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Organic chemistry to stimulate meta-cognitive skill in natural material for development of module of medical plants

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Abstract
Medical plants are increasing attention worldwide due to their empirical efficacy and development. This study aims to develop a medical plants module on organic chemistry in natural materials to simulate the students' metacognitive skills. It investigates technique that refers to the research and development steps. Organic chemistry is in action; this program aims to improve learning and understanding of organic chemistry. Then, this investigation starts by examining the subject requirements in plant and natural material in organic chemistry that people frequently use as a medicine and a module as a learning resource. The results evaluate the students' metacognitive skills using the medical plant's modules significantly vary. Students' metacognitive skills are determined, and their ability in the scheduling feature is well developed. The potential of the local medicinal plant module can simulate students' metacognitive skills.

Keywords: organic chemistry, stimulate meta-cognitive

Introduction

The method of natural resources in the medicinal plants is one of the significant materials in the natural resources maintenance subject. (Zubail, Retnoningsih, and Ngabekti, n.d.)This subject course on the education of biology still depends on the discussions with material sources are coming from the internet sources, and the modules are lack for the students from the potential of local. The lecturer's assessment of the medical plant materials is limited to the ability of metacognitive, assessment psychomotor, and affective needs (Palevitch 1986) [11]. The significance of psychomotor and affective assessment is directly on the learning process experienced by the students. Studying medicinal plants is essential for the students to preserve the traditional culture of producing herbal medicine. This module was designed to make explicit the connection between natural, synthetic organic chemistry and students' experience in the project research. The chemistry laboratories' projects are based open-ended by allowing the students to pick up their targets and develop their artificial plans are based on the earlier literature. (Slade et al. 2014) [17] In this research project, the targeted products are novel themselves, and the students are tasked with improving novel condition reactions to produce the target. The natural material on organic chemistry that contained sub materials of standard competence herbs for this subject, which includes the students, is simple to understand about the uses of natural material compounds and found in the plant's families than the standard potential is in the medicinal plant's forms that are grown in specific locations, which can be applied in the subject's learning sources. The academic institution designed the curriculum using natural resources such as organic chemistry (Pengelly 2020) [12]. Natural material organic chemistry concerns the lecturer's interview results from specific organizations. Organic chemistry is one of the learning options available to students in the second semester of the approved material. The preliminary analysis results using the teaching resources are established from the possible common studies that have never been completed on organic chemistry's accepted material subject (De Silva 1997) [4]. Metacognitive learning theories are used to study, and mental analytical processes and metacognitive abilities are discussed concerning the students' studying strategy. Each biological development is related to a gradual increase in metacognitive skills (Austin, n.d.). In this theory, learning occurs when each discovers and constructs their knowledge. (Ajayi 2019) [2] They are visible to relate with the meaningful information data related to their knowledge structure. Thus, the metacognitive approach is influenced in the education of chemistry curriculum design. (Lismeiriza et al. 2021) [9] the development of students' metacognitive skills is facilitated via the learning process. They describe the teaching material development are based on the plant products module, the one solution to provide a different teaching material variety and develop the student's metacognitive skills. The remainder of this section and this article will discuss organic chemistry to replicate natural material metacognitive abilities to advance medicinal plants' role. Part 2 focuses on the prior work that researchers may conduct on this subject via various experimental activities. Part 3 presents the methodology's recommended architectural model and its mechanism. Part 4 evaluates and performs the results and discussion, while Part 5 summarizes the job accomplished in conclusion.

