

THE RELATIONSHIP OF BASIC CHEMICAL CONCEPTS IN PHARMACEUTICAL LEARNING

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Abstract

This study aims to analyse what pharmacy students need basic chemical concepts as prerequisite concepts in learning other concepts based on the curriculum. To achieve the expected goals, an analysis of the Semester Learning Plans (RPS). This research method was carried out descriptively, and the data obtained were processed qualitatively. The data obtained shows that 46% or 18 of the 39 courses in the five science units are subjects related to basic chemistry. Based on the analysis of the relationship between concepts in basic chemistry and other subjects, it was found that the concepts in the subject matter have a relationship of 16%, atomic structure 2%, periodic system of elements 6%, chemical bonds 20%, complex compounds 2%, stoichiometry 16%, redox and electrochemistry 12%, reaction rate 10%, nuclear chemistry 10%, and elemental chemistry 4%. Although the percentage value is low, it has an important relationship as one of the prerequisite materials. The real impact of this research is that the process of preparing the RPS has now adjusted to the needs of the concepts needed by students so that students can understand the next concept well.

Keywords: Basic chemistry, Draft, Pharmacy, Subject.

1. Introduction

The basic chemical pharmacy study program is an important subject in the curriculum [1]. This material is taught to first-semester students. By studying the concepts in basic chemistry, students are expected to be able to understand the concepts of matter, atomic structure, the periodic system of elements, chemical bonds, complex compounds, stoichiometry, redox and electrochemistry, chemical reaction kinetics, nuclear chemistry, and elemental chemistry. By attending basic chemistry lectures, students are expected to be able to understand the basic concepts that will be used as a provision to understand the concepts studied by pharmacy students at a higher level.

The importance of understanding basic chemistry concepts for pharmacy students is supported by several studies conducted with the main aim of making basic chemistry concepts well understood by students. Such as the application of team-based chemistry learning for pharmacy students [2], learning redox concepts using CCT-based teaching materials [3], analysing the level of difficulty in learning chemical kinetics in pharmacy students [4], application of the PSO algorithm for problems of a Pharmaceutical Plant [5], waste management with chemical concepts [6].

The role of basic chemistry concepts as prerequisite material is very important in building an understanding in pharmacy students. As the constructionist learning theory, which is widely used in scientific research, sentences are smoothed [7]. According to Piaget, constructivism theory is an approach that views students as active individuals in building their knowledge by experiencing and working on it, in the process of entering the real world continuously, so that facts and skills are learned holistically, and there is a process of connecting new knowledge and skills to the real world. In prior knowledge and skills. Therefore, in every learning activity, especially for pharmacy students, past learning experiences (initial conceptions), this case, basic chemistry as prerequisite knowledge from students will affect the learning process in lectures in the pharmacy study program, the first step the lecturer must take when teaching new material, the new material must be related to the concepts that already exist in the student's knowledge structure. So that basic chemistry as a prerequisite material must be mastered well by students. For example, research conducted in constructivist learning with the help of modules greatly affects the understanding of concepts [8].

2. Experimental Procedure

The analysis of basic chemical concepts is carried out starting with grouping subjects based on the scientific field groups that have been determined in the curriculum by grouping them into five groups of fields of science, including Pharmaceutical Biology, Pharmacology, Community Pharmacy, Pharmaceutical Chemistry, and Pharmaceutical Technology. The number of subjects incorporated into the scientific field group is 39 subjects with the composition of 9 Pharmaceutical Biology courses, 8 Pharmacology courses, 4 Community Pharmacy courses, 10 Pharmaceutical Chemistry courses, and 8 Pharmaceutical Technology courses.

The next step is to map the basic chemistry lesson plans to determine what concepts will be taught in the course. The concepts studied in basic chemistry are grouped into ten subjects, including matter, atomic structure, periodic table of elements, chemical bonds, complex compounds, stoichiometry, redox and electrochemistry, reaction rates,

nuclear chemistry, and elemental chemistry. Next is an analysis of the 39 subjects that are related to the basic chemical concepts incorporated in the ten subjects. In addition, the researchers also recorded the development of basic chemical concepts needed to support the learning of other subjects.

After the data from the analysis are obtained, statistical analysis is carried out using excel so that it can be mapped which courses have a conceptual relationship with basic chemistry. In addition, it can also be analysed descriptively what concepts need to be developed to support learning at a higher level.

3. Results and Discussion

Based on the results of the study, data was obtained that there were 46% or 18 of 39 courses that were related to basic chemistry concepts. The subjects that have the most relevance to basic chemistry concepts are physical pharmacy courses, which are 60% or 6 of the ten subjects taught in basic chemistry. These concepts include matter, chemical bonds, stoichiometry, redox and electrochemistry, reaction rates, and nuclear chemistry (see Fig. 1).

Based on the data, Fig. 1 shows data that the groups of fields of science that have the most relationship with basic chemistry are the field of pharmaceutical technology and pharmaceutical chemistry, while for other groups of fields of science, there are only a few concepts related to basic chemistry.

If the analysis data is grouped by subject, the concepts of 10 subjects that have the most relevance to basic chemistry are chemical bonds; there are 56% or 10 of 18 subjects that are related to basic chemistry.

Of the ten subjects discussed in basic chemistry (Fig. 2), all of them have conceptual linkages with other subjects. Based on the data generated, from 39 subjects that are incorporated into five groups of fields of science, 18 subjects are related to basic chemistry. Of the 18 courses, nine courses are included in the pharmaceutical chemistry group; six courses include the pharmaceutical technology group, one community pharmacy group course, one pharmacology group course, and one course including the pharmaceutical biology group.

