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Natural Science Mini Project Practicum through The Practical Instructions Module for Identifying Natural Chemicals in Medicinal Plants

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Abstract—21st century learning includes achieving the ability to communicate, think critically, think and act creatively, and collaborate. One of the efforts recommended by experts to achieve this is through the application of project-based learning. Various forms of blending are implemented using project-based learning. One form of method in project-based learning is the practicum method. This literature review aims to describe various forms of project-based learning as well as the development of practical guide modules and their relationship to several practical activities that lead to the chemical identification of natural medicinal plant ingredients. The various results of this research will give birth to alternative project-based learning by developing practical guide modules that can strengthen students' understanding of high-level thinking skills related to the classification of living things, especially plants, as well as science process skills and scientific attitudes.

Keywords—Project-based learning, science practicum, Classification of Medicinal Plants
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1. Introduction

This article is a literature review in project-based learning journals through science practicum, especially regarding the chemical identification of natural substances in plants. This article discusses 3 search groups, namely the application of project-based learning, the application of science practicum manual modules and the introduction of natural product chemistry to various medicinal plants. The journal articles were reviewed to find the main ideas of each journal article and connected them to each other.

Science learning is a collection of knowledge that studies natural phenomena that are arranged systematically, which is obtained from thought and research through the process of observation and experimental skills [1]. Concepts in science learning are collected from observation activities or facts experienced in everyday life. The various facts found were finally strengthened through various investigations through science practicum activities. The implementation of science practicum will proceed by referring to the practicum guide module provided by the teacher. The science practicum method can have a positive influence on students' learning abilities such as students' science process skills [2], [3] improving students' critical thinking skills [4]. Practicums in the application of science can also be carried out based on students' scientific literacy [5], inquiry-based and project-based [7].

Referring to UNESCO's four pillars as recommendations for efforts to face and adapt to future challenges, namely Learning to Know, Learning to Do, learning to Be, and learning to live Together, demanding learning refers to learning that demands the role of students to develop their potential. The demands of the 21st century education paradigm also describe students who are able to collaborate, communicate well, have the ability to think critically and creatively (4C) [8]. Every student who learns will certainly gain a construction of understanding, become more skilled and have better attitudes and behavior. In line with that, science education in Indonesia leads to achieving competency in attitudes, knowledge and skills.

One of the recommendations of experts to achieve the demands of this paradigm is to use project-based learning. Project-based learning is basically a learning model that provides students with direct real-world experience related to engineering to enrich their understanding of technical theories and concepts [9]. The project-based learning model can also be combined with other learning models such as problem-based learning which can be used to develop 21st century skills [10]. The application of project-based learning can actually be useful in increasing students' capacity to support daily life. In project-based learning, students are trained to work collaboratively with others and reflect on what they have learned. In addition, students can become active in the search and decision-making process by improving practical thinking skills [11]. Project-based learning can also be designed with the aim of achieving behavior towards environmental literacy and internalization of Islamic values [12].

Based on several things above, project-based learning which leads to collaborative collaboration with other people and is active in the search and decision-making process, a form of project-based learning can be applied to science practicum activities. To facilitate the implementation of science practicum, tools are needed in the form of student worksheets which are implemented using a project-based learning model [13]. Science practicum is part of the investigative and experimental efforts carried out by students to prove the concepts presented by the teacher in class.

One of the concepts given to class VII SMP students is the concept of classification of living things. The science practicum activity consists of collecting information in the form of plant names around the route from home to school. Identify the name and shape of the plant. In the New York area, a learning module was developed in which there was a set of worksheets that asked students to know the names of the trees they encountered [14]. In the research he conducted, the results were obtained that students' ability to recognize the names of trees will have a positive impact on environmental knowledge, environmental attitudes and behavior in protecting the environment. For tourist areas such as in various countries, the introduction of tree names will increase the tourist value of the area because it has people who care and know the environment.

