



Analysis of General Chemistry Teaching and Learning Resources: Department of Agro-technology University of Medan Area

Fitri Anggraini^{1*}, Silvia Elastari Matondang²

¹Informatic Engineering, STIKOM Tunas Bangsa, Jl. Jendral Sudirman Blok A No. 1, 2, 3, Pematangsiantar, 21115, Indonesia

²State Islamic University Syeikh Ali Hasan Ahmad Addary Padangsidempuan, Faculty of Tarbiyah and Teacher Training, Jl.T. Rizal Nurdin No.Km 4, Padang Sidempuan City, North Sumatra, 22733, Indonesia

*E-mail: franggraini850@gmail.com

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Abstract

This study aims to describe how the teaching materials related to chemical in the curriculum of the Department of Agro-technology Medan Area University. For the purpose of observation, interviews and giving questionnaires to various stakeholders in the Department of Agro-technology University Medan Area. Results obtained in the form of retribution subjects related to chemistry as much as 7 subjects with a weight of 20 credits or as much as 13.8 % of the total of 145 credits. Those subjects are General Chemistry, Biochemistry Agriculture, Basic Soil Science, Soil Fertility and Fertilizer, Seed Technology, Post-Harvest Technology and Advanced Plantation Crops.

Keywords:

Chemistry Teaching Materials, Curriculum

1. Introduction

Chemistry plays a major role in human welfare. Almost all industrial production for the needs of human daily life uses chemicals in the production process. There are almost no daily necessities that are consumed without the role of chemicals in their processing. The more stuff we use, the more chemicals are involved in the manufacturing process.

The role of chemistry in the environmental field is very large. The issues of global warming, air, water and soil pollution have triggered the development of green chemistry which is oriented towards processes and the use of environmentally friendly materials. The concept of environmental management has shifted from protecting the environment against waste to engineering production processes that

do not produce waste. Chemistry is closely related to all human senses, namely sight, hearing, feeling, and smell. In addition, chemistry is a stepping stone to other sciences. Basic chemistry helps someone to learn other fields of science (Mellyzar, 2012).

Many concepts of chemistry are attached to various fields of science and related to other sciences. Often found in several concentrations of science that require chemistry as a basis for learning, for example Health Sciences (Medicine, Midwifery/ Nursing), Biology, Pharmaceutical Sciences, and so on. Likewise in the world of higher education or university. Chemistry is not only needed for special concentrations in chemistry, but many other scientific concentrations related to chemistry.

In every higher education or university, there are courses, courses are teaching materials/materials based on a scientific foundation that will be taught to students as a learning load through certain methods and approaches. The study load for a course is determined by the SKS load (Semester Credit System), as well as the breadth and depth of each of these tertiary institutions.

Agro-technology which is a branch of Agricultural Sciences is a branch of science in which there are several basic sciences that use chemistry. Agro-

technology comes from 2 words, namely agro and technology. According to the Big Indonesian Dictionary, the word agro-technology is defined as the application of science and technology in the field of biology to intensive farming systems (<https://kbbi.kemdikbud.go.id/>, 2022)

Agro from agronomy is the science that hides the signs (phenomena) behind the use of weapons or the theory and practice of land management and plant production. While technology is closely related to science and wealth. Science refers to our understanding of the real world around us, namely about the basis in the spatial dimension, about matter and energy in their interactions with one another (Assegaf, 2022)

It should be understood that the technology referred to here is not technology in the form of processing machines due to agriculture, or being diverted using agricultural techniques, so in the agro-technology department we will not learn how to assemble machines for agricultural purposes (Assegaf, 2022)

Basically, in Agro-technology, you learn about how to manage a commodity, from seeds to products and then products. We will learn about plants and herbs, food or horticulture, as well as good planting methods, harvesting processes, processing processes, and

production processes. (Salasanto & Mulyadi. 2013)

There are several universities that have Agro-technology Departments, one of which is Medan Area University. With B accreditation, this department has standardized quality by BAN-PT. So, taking into account the previous description, the researcher wanted to find out how chemistry relates to several subjects studied at the Department of Agro-technology, University of Medan Area.