Related Work

The chemistry laboratory course is typically focused on upper-level courses. (DeKorver and Towns 2016) this learning is used the video replicated call to conference the junior and senior level of chemistry is major they can be passed out by experimental laboratory course. This course is more interesting and motivated to learn about chemistry by the students need very little study material. Thus, the interview and videos are exposed to the upper-level students' strong similarities in the introductory coursework level. The students hold their goals and lack reflection in their work to achieve their goals. The interaction between the people and the environment brings out the skills to manage the natural resources useful for life and use many plants to produce a traditional medicine (Pit'ay, Anggraito, and Ngabekti 2019) [20]. The aim is to recognize and file the medical plant species in the forest; material creating and teaching and biological instrument learning variety and the natural resources used are based on documentation and identification result (Taylor et al. 2001) [18]. Then, the validity testing and material legibility, and the instruments. The information gathered the medicinal plant species and the local skills to manage the plants. The learning materials about the medicinal plants are organized as the material is constructed on the information. The research determined the medicinal plant change used by the people as the medicine and the learning material are applicable and valid. (Raker, Gibbons, and Cruz-Ramírez de Arellano 2019) [15] The effect relates to persistence rather than success in the STEM courses developments and the degree program—the growth of achievement Emotions Questionnaire in the organic chemistry postsecondary courses (AEQ-OCHEM). The growth of instruments is founded on the achievement of emotion then the AEQ is used to measure the level of the learning institution. (Pratt and Raker 2020) [14] The All AEQ-OCHEM subscales are used to commit to the distinct and coherent. The upcoming work is based on using the implication that AEQ-OCHEM were obtainable. To develop more discipline and course-based information is finished. To finish, by measuring the amount of emotional achievement in the instructional context, laboratories, and research undergraduates are needed for more strong consideration on effects in the STEM contexts. (Norman and Furnes 2016) The aim is to discover the relationship between the metacognitive experiences and the learning material for the digital vs. non-digital information in a particular situation. Then, the metacognitive experiences are assumed more than older studies, and many potentially confounding factors are controlled. The metacognitive experiences are measured by the performance predictions, ratings of confidence, and learning judgments. The recognition performance calculates the learning results by comparing the conditions of paper with a PC condition with the excellent opportunity to take a learning material. In recent years, there has been a growth in teaching skills and evidence-based medicine as EBM for medical professionals. (Kumaravel et al. 2020) [8] Best Evidence Medica Education (BEME) information and retrieved references articles are published and presented the properties of psychometric include dependability, relevance, and rationality to 5 domains of EBM for learning. The proper 6 tools validity for determining the more steps of EBM and specific domain for learning. Further validation and development of a tool that considers all steps in EBM and the educational domain results are needed.

System Model

Metacognitive skills in natural material

The metacognitive skill has four subscales: Activities of orientation, systematic orderliness, evaluation, and elaboration activities. It is also known as PDCA. (Veenman, Prins, and Elshout 2002) [19] The activities of orientation concern task preparation. This activity is judged on the indication of studying the problematic statement, identifying dependent than independent variables scheme, the structure of the task type, and generating hypotheses then the predictions. The systematic evaluation Orderliness is contingent upon the quality of the schedule, the execution of the systematic plan, the completion of actions in an ordered sequence, and the avoidance of unsystematic occurrences. The assessment activities are concerned with the control and management of metacognitive learning. (Manzanares, Sáiz, et al., 2019) [16]. They are judged on checking and monitoring, both on the ordinary level and keeping the global level for progress is being made. Finally, the elaboration judgment concerns the storing intention of discovery and the ideas on memory. These depend on recapitulating suggestions, conclusion for diagram, these connecting to the conclusion on the topic substance and producing the clarifications. By explanation, itself can be considered the cognitive activity, but it assumed the reasoning action occurrence at an exact idea in time outcome from the metacognitive action.

The subscales are four on metacognitive skill and are rated on the five-point scale, extending from 0 to 4. The characteristics of metacognitive skill are refereed on the performing value on monitoring events, not on the information exactness of this outcome. For occurrence, correction conclusions or wrong predictions may still result in high scores on elaboration or orientation. (Ibnu, Rahayu, and others 2017). An amount score completed the 4 subscales for an individual contributor is figured to attain the entire score for metacognitive skill. The steps for the Metacognitive learning system (MLS) are based on the metacognitive theory. The students' learning flow activities were arranged, supervised, and scheduled to create a thorough understanding. The learning stages have been produced and are being utilized to gather the learning tools. The development's outcomes are represented and shown in figure.1.

Characteristics module of medicinal plant

The design and development of the medicinal plants are applied to the organic chemistry subject of the natural materials-oriented provisioning metacognitive skills have the physical characteristics structures are in table.1.