Apart from science practicum related to tree names, students also need to know the chemical content of natural ingredients found in the various plants they encounter. This identification can be done through phytochemical practicum of natural ingredients such as medicinal plants In Indonesia, especially on Lombok Island, West Nusa Tenggara Province, plants are widely consumed and are believed to have many benefits for humans. On the island of lombok you can find many Moringa oleifera plants. This plant can be used as a bioactive for the metabolism of living creatures [15].

The aim of this research is to provide an overview of the relationship between project-based learning and the use of science practicum guide modules, especially for chemical identification of natural products in medicinal plants. The importance of this research is to describe alternative ecotourism-based science learning through a project learning model by carrying out science practicum activities, especially identifying medicinal plants.

2 Method

The method for writing this review article is a qualitative descriptive method based on observation, experience and literature review from several literature journals. In this article, the author uses the literature study method or conducts a study of various scientific articles published in Indonesian national journals (Sinta and Garuda index) and reputable international journals (Scopus) related to the topic raised, namely the study of project-based learning through modules. Science practical instructions for chemical identification of natural products in medicinal plants. This research aims to determine the extent to which project-based learning is applied in science learning. Furthermore, studies related to the implementation of science learning using the Science Practicum Guide Module as well as studies related to chemical identification of natural medicinal plant ingredients. This literature review is to look for various things that have been applied in examples of these three things so that they become new ideas related to the development of learning facilities in the current school environment so that they can produce new knowledge and contribute to knowledge that can be useful for society. If it is linked to science learning from an ecotourism perspective, it is hoped that this research can contribute to how these three things can be linked to science learning from an ecotourism perspective.

3. Results and Discussion

Project Based Learning

The development of human life in the 21st century has been responded to by the world of education in Indonesia which has implemented an empathetic approach to education since 2000, namely: a. Life skills oriented education; B. Competency-based curriculum and learning; C. Production-based learning; and D. Broad Based Education (Broad Based Education). Education is fundamental in shaping the character of each individual. Education is expected to be able to optimize students to become humans who have complete competence. Through a good learning process quality human will be created [16].

Project Based Learning is a learning model that involves students in the context of problem solving and provides opportunities for students to work independently to construct their own learning and ultimately produce valuable and realistic student work products. To achieve the goals of project-based learning with a student-centered approach, project-based learning teachers must be motivated, open to change in conducting their teaching, and ultimately enable in planning students' learning experiences [17]. The implementation of project-based learning cannot be separated from the role of the teacher. Teachers can also benefit from implementing project-based learning. Universities in the Western region of the United States conducted an assessment of 16 teachers who participated in the Curriculum and Instruction program which stated that this showed an increase in teachers' knowledge and confidence in planning and implementing project-based learning units. Meanwhile, data from post-training interviews revealed that teachers had benefits and challenges in designing and implementing project-based learning units in the classroom environment [18].

According to [19] definitions of project-based learning vary greatly, but most have complementary criteria, including: a. projects driven by real world and authentic questions; B. they engage students in rigorous and sustained inquiry; C. they offer students the right to speak, vote, and choose in a collaborative learning environment; D. they provide ample opportunities for reflection, revision, and assessment; e. Ends in peer production that is authentic and felt by the public. Project-based learning has the following characteristics: a. A shift from regular classroom practice is brief (a model of classroom activity that is different from the regular classroom); B. long-term (long-term) learning activities; C. Interdisciplinarity (interdisciplinary); D. Student Center (student-centered); and e. Integrated with real world problems and practices (integrated with the real world and real problems). In simple terms, it can be explained that project-based learning is an innovative learning model that is student-centered, placing the teacher as a motivator and facilitator and students are given the opportunity to work independently to construct their learning. Project-based learning is also an effective educational approach that focuses on creative thinking, problem

solving and interaction between students and their peers to create and use new knowledge. The project-based learning approach can be seen as an approach to creating a learning environment that can encourage students to construct knowledge and skills personally.