2. Research Method

This research was conducted at the Department of Agro-technology, University of Medan Area, Jalan Pool, Pasar V Medan on March 2015. Where this research is a descriptive research. The population in this study were 120 students majoring in Agro-technology, University of Medan Area, consisting of 2 classes, namely:

- Class A as many as 65 students
- Class B as many as 55 students

The sample in this study were students who had taken a general chemistry course, namely students from 5th semester with the consideration that most likely the students' memories of the General Chemistry course were still fresh in their minds. Class A was randomly selected for 10 students.

In carrying out this activity, the authors conducted research directly

sourced from students and lecturers supporting the General Chemistry course at the Department of Agro-technology, University of Medan Area. Questionnaires were used as a data collection tool given to students, direct interviews with lecturers in charge of General Chemistry courses at the Department of Agro-technology, University of Medan Area as well as collecting curriculum and other data needed to support the completeness of the data.

The research data were then processed in a descriptive systematic manner, to see the respondents' answers, namely to see the suitability of teaching materials and learning problems that existed within the scope of the Department of Agro-technology, University of Medan Area.

3. Result and Discussion

The background to establishing Medan Area University is as a manifestation of the elaboration of the 1945 Constitution, which is to participate in educating the life of the nation and is a container for the aspirations and desires of the people who continue to grow to enjoy higher education.

In 2018 the Medan Area University officially received institutional accreditation with a grade of B with SK number: 414/SK/BAN-PT/Akreditasi/PT/XII/2018, SK Date:

December 19 2018 and valid until December 19 2023.

Until now, Medan Area University (UMA) has seven Faculties with 16 study programs for Strata 1 (S1), 4 study programs for Strata 2 (S2) and 1 Doctoral program (S3). The seven faculties, namely the Faculty of Engineering, Faculty of Agriculture, Faculty of Economics, Faculty of Law, Faculty of Social and Political Sciences, Faculty of Psychology and Faculty of Science and Technology, have accredited status for all study programs held with grade "A" and grade "B" .

The UMA Faculty of Agriculture has two study programs namely Agro-technology and Agribusiness. Carry out a productive & efficient quality educational process through the implementation of science & technology programs that support development in agriculture, which produces graduates who are innovative, have noble character, are professional, have intellectual abilities with high analytical power and are skilled in applying knowledge.

3.1 Approaches in Curriculum Development

The curriculum of the Faculty of Agriculture, University of Medan Area is adapted to the needs of society and the world of work for graduates who have

adequate basic competence and expertise.

Start from 2016/2017 Medan Area University enforces the KKNI-Based Curriculum (Indonesian National Qualifications Framework) with reference to the Indonesian National Qualifications Framework Curriculum Development Guidebook (Presidential Regulation No.8 of 2012).

Furthermore, the Faculty of Agriculture, University of Medan Area determines the core curriculum to be a complete study program in accordance with the conditions and direction of development and goals that lead to 5 (five) main competencies, namely:

- Businessman
- Agricultural Business Actors
- Manager
- Educator
- Researcher

In meeting the needs of the business world, government agencies and the public who use agricultural graduates, the Faculty of Agriculture, University of Medan Area will implement the KKNI (Indonesian National Qualifications Framework) Based Curriculum.

In accordance with the Decree of the Minister of National Education No. 232/U/2000 dated December 20, 2000, the courses at the UMA Faculty of Agriculture were grouped into (1) Personality Development Courses

(MPK), (2) Science and Skills Courses (MKK), (3) Craft Skills Courses (MKB), (4) Work Behavior Course (MPB), (5) Community Living Course (MBB).

The study load for the Department of Agro-technology, University of Medan Area is 145 credits of the core curriculum which consists of:

MPK: 10 credits = 6.9%

MKK: 88 credits = 60.7 %

MKB: 35 credits = 24.1 %

MPB: 7 credits = 4.8%

MBB: 5 credits = 3.5 %

With the proportion of courses 119 credits (82%) theory and 26 credits (18%) practice.

The number of courses related to chemistry is 7 courses with a weight of 20 credits, with 14 credits (70%) theory and 6 credits (30%) practice from the total chemistry lesson.

