Diagnosis of basic chemistry II in student program study of the chemistry of FMIPA UNIMED

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Abstract. This study aims to determine the extent of mastery of students of the chemistry education program FMIPA UNIMED on basic chemical material II on the subject of redox and electrochemistry, chemical and radiochemical kinetics. The population in this study was at the same time a sample of education students in the 2016 class of the FMIPA UNIMED chemistry education program totaling 108 people. The instruments used were multiple-choice test questions and questionnaires. The results of the study showed that 108 students of the 2016 chemistry education program FMIPA UNIMED obtained that the level of mastery of students in solving basic chemical questions II on the subject of redox and electrochemistry, chemical kinetics, radiochemistry is low, namely students who have a high mastery level 0 (0%) Based on the cognitive aspects of students on knowledge questions (C1), 14 (12.96%) students had a high level of mastery. On the question of cognitive aspects of students on understanding questions (C2), 5 (04.63%) students have a high level of mastery. For the question of cognitive aspects of the application (C3), 25 (23.15%) students had a high level of mastery. For the cognitive aspects of analysis (C4), 2 (01.85%) students have a high level of mastery. From the results of the student questionnaire answers that students feel the difficulty of learning basic chemistry, especially on the subject of redox and electrocima, chemical and radiochemical kinetics. Reading the interest and motivation of students to study basic chemistry II is still low.

1. Introduction

Since the last few years "teachers" and various problems ranging from the results of competency tests, the decline of the professional image to the paradigm (procurement) of teachers have become interesting discourses to be studied. Talking about teachers, of course, cannot be released from teacher-producing institutions or commonly referred to as the Educational Personnel Education Institution (LPTK), which prepares prospective teachers to become "professional" staff educating the nation's children. Educational institutions which have not been established and tend to be patchy since the beginning of independence have contributed to the low quality of education in Indonesia. As an Institute of Education for Education Personnel (LPTK) Medan State University has the aim of producing superior and professional graduates. Teacher candidates are expected to have competence and professionalism in their respective fields where the competency is expected to be reflected in the time of the students in the field. Students are expected to practice pedagogy and interactive skills that have been studied theoretically [1]. In this case, prospective teacher students are required to master the subject matter, lecturer, information presenter, supervise the teaching and learning process and
understand the role of the school in the whole process of development of the whole community and all Indonesian people.

The vision of the chemistry department of FMIPA UNIMED is to make a department that excels in the study and development of chemical and chemical education. Since the 2000/2001 academic year, Medan State University has launched a curriculum change for both educational study programs and non-educational study programs. Changes in the structure of the curriculum and the substance of the course aim to equalize the mastery of the material in their respective fields of study both non-educational and educational, where for the two study programs will master the subject matter of the equivalent of six semesters. The number of basic skills courses (MKDKa) is 17 subjects with a total SKS of 34 credits. One of the basic skills courses (MKDKa) is basic chemistry. Basic chemistry is the main subject of the first and second semester for new students in college, whose contents are chemical material in high school.

The facts in the field show that there are still many students when lecturers provide Expertise Courses (MKK), for example, organic chemistry, students have difficulty capturing some concepts taught by lecturers that should have been obtained when studying basic chemistry I and basic chemistry II. When students take micro-teaching there are still students who wrongly teach chemical material [2]. Students also have difficulty in mastering high school chemistry material and student mastery of basic chemistry levels is still relatively low [3,4].

Basic chemistry material II was obtained in semester II which allows students to forget during semester 7. Even though students will carry out field experience practice (PPL) which will teach at both middle and high school where the material taught is basic chemical material. PPL provides a real experience for student teachers in the teaching and learning environment [5,6]. Students in chemistry education study programs as prospective teachers must essentially master basic chemical material, so that when students in the field can become professional teachers who master their fields. From the background above, the researcher is interested in conducting a study entitled "Diagnosis of Mastery of Basic Chemistry II for Students of Chemistry Education Study Program at FMIPA UNIMED".

2. Methods
This research is descriptive research that is diagnosing the mastery of basic chemistry in students of class 2016. The research location is the chemistry department of UNIMED FMIPA. The population in this study was at the same time a sample of the 2016 class of chemistry education students as many as 3 classes. The research instrument is a test of basic chemistry learning abilities on the subject of redox / electrochemical reactions, chemical and radiochemical kinetics. To support the correctness of this diagnosis, questionnaires were used for students. ability tests are arranged in the form of multiple choices totaling 24 questions and are used to determine the cognitive level. The distribution of instruments for this study is based on indicators contained in the basic chemistry courses II.