Project-based learning is one of the appropriate learning models for learning with certain products [20]. If it leads to a constructivist education paradigm, then project-based learning can construct students' knowledge, skills and attitudes through various project activities carried out by students. The project-based learning model is a constructive learning model that positions students as builders of the knowledge they have based on the knowledge they already have. In this way, students become active learners. Students will have high academic involvement while studying with the project-based learning model because it is facilitated with projects that are interesting, challenging, related to everyday life phenomena and relevant to needs in society [21].

The development of project-based learning has been carried out by many experts by combining several models and techniques as well as supporting facilities. This combination is development research with various models. This means that through project-based learning, students' abilities can be improved by combining them with various things. Zulfa and friends [22] succeeded in implementing project-based learning using simulation and its impact on character values. Some of the findings from this research are: 1) Project-based learning with simulations can be applied to students to develop learning tools; 2) Project-based learning with simulation meets the requirements to be applied in learning. Based on the validator's assessment, the learning model has met content validity and was assessed by both lecturers and students in the "Very Good" category; 3) Teaching and learning in project-based learning using simulation effectively improves student knowledge and attitude learning outcomes. The average value of student learning outcomes in the experimental class is higher compared to the control class.

Afriana and friends and Samsudin and friends also developed project-based learning with STEM [23] and [24]. Project-based learning combined with STEM is an approach that leads students to explore ill-defined problems that integrate STEM into a limited environment. A student-centered approach, hands-on activities, promoting collaboration, team communication, knowledge construction, and having an assessment format have been stated as key components of STEM project-based learning. By engaging students in solving real-world projects, working in groups collaboratively, applying scientific reasoning, and developing concrete solutions, recent research in STEM project-based learning shows that learning activities can improve student achievement in STEM fields. By using STEM methods, project-based learning can increase students' self-efficacy in solving physics and mechanics problems. Self-efficacy is an individual's belief or belief regarding the ability to organize, carry out tasks, achieve goals, produce things and take actions to achieve certain skills.

a. It turns out that project-based learning can also be combined with problem-based learning and can improve students' thinking abilities [10], namely critical thinking [25]. To improve learning outcomes, project-based learning is implemented through learning. This combination results in a project-based instruction approach [26]. Project-based learning is not only applied to students, but can also improve the abilities of prospective teachers. According to him [27] project-based learning can be applied to prospective teachers. Project-based science learning is effective in pre-service teachers' learning literacy and creativity skills in waves and optics. Science learning by implementing a project-based learning model can also strengthen students' creative abilities as one of the 21st century skills by using virtual media [28]. Other research states that project-based learning can be carried out more effectively if supported by technology [29].
b. It turns out that the application of project-based learning is not only beneficial for students in the field of education, but can also be beneficial for courses. [9] stated that a project-based learning approach has been presented to improve undergraduate-level microprocessor-based embedded course teaching systems. It is clear that engineering students during their educational journey are able to solve real world problems by asking them to design and implement a comprehensive prototyping system that has been determined and has realistic limits. The project-based learning method in teaching this course has helped bridge the gap between theoretical and real-world electrical engineering education. Feedback from students confirms that this method is effective in increasing students' understanding and ability to apply embedded system design concepts to solve real-world engineering problems.

Based on the studies above, it can be concluded that there are several advantages and disadvantages of project-based learning. Some of the advantages of implementing project-based learning are:

a. Can change students' mindset from narrow to broader and more comprehensive in viewing and solving problems faced in life;
b. Fostering students to apply knowledge, attitudes and skills in an integrated manner, which is expected to be useful in students' daily lives;
c. According to modern didactic principles;
d. Increase motivation, students are diligent and try hard to achieve the project and feel that learning in the project is more fun than other curriculum components;
e. Improve problem solving abilities, from various sources that describe a project-based learning environment that makes students more active and successful in solving complex problems;
f. Increasing collaboration, the importance of group work in projects requires students to develop and practice communication skills. New cognitive and constructivist theories suggest that learning is a social phenomenon, and that students will learn more in collaborative environments; And
g. Improving resource management skills, if applied correctly, students will learn and practice in organizing projects, making allocations of time and other resources such as equipment to complete tasks.