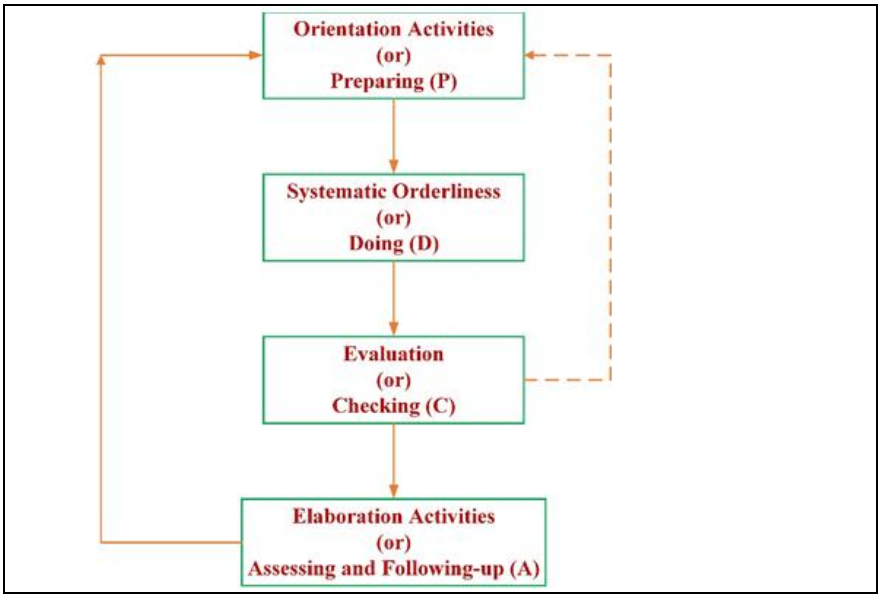

Fig 1: Stages of Metacognitive learning strategy.

Table 1: (Lismeiriza et al. 2021) [9] Features of Medicinal plant modules

Sl.no	Modules	Data
1	Basic Theory	The part on medicinal plants is based on the theory of constructivism learning.
2	Basic Activity	The module on medicinal plants is a common form of knowledge movement—the individual education process takes various educational objectives. Initially, education activities have a stimulus skill of metacognitive in the planning aspects. At the individual end of knowledge, activities were incentive skills of metacognitive on monitoring, revising, and evaluating features.
3	Characteristic Assessment	Metacognitive skills are calculated using the material in the procedure of discussion substance. The 12 grains have 4 features: metacognitive skills such as preparation, assessing, revising, and monitoring.
4	Basic Material	The basic materials are resultant from the study of plant data.
5	Mission Module	The development of study on medical plants is obtained from the possible natural environment in organic chemistry subject on the natural material to simulate metacognitive skills.
6	Capability part	Demonstrate a gentle boldness towards the medical plants. Demonstrate scientific morals that show the medicinal plant education process. Defines the habitats and features of medicinal plants. Classifying the medicinal plant's secondary metabolites. Applying the utilization concept of medicinal plants' secondary metabolites. Applying the utilization concept of the medicinal plant's results Applying the metacognitive skills of the medicinal plants learning activities material.

Definition and Important medicinal plants

The whole plant or each plant parts are stems, bark, fruits, flower, seeds, leaves, root, or the chemicals are derived from these plant parts are used in various systems of medicines such as Ayurveda, Siddha, Folklore, Allopathy, Unani, Homeopathy, Herbo-mineral, and others to cure the diseases are also known as the medicinal plants(Kirtikar, Basu, and others 1935). The medicinal plant's utilization is directly utilized in the plant parts form as powder, medicinal chemicals, plant drugs, and extracts. The essential medicinal plants with their medicinal uses and practical part are shown in table.2.

Table 2: (Aishwath and Tarafdar 2008)The essential medicinal plants with their medicinal uses and functional parts

Scientific Name	Common Name	Useful Parts	Chemical Constituents	Uses
Glycyrrhiza glabra	Liquorice	Underground root & stem	Glycoside glycyrrhizin	Peptic ulcers, analgesic, cough
Mucuna Pruriens	Itching bean	Seeds	L-dopa	Parkinson’s disease
Papaver somnifera	Opium poppy	Latex	Papaverine, codeine, morphine	Smooth muscle, sedative
Phyllanthus amarus	Phyllanthus	Herb	Phyllanthin	Relaxant
Piper longum	Long pepper	Seeds, roots	Piperine, piplarine	Hepatoprotective

Plantago ovata	Psyllium	Constipation & laxative	Mucilage containing fatty acids	Digestive, cure respiratory disease
Rauvolfia serpentine	Rauvolfia	Roots	Reserpine, serpentine	Husk and seed
Tinospora cordifolia	Tinospora	Stem	bitters	Antipyretic
Silybum marianum	Silybum	Seeds	Silymarin	Hepatoprotective
Withaniasomnifera	Indian ginseng	Roots	Withanolides	Aphrodisiac, adaptogenic
Solanum khasianum	Medicinal brinjal	Berries	Solasodine	Steroidal drugs

Result and Discussion

The metacognitive Learning Strategies have been validated, developed, and implemented in organic chemistry learning. By applying the objective of this education approach to progress, the metacognitive skills of students were experimenting with the information developed. The metacognitive awareness inventory (MAI) has increased students' metacognitive skills. The measured increase in learning after and learning before is shown in figure 2 for the individual metacognition component.