The relationship between basic chemistry concepts and the subjects from the analysis results is in accordance with the characteristics of the group of disciplines. As in the community pharmacy field group, there is only one course related to basic chemistry, namely the hospital pharmacy course. This is because the characteristics of the courses in the community pharmacy group are how a pharmacist performs pharmaceutical services in the form of services to patients [9], so it is natural to not discuss basic chemistry concepts.

The basic chemical concepts used in courses in the community pharmacy science group are the sterilization process of medical devices with UV, radioactive drugs, radioactive waste, and radiology. These concepts are in line with the core chemistry topics in basic chemistry. With the basic concepts of chemistry about core chemistry, it is expected to be able to equip students in attending hospital pharmacy lectures and be able to apply them in the world of work so that they become professional pharmacists and always prioritize patient care [10].



Fig. 1. Relationship of basic chemistry concepts with other courses (total 10 basic chemistry materials).

Next is the group in the field of pharmaceutical biology. Of the nine courses in this group, there is only one course that has material related to basic chemistry. The subject is phytochemistry; the related subject is about the material with concepts about chemical compounds and the process of separating mixtures. In this scientific field group, there is not much discussion of basic chemical concepts, and biological concepts are more dominant. In this scientific field group, many discussions about plants as medicinal ingredients to their processing. For the separation concept obtained from basic chemistry, it can be used for the basis of the process of separating mixtures that can be used as raw materials for drugs such as chromatographic and extraction separation processes [11].

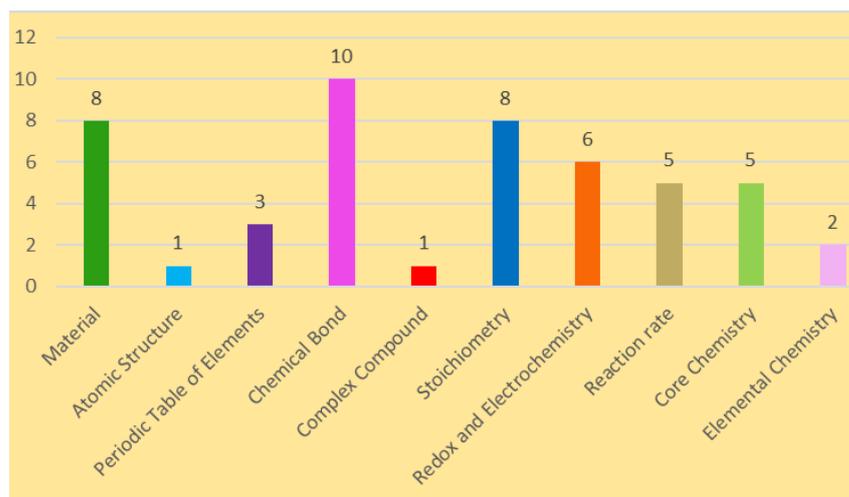


Fig. 2. Grouping of courses related to basic chemistry.

Similar to the group in the field of biology, pharmacy, and community pharmacy, for the group in the field of pharmacology, there is only one course that discusses the concepts in basic chemistry. The subject is pharmacology, with the basic chemical concept discussed is bond polarity which is one of the concepts in the subject of chemical bonds. With the basic concepts obtained from basic chemistry, this can be a provision in solving problems when studying pharmacology [12] who learn a lot about the use of drugs, especially for the concept of chemical bonds, one of which is in the process of drug reactions by releasing the bonds [13].

In the pharmaceutical technology field group, it is different from the previous three groups of science fields. The characteristics of the pharmaceutical technology field group are closely related to pharmaceutical preparation processing techniques. In this case, the subjects related to concepts in basic chemistry are biopharmaceuticals, basic pharmacy, physical pharmacy, drug delivery systems, drug stability, and pharmaceutical preparation technology. 1. Basic chemical concepts used in these courses include compounds, mixtures, and their separations, reactions chemistry, chemical formula, O₂ release mechanism on drug destruction, polarity, chemical bonding, molecular structure, calculating drug concentration, redox reaction, drug reaction rate, half-life, and UV sterilization. These concepts are incorporated in the subject matter, chemical bonds, the periodic table of elements, stoichiometry, redox and electrochemistry, reaction rates, and nuclear chemistry. In addition, based on the analysis in this field of science, there are material developments such as the addition of concepts about solutions, colloids, and suspensions which are part of a mixture. Quite a lot of basic chemistry topics are related to this group of fields of science. This proves that the importance of basic chemical concepts as applied to pharmacy students [14]. With a good understanding of chemical concepts as the basis for studying pharmacy, it is hoped that all students can meet the graduation standards as a pharmacy graduate and in accordance with the needs of the world of work.

In the field of pharmaceutical chemistry, of course, there will be a strong connection with basic chemistry. All courses in this scientific field group are related to the concepts contained in the basic chemistry subject. This greatly affects the learning objectives in pharmacy. If the basic chemistry concepts possessed by students are weak, then they will have difficulties in learning concepts in all courses in the pharmaceutical chemistry group. For this reason, understanding basic chemistry concepts for students must be prioritized. One of them with a basic chemical understanding of bonds can make it easier for students to understand the concept of organic chemistry [15]. Specifically, when it is applied in the practicum that need special treatment and curriculum [16-21].

4. Conclusion

Based on the results of this study, it can be concluded that the concepts in basic chemistry are needed by pharmacy students as a basis for learning concepts in other subjects. This is proven by 46% or 18 of the 39 subjects that are related to basic chemical concepts, which are incorporated in five groups of science fields.

Acknowledgments

Wati Sukmawati acknowledged this study is supported by UHAMKA, DIKTI, and WCU program UPI.

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