Apart from the benefits that students can gain or feel by participating in learning using project-based learning, there are also several weaknesses in implementing project-based learning, namely:

a. Class conditions are somewhat difficult to control and easily become noisy during project implementation, because there is freedom for students which provides opportunities to be noisy and for this reason teachers' skills in good classroom control and management are needed;
b. Even though you have allocated sufficient time, you still need more time to achieve maximum results

Based on several explanations related to project-based learning, the steps for project-based learning refer to [30] which states that the learning steps include;
a. Setting, namely determining learning objectives, deciding on the project to be implemented and managing the time for project implementation as well as possible;
b. Begin is to start working on a project;
c. Changes make necessary changes to improve the project being worked on and
d. Demonstration, namely showing what has been achieved through a presentation

Mini Project Natural Science Practicum Module

Science learning is a learning process that emphasizes natural phenomena and the relationship between these phenomena, so that the science learning process does not only emphasize cognitive aspects, but also includes attitudes, processes, products and applications that must be carried out as a whole. Science learning requires skills in connecting concepts and evidence. To prove the concept, a proof process is carried out through science practicum activities. In order for science practicum activities to run as expected, practical instructions are needed. Science practical instructions need to be prepared systematically in language that is easily understood by students according to their level of knowledge and age. They can learn (independently) with minimal help or guidance from educators [31].

Science material or concepts are not appropriate if they are only taught by giving and conveying concepts, because science concepts are discovered through the experimental stage. In this regard, the appropriate teaching of science material is to use practicums. In general, practical activities are based on learning plans that have been created and determined by the teacher to improve psychomotor skills which include the ability to use tools, work attitudes, the ability to analyze problems, arrange activity sequences, the ability to read and describe pictures. and can carry out activities quickly.

Before carrying out science practicum, at the tertiary level students are required to read and understand the instructions provided in the practicum guide module, however the results of research conducted by Dinata and friends at FMIPA Palangkaraya University show that many students do not prepare well before practice. The practical guidance module, which is a mandatory item, is not brought. When the practicum begins, many students do not understand work procedures and how to use measuring tools, so they are very dependent on assistants. They are unfamiliar with the material means to be used; This indeed hampers the data collection process. This problem arose because it turned out that students were lazy about reading the printed modules that had been distributed. In the end, students rely too much on assistants during experiments, so that the expected psychomotor abilities are not achieved [32]. On the other hand, teachers are also required to serve and prepare themselves before practical activities begin. Teachers are obliged to respond to every student complaint, answer all student questions, and even carry out laboratory administration themselves [33].

The conditions above cause teachers to design or devise various patterns of presenting practical instructions so that students are more easily understood and liked according to their age. The application of practicum instructions at the elementary school level, for example, the science practicum instructions that were developed were contextually based science practicum instructions for science subjects for fourth grade students at SD Negeri Pondok Pucung 01 South Tangerang [34]. At the junior high school level for business and energy concepts, junior high school teachers in the city of Singkawang developed science practicum instructions based on the POE (Predict Observe Expect) learning model. At the lecture level, even at the student level, inquiry-based practicum processes are also developed [35] [36].

In line with the demands for student competency in scientific literacy, practical instructions based on scientific literacy have also been developed. This practicum guide was developed by lecturers at Samudra Banda Aceh University to be implemented at SMP Negeri 1 Langsa and in terms of feasibility, this practicum guide is very feasible [5]. At the elementary level, a science practical guidebook was also developed with the acronym PUTIK BERISI. The science practicum guidebook based on scientific literacy for fifth grade elementary school students is suitable for use by making improvements according to suggestions from the validator [37].