3. Result and discussion
Mastery data on basic chemical II material was obtained by giving a test to the students of the 2016 chemical education. To determine the level of student mastery in solving basic chemical questions II on the subject of redox and electrochemistry, chemical kinetics, and radiochemistry, the total score of student acquisition was obtained [7–10]. Thus it can be seen the number of students who answer the question right or wrong. Criteria for the level of mastery of students in solving basic chemical questions II on the subject of redox and electrochemistry, chemical kinetics, radiochemistry, namely: 0-69% = low, 70-79% = moderate, 80-100% = high.
Table 1. Criteria for Student mastery Level

| Student Mastery Level | Amount of Students | Percentage (%) |
|-----------------------|--------------------|----------------|
| High                  | 0                  | 0 %            |
| Medium                | 11                 | 10.19%         |
| Rendah                | 97                 | 89.91%         |

Table 2. Frequency of student mastery level in solving basic chemistry questions II

| No | Cognitive level | Mastery level | Percentage |
|----|-----------------|---------------|------------|
|    |                 | High | Medium | Low | High | Medium | Low |               |
| 1. | Knowledge       | 14   | 1      | 93  | 12.96% | 0.93% | 86.11% |               |
| 2. | Understanding   | 5    | 0      | 103 | 04.63% | 0%    | 95.37% |               |
| 3. | Application     | 25   | 9      | 74  | 23.15% | 08.33% | 68.52% |               |
| 4. | Analysis        | 2    | 21     | 85  | 01.85% | 19.44% | 78.70% |               |

The results of student interest questionnaires, 37 (34.26%) students stated they did not like to study basic chemistry II on the subject of redox and electrocima, chemical kinetics, radiochemistry. As many as 39 (36.12%) students stated that they did not like to read books about basic chemistry II on the subject of redox and electrochemistry, chemical kinetics, radiochemistry. The results of student motivation questionnaires, 30 (27.78%) students did not really pay attention and listened to basic chemical material II when teaching basic chemistry teaching II, 29 (26.85%) students stated that they did not try to find basic chemistry books II from sources other than dictates, 14 (12.96%) students did not try to learn basic chemistry to facilitate mastering advanced chemical material.

The results of the questionnaire regarding student perceptions showed that 22 (20.37%) students stated that they were not happy to learn basic chemistry II, 55 (50.92%) students stated that the calculation of redox equivalence questions was difficult, 43 (39.81%) students stated disliking the calculation of cell potential, 71 (65.74%) students stated that they found it difficult to learn and master the concepts of chemical kinetics, 38 (35.19) students stated they did not like learning about catalysts, 53 (49.07%) students stated do not like the calculation of the weight of the substance produced in the electrode. Based on the results of the student questionnaire answers, the 25 (23.15%) students stated that they found difficulties in determining the reaction order, 44 (40.11%) students stated that they found it difficult to calculate the number of radioactive elements that remained after decaying at a certain time, 52 (48.14% of students stated that they did not like the material of fusion and fission reactions, 34 (31.48%) students stated that they were not happy to learn about distinguishing voltaic and electrolysis cells, 72 (66.66%) students stated that they did not like the calculation of core binding energy, and 19 (17.59%) students stated they did not like learning radioactive uses.

The attendance method and frequency of lecturers determine mastery of basic chemistry II, 84 (77.77%) students agree about the teaching method to determine mastery of basic chemistry II, 96 (88.89%) students state the frequency of attendance of lecturers determine mastery of basic chemistry II, 27 (25 %) students stated that lecturers were not suitable to give assignments in accordance with the subject being studied. Facilities and infrastructure for student questionnaire answers, 35 (32.41%) students stated that basic chemistry book II was not complete in public libraries and faculties, 33 (30.56%) students stated that laboratory facilities were incomplete to assist mastery of basic chemistry.

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II [11]. In the family environment, 25 (23.15%) students stated that the atmosphere of the home/student residence was uncomfortable and conducive to learning.

Students who answer the right questions a lot are questions number 18 and 22 while the most answered questions by students are wrong number 21 with the number of students who answer correctly is 9 out of 108 people. The level of mastery or ability of students about basic chemical material II based on the cognitive aspects of students is still relatively low. On the questions included in the cognitive level of knowledge (C1), 103 (95.37%) students had a low level of mastery, namely in question number 13, 14, 22, 23, 24. Problem number 13, 14 about identifying elements that are radioactive while the questions number 22, 23, 24 about mentioning radioactive uses in everyday life. Based on the results of the questionnaire also, 19 (17.59%) students stated that they did not like to learn about radioactive uses. Especially for question number 23, many students answered incorrectly because students did not pay attention to the word "except".

