International Journal of Science and Applied Science: Conference Series P-ISSN: 2549-4635
Int. J. Sci. Appl. Sci.: Conf. Ser., Vol. 5 No. 1 (2021) E-ISSN: 2549-4627
ICSSEH 2021 doi: 10.20961/ijsascs.v5i1.62057

Development of Innovative Learning Resources based on Isolation Materials Compound Purification and Identification Alkaloid Group

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Abstract: This study aims to develop project-based innovative learning resources on purification isolation materials and identification of alkaloids using Flipbook Maker software based on SNPT. This research is a development research (R & D) with ADDIE model. The sample in this study were 3 lecturers at the State University of Medan, Faculty of Mathematics and Natural Sciences, majoring in Chemistry, as validators of media experts and the material was adjusted to the needs. The research instrument was an SNPT questionnaire filled out by media expert validators and material expert validators. Data were analyzed descriptively qualitatively. The results of the study indicate that project-based innovative learning resources on purification isolation materials and identification of alkaloid group compounds with an average score of 3.73 and categorized in the "Very feasible" criteria are used for purification isolation materials and identification of alkaloid group compounds in organic analytical chemistry learning.

Keywords: Innovative learning resources, projects, isolation, purification and identification of alkaloid compounds

1. Introduction

Project-based chemistry learning resources are learning resources that can support learning in order to increase student competence and as a medium in learning that is indispensable as an accurate communication tool from learning resources to students [1]. Innovative learning resources must also be supported by scientific learning which is learning that uses scientific steps in knowledge through scientific methods [2]. Project-based learning is a form of collaborative learning in which the learning process uses student-centered learning to work together in solving problems to build mutual knowledge [3]. Project-based learning can improve student learning outcomes in cognitive and psychomotor aspects [4]. [5] In his research, it was shown that the learning process using the project-based learning model was in the good category and a significant increase in students' thinking skills after the project-based learning model was applied.

Student learning activities that have been designed have not been as expected because students have not been able to achieve the learning objectives, namely having the ability to explore a project-based learning resource with multimedia so that students' higher-order thinking skills [6].

Based on the research of Sutrio et al. (2018) that the student response after using project-based teaching materials was good and able to improve thinking skills very well from the initial test results with an average score of 38.1 and the final test results with an average score of 69.8. [7] Shows the results of research on the application of problem-based learning models can improve students' thinking skills in introductory chemistry education courses. There are problems that occur in the learning process such as lack of skills in identifying information, low ability to ask questions, difficulty expressing ideas or opinions, concluding information, and low ability to know if not addressed immediately, it will cause more complex problems, which in turn will lead to more complex problems. causing the low quality of graduates [8]. The development of innovative chemistry learning materials is very important in motivating students to the desired knowledge and skills as well as helping to understand chemical concepts and easy to remember to understand the relationship between theory and context [9]. Project-based learning is an effective method in developing students' thinking skills in designing a project that can be implemented to analyze and solve problems independently [10] [11]. Innovative project-based learning resource developed using Flipbook Maker software media that is used to facilitate students as well as teachers and lecturers in teaching and learning activities [12]. By using this software, the display of the media will be more varied, not only text, video images, audio but animation on this media so that the learning process will be more interesting [13]. Learning resources using the Kvisoft Flipbook Maker application can improve understanding of physics concepts in understanding abstract physical material, because students use Kvisoft's guides in understanding a material concept [14]. To overcome the above problems, project-based learning can be used to build understanding and mastery of educational objects. Some project-based learning that is often used in learning include using laboratories, field studies, literature studies, virtual via the web, problem solving, and assignments [15]. This study aims to develop project-based innovative learning resources that meet the National Higher Education Standards (SNPT) that can improve student learning outcomes.

2. Method

The type of research used is research and development, namely research methods used to produce certain products and test the effectiveness of these products [16]. The development model in this study uses the ADDIE model which consists of Analysis, Design, Development, Implementation, and Evaluation. Of the five stages of ADDIE only 3 steps were adapted in the research, namely to the feasibility test at the development stage [17]. Briefly, the stages of development research can be seen in Figure 1.