Sometimes, with limited facilities at schools, schools are unable to provide services to improve the learning process by utilizing virtual laboratories. The students observed via virtual broadcast how the practicum process was carried out. Virtual work practice is one means of initiating innovative learning to overcome this. a virtual laboratory practical learning innovation that visualizes abstract science events and becomes real so that students can easily understand them. Apart from that, virtual laboratories are intended to overcome problems that cannot be carried out by laboratory practicum due to various limitations. Therefore, laboratory practicals need to be carried out virtually [38].

Practicum implementation using a practicum guide module has been developed for junior high school students. Various practical instructions have been prepared, such as those relating to the organization of life [39], practical instructions relating to the digestive system [40], and practical instructions relating to environmental pollution [41]. The development of practical instructions was carried out using the 4D development research model and resulted in the conclusion that the practical instructions developed were valid, very practical and effective. The level of effectiveness of practical instructions when measured by several other variables to be achieved.

The development of practical instructions is also carried out at the high school level. Several researchers have practical

guidelines for developing several concepts such as: the invertebrate concept [42], the fungal concept [43] and colloidal materials [44]. The development of practical instructions was carried out using the 4D development research model, while others used Borg and Gall with slight modifications. It turns out that research activities in an effort to develop practical instructions are not only carried out at the junior and senior high school levels, development is also carried out at the lecture level. Many lecturers carry out research by developing practical instructions on the concepts of anatomy and physiology of living things [45], microbiology practicum [46]. The development of practical guidelines related to the chemical isolation of natural products such as artelatisin [47], isolation of cinnamaldehyde [48], and extraction of carbolic compounds was also carried out [49]. The development and implementation of practical instructions was carried out using the Borg and Gall development research model and the experimental research model.

Practicum in the narrow sense is a structured and scheduled learning activity as a complement to face-to-face theory carried out in the laboratory. This activity can take the form of carrying out standard procedures. Practicums can be carried out in the laboratory, field or in the classroom by means of cooking. Demonstration is a way of showing how to do something, this includes the materials used in the work being taught, showing what is being done and how to do it, as well as explaining each step of the process. Practical activities are a learning process that provides real, direct interaction to students through their five senses. This will of course provide a science learning experience that can be felt directly. So that practical activities have an important role in realizing motivation and interest in learning as well as developing students' science skills in the science learning process which will ultimately lead to student learning outcomes. Practical activities by making observations that involve students' senses can provide meaning and make sense of the experiences they experience in the form of perceptions in response to objects from their senses. Practical activities will support and support the success of learning, of course they must be carried out well. Considering the important role of practicum activities in the science learning process as a form of activity that is able to develop knowledge, skills and attitudes. Therefore, so that practicum activities can achieve what is expected, a practicum guide module was developed. Science practicum is carried out in teaching laboratories, namely laboratories designed for practicum, not research. However, if the practicum involves sophisticated or delicate equipment that can only be operated by trained people used for research, then the practicum can be carried out in a research laboratory.

Each development of a practical guide module in various concepts of the material being taught is expected to provide added value for students. Student competencies related to knowledge, skills and attitudes can be improved by implementing practical instruction modules. Several findings from the research results provide an overview of increasing student competency with future needs and challenges. Generic ability-based learning practicum has a positive impact on the generic ability profile of good prospective teacher practicum planning. From the generic abilities of prospective teachers' practicum planning, it turns out that it can also improve students' generic science abilities. Aspects of general science skills are generally present in students at school, such as direct observation. So when students make direct observations in learning they will be able to gain a better understanding of concepts and will be able to improve student learning outcomes [50].

The existence of a science practicum module is very effective in increasing understanding of concepts [51]. Conceptual understanding is the ability to grasp meaning, such as being able to express material presented in a form that is easier to understand, being able to provide an interpretation and being able to apply it. Concept understanding is the level of ability that students are expected to be able to understand the meaning of the concepts, situations and facts they know. Based on Bloom's cognitive domain, understanding is the second level. Understanding is defined as the ability to absorb the meaning of the theory or material studied. The understanding aspect is a reference aspect to the ability to comprehend and comprehend a concept and interpret the meaning of a material. This aspect of understanding includes a person's ability to capture the meaning of a concept in a single sentence. Understanding a concept is the ability to learn from an event or lesson (material) presented by the teacher so that understanding in depth a concept or material becomes easier.