On the questions included in the cognitive level of understanding (C2), 103 (95.37%) students had a low level of mastery namely questions number 4.5 and 21. Problem number 4.5 about distinguishing voltaic cells and electrolysis cells, 34 (31.48%) of students stated they were not happy to learn about distinguishing voltaic cells and electrolytic cells. For question number 21 about distinguishing fusion reactions from fission and based on questionnaire results, 52 (48.14%) students stated they did not like to learn about fusion and fission reaction materials.

On the questions included in the cognitive level of application (C3), 74 students scored low (68.52%), namely questions number 1, 2, 3, 10, 11, 12, 15, 16, 17, 18, 19, 20. Problem number 1, 2 is the equalization which includes redox and based on the results of the questionnaire, 55 (50.92%) students stated that they found it difficult to work on redox equivalence questions. For question number 3 about calculating cell potential, 43 (39.81%) students stated that they did not like the calculation of cell potential. Questions number 10, 11, 12 regarding the calculation of the reaction order and based on the results of the questionnaire answers, 25 (23.15%) students stated that they found it difficult to do the determination of the reaction order. Questions number 15, 16 regarding the calculation of mass defects in the decay reaction and based on the results of the questionnaire answers, 72 (66.66%) students stated that they did not like the calculation of core binding energy. Problem number 17, 18, 19, 20 about counting the number of radioactive elements living after decay and based on the results of the questionnaire answers, 44 (40.11%) students stated that they found it difficult to calculate the number of radioactive elements that remained after decay.

On questions including the level of analysis (C4), 85 (78.70%) students scored as low as questions number 6, 7, 8, 9. Problem number 6 about calculating the weight of substances produced at the electrode and based on the results of the student questionnaire answers, 53 (49.07%) students did not like to connect the calculation of the weight of the substances produced by the electrode. Problem number 7 about describing the role of energy in a reaction and question number 8, 9 about describing factors that can increase the reaction rate. Based on the results of the questionnaire answers, 71 (65.74%) students found it difficult to learn and master the concepts of chemical kinetics [12]

Other factors that cause low levels of student mastery are:

1) Student reading interest is lacking, namely, from the results of student questionnaire answers, 39 (36.12%) students stated that they did not like to read basic chemistry II books, especially on the subject of redox and electrochemistry, chemical kinetics, and radiochemistry.

2) Student motivation is lacking. This can be seen based on the results of the questionnaire answers that 30 (27.80%) students stated when teaching lecturers students did not really pay attention to and listened to basic chemistry II, 14 (12.96%) students were not motivated to learn basic chemistry II as a basis to study advanced chemistry.

3) Health, namely 31 (28.79%) students could not hear what was delivered by lecturers and 37 (34.26%) students could not clearly see the lessons written on the board.

4) The lecturer factor is the teaching method, the frequency of attendance and the assignment of assignments is not in accordance with the subject being taught.
5) Facilities and infrastructure, namely basic chemistry books II, especially redox and electrochemistry, chemical kinetics and radiochemistry, incomplete in public and faculty libraries, namely 35 (32.41%) students stated that basic chemistry books II were incomplete in public and faculty libraries. The laboratory facilities are less complete to help with mastering basic chemistry II; namely 33 (30.55%) students stated that laboratory facilities were incomplete to assist mastery of basic chemistry II.

6) A family is a place that is not conducive and comfortable for learning, 25 (23.15%) students stated that the residence/home is uncomfortable and conducive to learning.

4. Conclusion

1) The level of mastery of students in solving basic chemical questions is low, namely students who have a high mastery level of 0 (0%).

2) Viewed from the cognitive aspect the level of mastery of students is relatively low. On knowledge questions (C1), 14 (12.96%) students have high mastery levels, comprehension (C2) of 5 (04.63%) students have a high mastery level, application (C3) is 25 (23.15 %) students have a high level of mastery, analysis (C4) of 2 (01.85%) students have a high level of mastery.

3) Factors that cause students' mastery of basic chemistry II are low interest and motivation of students to study basic chemistry II low, basic chemistry books II especially on the subject of redox and electrochemistry, chemical kinetics and radiochemistry are not complete in public libraries and faculties. The method, the frequency of the attendance of the lecturer and the assignment of assignments are not in accordance with the subject being taught.

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