Table 1. Table of Retribution for Subjects Related to Chemistry

No	Kel. M.K	Mata Kuliah	SKS
1	MKB	Kimia Dasar	2+1
2	MKB	Biokimia Pertanian	2+1
3	MKK	Dasar Ilmu Tanah	2+1
4	MKK	Teknologi Benih	2+1
5	MKK	Kesuburan Tanah & Pemupukan	2+1
6	MKK	Teknologi Pasca Panen	2+1
7	MKK	Budidaya Tanaman Perkebunan Lanjutan	2+0
Jumlah SKS			20

3.2 Analysis of Chemistry Teaching Materials

The Department of Agro-technology has several compulsory and elective courses which in their discussion have a link with Chemistry, with a weight of 20 credits out of 145 total credits with a percentage of 13.8% of all courses, including:

3.2.1. MKB (FPT 102) Basic Chemistry (2+1 credits).

Explanation of materials, compounds, elements and methods of measurement using significant figures. Atomic theory and the process of its discovery. Chemical calculations with stoichiometry and substances in the form of solutions, ideal gas laws, real gases and their calculations. Electron

chemistry, homogeneous and heterogeneous balance. Concept of acids and bases, calculation of pH, electrolytes and retaining mixtures.

3.2.2 MKB (AET 102) Agricultural Biochemistry (2+1 credits).

Synthesis of carbohydrates, proteins and fats. Enzymes and Nucleic Acids. Metabolism of carbohydrates, proteins and lipids.

3.2.3. MKK (FPT 209) Basic Soil Science (2+1 credits).

Approaches to the definition of land. Soil constituent materials. Soil formation processes, factors influencing soil formation. Soil physical properties, soil chemical properties and soil biological properties. Essential nutrients and the mechanism of absorption of nutrients from the soil. Soil and plant nutrient relationships, nutrient balance. Fertilizer and fertilization, single fertilizer, compound. Liming.

3.2.4. MKK (AET 210) Seed Technology (2+1 credits).

Flowers and flowering process, factors affecting induction of flowering, ovule formation, male and female gametes, pollination, fertilization, and seed development. Seed structure and chemical composition. Germination of seeds, factors affecting germination and germination processes. Seed dormancy, types, causes and breaking of dormancy. Handling of seeds,

components of activities in handling seeds. Seed storage, grouping of seeds based on moisture content, factors affecting seed viability before storage and in storage. Theory of the causes of seed deterioration, the application of the principles of seed storage and packaging.

3.2.5 MKK (AET 212) Soil Fertility and Fertilization (2+1 credits).

This course discusses chemical principles; stoichiometry and analytical chemistry; soil solutions and colloids; soil reaction; soil reduction and oxidation (redox); soil cation exchange capacity; availability of plant nutrients; organic matter; analysis of soil fertility and nutrient uptake by plants.

3.2.6. MKK (AET 420) Postharvest Technology (2+1 credits).

This course studies the characteristics of agricultural commodity production (food crops, horticulture, and annual crops); structure and anatomy of agricultural commodity products; chemical composition of agricultural products; respiration of agricultural products, post-harvest handling and quality of agricultural products, pests and diseases in storage warehouses, tools and post-harvest processing, packaging and trading of agricultural commodities.

3.2.7. MKK (AET 021) Advanced Plantation Cultivation (2+0 credits)

This course studies erosion and its consequences, decreased soil productivity, prediction of erosion, techniques and methods of soil conservation, reclamation of critical and polluted land, conservation crop farming models; the importance of sustainable agricultural systems; definitions, concepts, foundations, challenges and indicators of sustainability; history, concept, legislation of the organic farming system; organic industry, organic farming certification; SRI, seeds and varieties for organic farming; physical, chemical and biological factors; nutrient cycle (NPK); cover crop, green manure and compost; integrated pest weed management in organic farming storage, handling, processing and marketing of organic products.

3.3 Results of Surveys and Interviews

The survey was carried out by Agro-technology Class A students of 2014 and the Agro-technology Study Program to obtain the data needed. The questionnaire instrument in this mini-research was modified from Agustina Sariwahyuni (Analysis of Teaching and Learning Materials for General Chemistry Course, Department of Physics Education, Faculty of Teacher Training and Education, University of HKBP Nomensen Pematangsiantar with its Problems in the 2010/2011 Academic Year).