The sample in this study were 3 lecturers at the State University of Medan, Faculty of Mathematics and Natural Sciences, majoring in Chemistry, as validators of media experts and materials tailored to their needs. [18] The data were analyzed descriptively qualitatively using a non-test instrument, namely a modified SNPT validation questionnaire sheet with a Likert scale test using an even choice category. Questionnaires were given to three expert validators in their field, namely two material expert validators and one media expert validator.

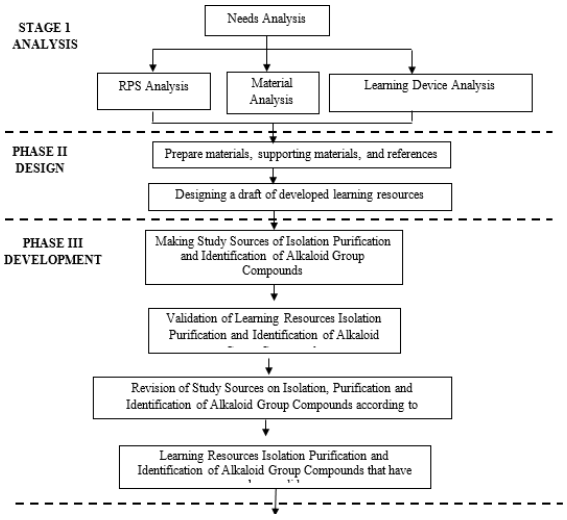

Figure 1. Learning Resource Development Flowchart

Then the questionnaire was filled out using a Likert scale of 1-4 where the answers given strongly agreed to strongly disagree. The feasibility study was carried out in two stages. Stage I is said to have passed if all the items in the assessment instrument received "scores" or positive responses. If there are items that are answered negatively, then the project-based innovative learning resource is declared not to pass, while the second stage of assessment is analyzed by calculating the average score.

Table 1. Criteria for Validity of Analysis on Average

Average	Validity Criteria
3,26 – 4,00	Valid (decent)
2,51 – 3,25	Fairly valid (decent enough)
1,76 – 2,50	Invalid (less feasible)
1,00 – 1,75	Invalid (not eligible)

3. Results and Discussion

This study consisted of five stages of ADDIE development which were adapted into 3 stages, namely the analysis stage, the design stage, the development stage, to the feasibility test.

3.1. Analysis Stage

At this stage analyze the learning resources used by students. The learning resources used by students are only handbooks and power point media and have not been project-based integrated into multimedia. At this analysis stage, analyzing needs by analyzing the curriculum of the Indonesian National Qualifications Framework (KKNI) in the Department of Chemistry education program, FMIPA UNIMED, what is seen is the learning outcomes of subjects and sub-achievements of learning in Non-metallic Inorganic Chemistry courses with carbon and silicon materials. The curriculum includes learning outcomes for non-metallic inorganic chemistry courses and sub-achievements for carbon and silicon, which can be seen in the Table. 2.

Table 2. Needs Analysis

Needs Analysis	Analysis result
Course Learning Outcomes (CPMK)	Able to design, conduct trials and evaluate practicums that utilize the design of tools and materials in the form of resources available in the surrounding environment
Sub Course Learning Outcomes (Sub CPMK)	1. Able to perform elementary analysis of organic compound samples 2. Able to apply isolation techniques of natural material compounds (percolation, maceration, shokletasi) 3. Able to apply distillation techniques (simple, fractionation, pressure reduction and steam) for isolation and purification of organic compounds and organic natural materials
Indikator dalam pengembangan sumber belajar inovatir berbasis proyek	1. Explain the classification of natural ingredients classified as alkaloid compounds 2. Applying the isolation technique of alkaloid group compounds (percolation, maceration, and soxhletation) 3. Applying the method of isolation of alkaloid compounds 4. Identifying and determining the structure of alkaloid compounds.

Furthermore, the analysis of teaching materials and analysis of learning media were carried out by interviewing lecturers of the organic analysis chemistry course. From the results of the interviews, it was found that the textbooks used by students did not contain special books that were used as student guides and the learning media used were powerpoint media. From the results of the analysis carried out, then the data obtained is used to determine the need for learning resources to be developed.

3.2. Design Phase

The second stage in this research is the design stage where this stage is carried out by designing innovative learning resources. The learning resources developed are innovating learning resources, making mini projects, and making multimedia on learning resources. The product results from the development of project-based innovative learning resources on alkaloid compound materials can be seen in Figure 2, Figure 3, and Figure 4.