Science practical learning modules can also improve science process skills [3], [52] and [53]. Science process skills are skills obtained from practicing basic mental, physical and social abilities as drivers of higher abilities. Process skills involve cognitive skills. Cognitive or intellectual skills are involved because students process skills using their minds. Skills manuals are clearly involved in the skills process as they may involve the use of tools and materials, measuring and drafting. Teaching and learning activities with process skills, carrying out and discussing observation results. Process skills aim to improve students' ability to realize, understand and master a series of activities related to the learning outcomes that students have achieved. The series of activities in question are observing, classifying, interpreting, predicting, implementing, planning research and communicating. Science process skills are: a vehicle for the discovery and development of scientific facts, concepts and principles for students; Scientific facts, concepts and principles discovered and developed by students also play a role in supporting the development of self-process skills and the interaction between the development of process skills and scientific principles which will ultimately develop the attitudes and values of scientists in students.

The science practicum guide module can also help solve problems. The ability to solve problems is part of the 7 types of skills needed to become student learning outcomes in secondary school. Problem solving skills can help students make appropriate, careful, systematic, logical decisions and consider various points of view. On the other hand, this reduced ability causes students to get used to carrying out various activities without knowing the purpose and reasons for doing them.

Implementing science practicum can improve critical thinking skills [54], [55], and [56] even increase local students' wisdom. Critical thinking skills are evaluative thinking skills that show the human ability to see the gap between reality and truth by referring to ideals, and being able to analyze and collect, and being able to create stages of problem solving, being able to apply material. which has been learned in the form of daily behavior both at school, at home and in social life in accordance with applicable norms. The level of success in understanding the concept as measured through quasi-experimental research from the development and implementation carried out, concluded that there was a significant increase in understanding of the concept after

implementing the science practicum instructions.

Even in the field, especially in Mataram City, NTB Province, information was obtained that all junior high schools have science laboratories. In the last 3 years, out of 24 schools, there were 3 schools that never carried out practicums again. The concepts that have been given by the teacher using the practical method include: 1. Homogeneous and heterogeneous mixtures; 2. Looking for microorganisms in soaked straw in the diversity of living creatures; 3. Observation of dicot and monocot plants; 4. identify acids and bases. 5. About the classification of living things, 6. Introducing the names of plants around the school. When science practicum activities are not carried out, learning activities use group discussion methods, introducing material using video shows, using charts and pictures, using slide shows, using virtual literature. Specifically related to plant classification, the teacher also introduces the names of plants around the school and their taxonomy. Some of these plants include: Moringa leaves, cat's whisker leaves, ginger, turmeric, and others. For all the plants whose names and taxonomies are introduced, teachers never carry out a science lab to prove that the plants around us every day contain natural chemicals that are very beneficial for human health..

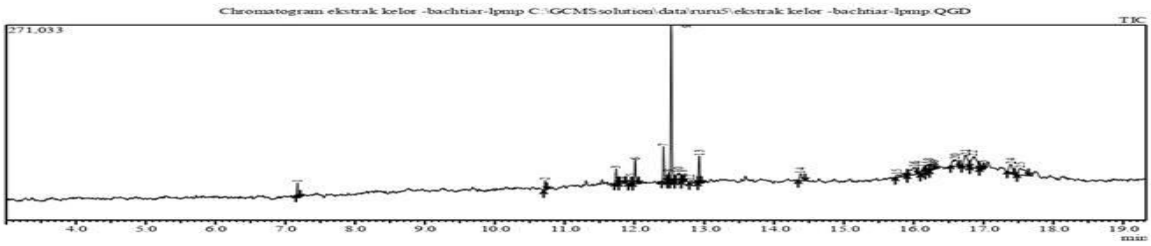
Chemical identification of natural substances in medicinal plants.