3.3.1 Student Background

Most of the students from the Department of Agro-technology at the University of Medan Area come from the Science Program Senior High School, with a percentage of 50%. Meanwhile, 30% came from Senior High School Social Sciences Program and 20% came from Senior High School Vocational Program. For the Department of Agro-technology, which is dominated by natural science courses, it turns out that it has special appeal for graduates from Social Sciences Program High Schools and Vocational High School graduates.

3.3.2 Motivation

There are 70% of students from the Department of Agro-technology at the University of Medan Area feel proud to be students of this department and as much as 40% know the competencies of graduates of the Agro-technology Study Program taken before being accepted as students. By knowing the competence of graduates, it indicates that students have strong motivation before choosing and continuing their education to a higher level in choosing majors and universities.

With its relation to Agro-technology, chemistry has a relationship with several courses received by students. As many as 40% of Agro-technology Department students are interested in General

Chemistry courses coupled with the motivation that is often given by General Chemistry lecturers to students.

3.3.3 Lecturer Profile

Lecturers in General Chemistry courses convey learning using Power Point media and often use training and assignment methods. The assignments are given in the form of exercises and individual assignments.

3.3.4 Facilities and infrastructure

The library in the Agro-technology Department of Medan Area University has a large collection of Chemistry books. The Chemistry Laboratory also functions well, it is proven that as many as 70% of students state that they always do the practicum needed in General Chemistry Courses. As for learning resources, students use the dictates/handbooks provided by the University.

3.4 Analysis and Development of Chemistry Teaching Materials

The curriculum of the Faculty of Agriculture, University of Medan Area is in line with the Decree of the Minister of National Education of the Republic of Indonesia Number: 232/U/2000 concerning Guidelines for Developing Higher Education Curriculum and Assessment of Student Learning Outcomes.

In meeting the needs of the business world, government agencies and the

public who use agricultural graduates, the Faculty of Agriculture, University of Medan Area will implement a Competency-Based Curriculum (CBC).

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Since the 2007/2008 academic year, the curriculum for the Faculty of Agriculture has been adjusted to the Decree of the Minister of National Education Number: 43 & 44/Dikti/Kep/2006.

Starting from the 2009/2010 Academic Year, the Curriculum of the Faculty of Agriculture, University of Medan Area was then changed in line with the changes in Study Programs based on the Decree of the Director General of Higher Education No. 163/DIKTI/Kep/2007 dated 29 November 2007.

In the general lecture process for chemistry-related subjects, 30% is learning that takes place in the laboratory (practice) and 70% is learning theory in the classroom, where in the learning process, the lecturer always uses power point media in combination with the method of giving exercises and assignments. The motivation provided by the lecturers of the General

Chemistry course also influenced the interest of students majoring in Agro-technology in the General Chemistry course. Lecturers who teach General Chemistry courses are guest lecturers who become permanent lecturers in the Chemistry Department, Medan State University.

Courses in the Department of Agro-technology that are related to Chemistry account for 13.8% of the total 145 credits given, not just Chemistry, the courses delivered are also related to Biology, Management and Economics.

The levy for courses related to Chemistry is in accordance with the graduate criteria expected from the Faculty's vision and mission. With the provision of General Chemistry given in semester I, then followed by Agricultural Biochemistry in semester II, Basic Soil Science in semester III, Soil Fertility and Fertilization and Seed Technology given in 4th semester, Post-Harvest Technology in semester VII and Advanced Plantation Plant Cultivation as elective courses in even semester. In addition, the authors suggest adding a course on Environmental Toxicology related to toxic substances for agricultural/plantation land.

4. Conclusion

The levy for courses related to chemistry at the Department of Agro-

technology, University of Medan Area is 13.8% of all courses.

Subjects related to chemistry taught at the Department of Agro-technology, University of Medan Area are General Chemistry, Agricultural Biochemistry, Basic Soil Science, Soil Fertility and Fertilization, Seed Technology, Post-Harvest Technology and Advanced Plantation Cultivation.

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