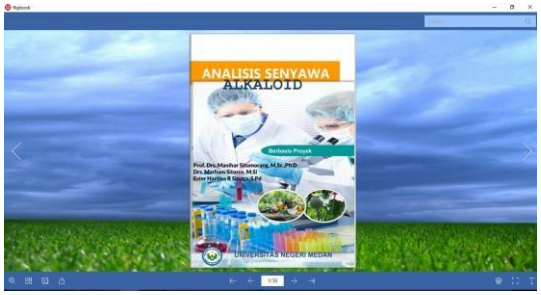

Figure 2. Display of learning resources

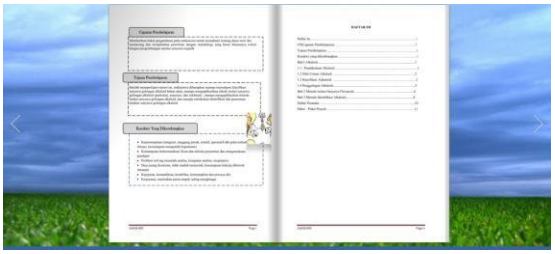

Figure 4. Display of the contents of learning resources

Figure 5. Project Mini View

3.3. Development Phase (Development)

At this stage, it is done by making project-based learning resources with developed multimedia (products) using flipbook maker software on the material of alkaloids.

Furthermore, the project-based learning resources that have been developed are standardized for learning resources to determine the level of feasibility of innovative learning resources in accordance with the eligibility standards of the National Education Standards Agency (BSNP) which aims to determine one aspect of product quality development, namely the validity aspect [19]. The project-based learning resource validation instrument refers to the BSNP instrument that has been adapted based on the SNPT, which is validated by expert lecturers. The feasibility level of project-based learning resources developed on the alkaloid compound based on the modified SNPT includes content feasibility, language feasibility and presentation feasibility as shown in Figure 6.

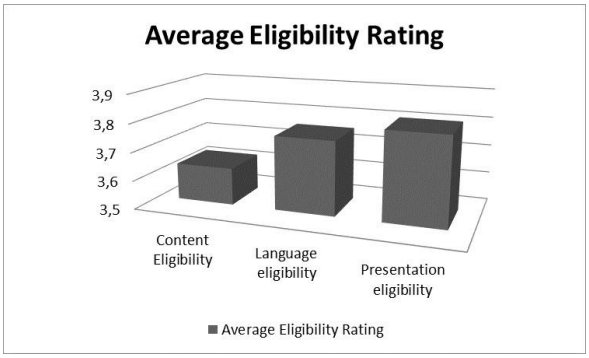

Figure 6. Graph of the Feasibility Analysis of the Presentation of Project-Based Innovative Learning Resources

Based on the graph of the results of the feasibility analysis of the developed project-based innovative learning resources, it is found that the average content feasibility is 3.65, which means that the media is very feasible and does not need to be revised, the feasibility

of language is 3.75, which means that the media is very feasible and does not need to be revised, and the feasibility of presenting 3 .78 means that the media is very feasible and does not need to be revised. In accordance with the standards set by SNPT, it can be concluded that an innovative project-based learning resource on alkaloid compound material in the organic analytical chemistry course with an average score of 3.73 has a very feasible criteria for use in learning. The suggestions and improvements obtained from the expert validators include 1) adding a concept map, 2) The title of the material is more clearly visible, 3) The use of chemical symbols such as reaction symbols should be adjusted, 4) The material displayed should include more sources of learning videos. Innovative project-based learning resources developed after media validation by expert validators are declared valid and can be used as students to support organic analytical chemistry learning in universities. Innovative project-based learning resources play a very important role in learning to be more effective, it can be combined with a series of high-quality instructions that can stimulate learning skills in students [20].

4. Conclusion

Based on the results and discussion, it can be concluded that project-based innovative learning resources with the help of flipbook maker software on alkaloid group compounds in organic analytical chemistry learning are appropriate to be used as learning resources based on assessments by expert validators with the SNPT (National University Standards) instrument. The results of the feasibility test from the expert validator with an average score of 3.73 have a very feasible criteria for use in learning.

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