The use of medicinal plants began with our ancestors to treat health problems with several medicinal plants that were around them. Learning from local folk medicine wisdom on several plants as medicine, large-scale research was carried out. These efforts yielded many compounds with potential pharmacological activity. In terms of nutrition, this species was found to contain calories, carbohydrates, protein, dietary fiber, riboflavin, small amounts of niacin, thiamin, and vitamin E, as well as minerals such as sodium, potassium, calcium, magnesium, iron, and zinc [57].

Medicinal plants are one of the parts introduced in the concept of classification of living things, especially plants. Society in general is based on knowledge passed down from generation to generation using plants that grow abundantly around where they live which have benefits. Some plants such as Moringa leaves are efficacious for diabetes sufferers, the sap of Cocor Bebek leaves is efficacious for cancer sufferers. Medicinal plants that exist around people's lives exist as plants that are known and believed by certain communities to have medicinal properties and have been used as raw materials for traditional medicine. There are several types of modern medicinal plants, namely plants that have been scientifically proven to contain compounds or active ingredients that have medicinal properties and whose use can be medically justified, as well as plants that are suspected to contain or have active compounds that have medicinal properties. However, it has not been scientifically and medically proven to be used as a medicinal ingredient. Traditionally, people also process medicinal plants by peeling, pounding, pressing, filtering, boiling, squeezing, drying, chewing, without processing, and so on.

Plants with medicinal properties serve as a basic treatment for many diseases of various forms and types throughout the world. These medicinal plants show a wide range of activities against many major diseases and their active substances. In recent years, phytoscience has made significant contributions to modern medicine. As a result, medicinal plants have become a primary source of treatment for various health problems. Another reason is that treatments to influence the environment are readily available and accessible and very cheap. In several countries, people still rely on herbal medicines to overcome all their health problems [58].

Lombok Island in West Nusa Tenggara Province has very unique plants which are consumed by the people and are spread throughout the island. The most common and simple dish from the people of Lombok Island is Moringa leaf vegetables. Apart from that, in several places there are several restaurants that serve Moringa leaf vegetables. Several studies have explained that it is currently being used as a bioactive candidate for secondary metabolites of Moringa leaves [59]. Secondary metabolites are produced through reaction stages in plant tissues called biosynthesis. Alkaloids, terpenoids, steroids, and flaphonoids are some examples of compounds produced from this biosynthesis. Studying the chemical content of a plant (leaves, stems, bark, roots, etc.) or filtering the chemical content of various plant species in one family in certain parts will provide information about their level of evolution. Based on the results of the secondary metabolites of Moringa leaves, it was found that all compounds such as alkaloids, terpenoids, steroids and flaphoids were identified in Moringa leaves.



