Student Task Analysis for the Development of E-Learning Lectural System in Basic Chemistry Courses in FKIP UMMY Solok

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Abstract. The student task analysis is one part of the define stage in development research using the 4-D development model. Analysis of this task is useful to determine the level of understanding of students on lecture materials that have been given. The results of this task analysis serve as a measuring tool to determine the level of success of learning and as a basis in the development of lecture system. Analysis of this task is done by the method of observation and documentation study of the tasks undertaken by students. The results of this analysis are then described and after that triangulation are done to draw conclusions. The results of the analysis indicate that the students' level of understanding is high for theoretical and low material for counting material. Based on the results of this task analysis, it can be concluded that e-learning lecture system developed should be able to increase students' understanding on basic chemicals that are calculated.

1. Introduction

Basic Chemicals is one of the science courses for first year students who take the Department of Mathematics and Natural Sciences Education, Study Program of Biology Education, at Mahaputra Muhammad Yamin University. This course is taught because chemistry is closely related to biology, science and other science. Graduates of Biology Education course are expected to have the skills to become biology and science teachers. Therefore, the basic courses related to IPA are included in the curriculum of the Biology Education course.

The presence of Basic Chemicals in Biology Education course curriculum is one of the steps to fulfill the learning achievement of Biology Education program namely:

a. Apply basic concepts of educational science and design appropriate biological learning in appropriate elementary and secondary education units;
b. Develop and utilize a system of assessment and evaluation of biology learning in elementary and secondary education units appropriately;
c. Identify the characteristics of learners from the academic, physical, social, emotional aspects appropriately and apply the example to become a superior person, in the scope of elementary and secondary education units and society;
d. Analyze the basic principles of science in life, chemistry of life, cell and genetics, evolution and biodiversity, ecology and conservation, structures and functions of animals and plants and applied biology correctly and responsibly;
e. Implement strategic management and management of biology laboratories in primary and secondary education units and apply entrepreneurial skills in biology and biology education with full responsibility;

f. Publish results of research in the field of Biology and Biology Education in a quality elementary and secondary education units.

In addition NSTA [1] recommends a standard of content that must be mastered by Biology teachers namely core competencies, advanced competencies, and supporting competencies. For supportive competencies, biology teachers are also prepared to effectively apply the concepts of math and science to biology learning that include the basic concepts:

- Chemistry, including basic chemistry and biochemistry with basic laboratory techniques;
- Physics, including light, sound, optics, electricity, energy, magnetism, and thermodynamics;
- Mathematics, including probability and statistics.

The above NSTA recommendation implies that the graduates of Biology Education courses in addition to mastering the material in the field of science, but also must master the chemistry and biochemistry. As part of science, the field of chemistry studies is so wide that chemistry is dubbed as central of science. Chemistry is generally abstract and requires an understanding of concepts and the ability to calculate. So basically in studying chemistry, students need a good understanding of concepts and able to see the relationship between concepts and apply it.

Afrahamiryano in The International Conference on Mathematics, Science, Education and Technology [2] states that the students' perception of the Basic Chemicals at FKIP UMMY Solok is good. The good perception of biology education program students to Basic Chemicals is a great potential for lecturers to develop learning. Development of Basic Chemicals learning system is expected to increase student interest in this course. However, prior to development, needs to be done first needs analysis. Needs analysis can be done through student task analysis. Analysis of this task aims to determine the level of student understanding of the material that has been studied.

Based on the background of the above problems, the authors are interested to know the level of understanding of students about Basic Chemicals through research entitled "Analysis of Student Duties for the Development of e-learning lecture System in Basic Chemicals at FKIP UMMY Solok". This study aims to determine the level of students' understanding of theoretical anc calculation of Basic Chemicals. To achieve this goal, this research is focused on the analysis of student tasks in Basic Chemicals. The formulation of the problem in this research is "How is the level of understanding of the students on theoretical and calculation in Basic Chemicals?"

2. Method

This research is part of a development research entitled "Development of e-Learning Lecture System in Basic Chemicals at FKIP UMMY Solok", with the 4-D development model. This student task analysis is part of the Define stage. The analysis of student task is done by using descriptive research. The descriptive research method is a method that tries to describe and interpret the object as it is [3].

The population in this research is all students of the Biology Education Study Program for academic year 2016/2017 which takes Basic Chemicals that is eight people. Because the population is small, the sampling technique used is Total Sampling. The data collection technique is done by analyzing the student's answer sheet and then input it in the task analysis sheet, and continued by calculating the percentage of students' understanding of the material that becomes the task, using the formula:

\[
\text{Percentage of Understanding} = \frac{(\text{Number of Students doing the job correctly})}{(\text{Total Students Total})} \times 100\% 
\]  

(1)

The results obtained are interpreted using the following criteria:
Because this research uses the descriptive research method, the data analysis technique used is triangulation that is to draw a conclusion based on the findings in the field.

