specific subject of the students. The curriculum developer could plan the skills needed by the students and the way to supervise and to assess that skill. The skill without any integrated subject to knowledge and skill in a curriculum with few references would not reach any skills needed.

Association of post-graduate recruiters in England has emphasized that the graduates must develop skill and independence during their education program. Independent graduates are aware about work change, profession responsibility, and personal developing. It is also expected to be able in managing the relation between work and learning in the steps of human life. This non-disciplined special skill is developed in around title program. This skill is usually called generic skill. Based on the research conducted to 305 students shows that 51.04% can solve problems, 57.39% can analyze, 53.07% have critical thinking, 51.91% can communicate and 55.27% can work in team. Besides that, most of the students have science generic skills at medium level. In addition, analysis skill was the most mastered by the students

CONCLUSION

Based on the research using *Testlet* instrument to measure science generic skill on the material of solubility and solubility product material to the science students of grade XI, can be concluded that: *Testlet* assessment instrument is suitable and appropriate to the criteria as a good question. Based on the research conducted to 305

students shows that 51.04% can solve problems, 57.39% can analyze, 53.07% have critical thinking, 51.91% can communicate and 55.27% can work in team.

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