Peak Report TIC

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	7.174	7.150	7.215	19655	1.81	18465	3.35	1.06		1-beta.-Pinene
2	10.721	10.700	10.745	16109	1.48	13853	2.51	1.16		1,2-Benzenedicarboxylic acid, dieth
3	11.737	11.710	11.775	25895	2.39	20432	3.70	1.27		1-Hexadecanol (CAS) Cetal
4	11.790	11.775	11.860	14976	1.38	4668	0.85	3.21	V	RT:11.790
5	11.951	11.910	11.975	13113	1.21	9383	1.70	1.40	V	7,9-di-tert-butyl-1-oxaspiro[4.5]dece
6	12.010	11.975	12.060	47352	4.36	32197	5.84	1.47	V	Hexadecanoic acid (CAS) Palmitic a
7	12.417	12.390	12.470	61160	5.64	48382	8.77	1.26		1-Octadecanol (CAS) Stenol
8	12.492	12.470	12.505	14121	1.30	12938	2.35	1.09	V	9,12,15-Octadecatrienoic acid, meth
9	12.527	12.505	12.575	2523336	23.26	217148	39.37	1.16	V	2-Hexadecen-1-ol, 3,7,11,15-tetrame
10	12.639	12.575	12.670	46793	4.31	12353	2.24	3.79	V	
11	12.685	12.670	12.710	14075	1.30	8228	1.49	1.71	V	RT:12.685
12	12.800	12.785	12.905	13655	1.26	3351	0.61	4.07		RT:12.800
13	12.927	12.905	12.960	48402	4.46	37572	6.81	1.29	V	DI(2-ETHYLHEXYL) MALONAT
14	14.382	14.345	14.445	27371	2.52	9671	1.75	2.83	V	Hexadecanoic acid, 2-hydroxy-1-(hy
15	15.755	15.735	15.905	19080	1.76	3466	0.63	5.50		
16	16.016	15.905	16.060	59151	5.45	10022	1.82	5.90	V	1,2-Benzenedicarboxylic acid, dinon
17	16.135	16.095	16.165	21275	1.96	8484	1.54	2.51		
18	16.212	16.165	16.225	30760	2.84	10231	1.85	3.01	V	1,2-Benzenedicarboxylic acid, dinon
19	16.290	16.225	16.310	30063	2.77	4780	0.87	6.29	V	
20	16.591	16.525	16.660	43352	4.00	9243	1.68	4.69		1,2-Benzenedicarboxylic acid, dinon
21	16.749	16.685	16.800	65345	6.02	15703	2.85	4.16		1,2-Benzenedicarboxylic acid, dinon
22	16.850	16.800	16.940	88128	8.12	15527	2.81	5.68	V	1,2-Benzenedicarboxylic acid, dinon
23	16.990	16.940	17.005	15125	1.39	4033	0.73	3.75	V	
24	17.386	17.340	17.445	39028	3.60	12088	2.19	3.23		1,2-Benzenedicarboxylic acid, diiso
25	17.522	17.480	17.645	58637	5.40	9390	1.70	6.24		1,2-Benzenedicarboxylic acid, dinon
				10849571	100.00	551608	100.00			

Fig. 1. GS-MS display results on Moringa oleifera

Each of these compounds was tested using a phytochemical test and to find out what types of chemicals or compounds it contained, a test was carried out using gas chromatography-mass spectrometry (GC-MS). Gas chromatography-mass spectrometry (GC-MS) is an analytical method that combines the features of gas chromatography and mass spectrometry to identify different substances in a test sample. This test is then explained to produce the percentage composition of the substances found. To analyze with GC-MS you need to know and to know you need a lot of practice and the habit of reading laboratory results. Based on Figure 1, it can be seen that several compounds extracted from Moringa leaves include: beta-Pinene (β-pinene) is a monoterpene. Benzenecarboxylic acid is a group of chemical compounds which are dicarboxylate derivatives of benzene. 7,9-Ditert-butyl-1-oxaspiro[4,5]deca-6,9-diene-2,8-dione is a flavonoid compound of hexadecanoic acid. Palmitic acid, (or hexadecanoic acid in IUPAC nomenclature), is a fatty acid with a 16-carbon chain. This compound is a saponin group.

Based on a series of discussions related to project-based learning, the use of science practicum instructions and the identification of natural chemicals in medicinal plants, it can be concluded that project-based learning is very useful in forming students' competencies. To meet future needs, activities such as science practicum are required. The form of practicum that leads to the environmental conservation movement is practicum in the science of medicinal plants. One way to find out what content is contained in a plant, whether in its leaves, flowers, stems, fruit, seeds or roots, is by phytochemical and GC-MS testing..

4. Conclusion

Based on a series of discussions related to project-based learning, the use of science practicum instructions and the identification of natural chemicals in medicinal plants, it can be concluded that project-based learning is very useful in forming students' competencies. To meet future needs, activities such as science practicum are required. The form of practicum that leads to the environmental conservation movement is practicum in the science of medicinal plants. One way to find out what content is contained in a plant, whether in its leaves, flowers, stems, fruit, seeds or roots, is by phytochemical and GC-MS testing.

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