3. Results and Discussion

Basically, Basic Chemicals teaching materials consist of theoretical and calculating material. The theoretical material has five topics, namely equalizing the reaction equation, atomic structure, periodic system, chemical bond, and organic chemistry. Counting material there are six topics, namely basic concepts of chemistry, basic law of chemistry, stoichiometry, solution, thermodynamics, and thermochemistry. The data of student task analysis on Basic Chemicals is shown in Table 2 below:

| No | Matter                        | Percentage of Understand | Criteria  |
|----|------------------------------|--------------------------|-----------|
| 1  | Equalizing reaction equation | 62.5%                    | Good      |
| 2  | Basic Concepts of Chemistry  | 50%                      | Medium    |
| 3  | Basic Chemical Law           | 50%                      | Medium    |
| 4  | Atomic Structure             | 87.5%                    | Very Good |
| 5  | Periodic System              | 87.5%                    | Very Good |
| 6  | Chemical Bond                | 75%                      | Good      |
| 7  | Stoichiometry                | 25%                      | Low       |
| 8  | Solution                     | 25%                      | Low       |
| 9  | Thermodynamics               | 25%                      | Low       |
| 10 | Thermochemicals              | 37.5%                    | Low       |
| 11 | Organic Chemicals            | 25%                      | Low       |

The data in Table 1 above shows students' understanding of the "equity of equations" is 62.5%. This data shows that students are able to equate the equation of the reaction well. However, some students are not able to equate the equation of the reaction, the cause is that the student is incapable of writing a complete and equitable reaction equation when the known name of the reacting compound and the name of the reaction product compound.

The level of students' understanding of the "Basic Concepts of Chemistry" is 50%. This data indicates that the level of students' understanding of this material is included in the medium category. This material is discussed about the understanding of chemistry, scientific methods applied in chemistry, elements, compounds, mixtures, material properties, and mixed separation techniques. In general, the material discussed is theoretical, but there are some concepts that are calculated to determine the level of substances.

The level of students' understanding of the "Basic Chemistry Law" material is included in the medium category (50%). This material is related to the matter of reaction equations and is counted. This material is discussed on the Law of Conservation of Mass, Fixed Comparison Law, Comparative Multiplier Law, Mutual Reciprocal Law, Avogadro's Law, Unifying Volume Law, calculating relative atomic mass, and calculating the relative molecular mass. In general, students have difficulties in
working on questions relating to this material, because this material demands an understanding of the concept of reaction equations and good math skills.

For the material "Atomic Structure and Periodic System", the level of student understanding is very good (87.5%). These two materials are theoretical and require a good conceptual understanding because between the Atomic Structure and the Periodic System are interrelated to one another. In this material, students generally have difficulty in determining the four major quantum numbers of the last electron in an electron configuration, or otherwise determining the electron configuration if the four major quantum numbers of the last electron are known.

The students' understanding of "Chemical Bonding" materials is good. The weakness found in this material is that students do not memorize members of the main group elements, so in general the students are difficult in determining the valence electron of an element, and it is difficult to determine the number of electrons involved in forming a chemical bond.

Furthermore, for stoichiometric material, solution, thermodynamics, and thermochemistry, the level of student understanding is low. These materials are quite complicated for students because in addition to demanding concept comprehension also requires the ability in the analysis of problems and calculations. In addition, these materials are also related to the reaction equation. So if students do not understand the equation of the reaction, then these materials will be very difficult.

Last is the material "Organic Chemistry". This material discusses the uniqueness of carbon atoms, hydrocarbons, functional groups and their derivatives, organic reactions, and polymers. This material is very difficult for students to understand because in this material is demanded by students understanding in nomenclature of chemical compound and reaction mechanism.

Based on the results of this analysis can be seen that the students of Biology Education Studies Program is rather weak on counting material. Besides that also added with the limited factor of reference book that can be used by students to support the learning process. In addition, student’s motivation to enrich information through low online media.

4. Conclusions
Based on the results of the analysis can be concluded that the level of student understanding is high for the material that is theoretical and low for counting material. Therefore, it takes e-learning lecture system that can improve student’s understanding on basic chemicals. Based on the conclusion of the results of this study, it is advisable to do Academic Potential Tests and Modality Tests to determine students' academic ability and student learning type. Next, the results of this study suggest that the development of e-learning can be applied to the lecture process conducted.

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