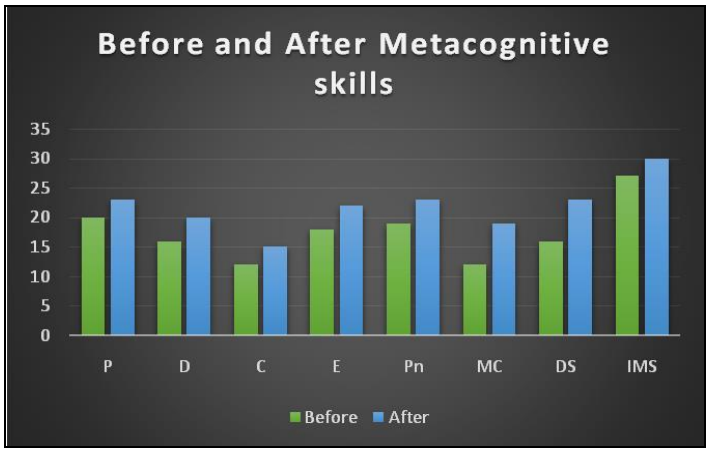

Fig 2: The Metacognition students score pre- and post-learning.

Where,
P = Planning
D= Doing
C = Checking
E = Assuming or Evaluating
Pn = Procedural
MC = monitoring of comprehension
DS = Debugging strategy
IMS= Information Management Strategy

At this step, the small-scale trials component at the student's semester. One validates the module's feasibilities that can be considered achievable on 98.20%. The actions can be passed out to see the success of the tooling education strategy medical plants compared to the metacognitive skills. The metacognitive skills valuation features have 4 stages such as (1) planning, (2) doing, (3) Checking, and (4) Assuming. The student's overall metacognitive skills are increased from the average ratings of the student's conversation. The student's semester percentage for the metacognitive skills using the development of the module is shown in figure.3.

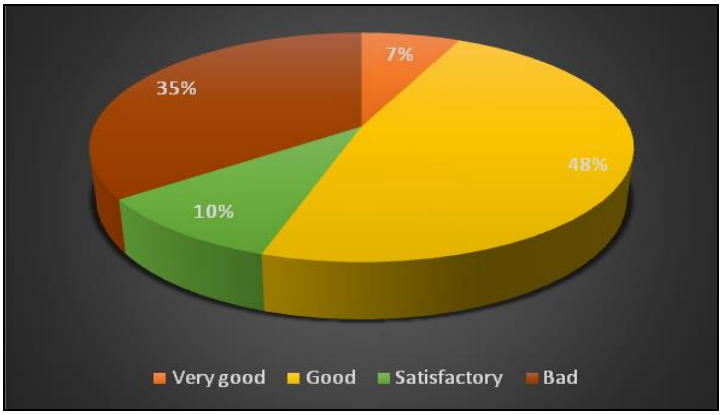

Fig 3: The student's metacognitive skills percentage.

The Figure.3. The student's metacognitive skills percentage is very good, 7%, good 48%, satisfactory 10%, and bad 35%. The supported education module percentage displays the outcome of the development of research-based that can simulate the metacognitive skills even though 35% of scholars lack metacognitive skills. The values of the 4 stages are enough because the medicinal plant has the disadvantage of simplifying the student's metacognitive skills. The scholar's lack in evaluating and synthesizing in the education process is given to the primary providing and the exercise thinking like scientific, reason, creative, deductive reasoning, decision making, explorative, problem solving, and inductive. This problem-solving technique is based on learning to evaluate a person's thinking and basic skills. The metacognitive skills development can use the self-reflection approach. Metacognitive skills have a significant role in supporting students' development process skills and thinking.

Conclusion

The medicinal plant's development of modules is based on the results and the learning material to simulate the discussion of student metacognitive skills. The metacognitive learning strategy (MLS) has developed 4 stages; these four stages frequently occur as a cycle in every learning material. The modules' features include the basic theory, essential activities, primary material, capability part, characteristic assessment, and mission module. The module possibilities are very practicable as 98.20% is used as a teaching-learning material in the organic chemistry topic on the natural material.

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