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Developing the i-spring media based on project based learning model on the alkane derivatives topic

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ABSTRACT

This study aims to (1) obtain i-spring-based media teaching materials from Project Based Learning which meet the criteria for content eligibility, language eligibility, and presentation eligibility under the National Education Standards Agency (BSNP), and (2) know the increase in student learning outcomes after using i-spring-based media Project Based Learning. The type of research used is Research and Development (R&D), which has been modified as needed. This research was conducted on students of class XII IPA 4 at Senior High School in Indonesia in the academic year 2021/2022, separately purposive sampling. The results showed that: 1) The developed i-spring-media based on Project Based Learning on the material of alkane derivative compounds meets the BSNP criteria, with the result: material feasibility is 3.31 and media feasibility is 3.51. It means the criteria are valid and do not need to be revised; 2) The developed media can improve student learning outcomes with an N-gain of 0.52 medium category.

1. Introduction

Article 3 of Law No. 20 of 2003 states that education aims to develop the potential of students to become human beings who believe and fear God Almighty, have a noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens (Handika, 2012). In order to achieve the goal, the learning process in the classroom needs to be improved to produce high-quality graduates.

From the results of observations and teacher interviews conducted at Senior High School, it was found that students were less active and did not understand learning because teachers only used teacher-centered lecture learning models, so students tended to be bored. It causes low student learning outcomes. If it was seen from the daily test, it was found that students scored above the KKM (KKM = 76) by only 30%. Therefore, various learning media are needed so that students do not get bored in the learning process by using a learning model that involves students and can shape students. Learning methods have interrelated and integrated relationships and are a unified learning design (Marpaung et al. 2020).

In the 2013 curriculum, one of the compulsory subjects for high school students specializing in Mathematics and Natural Sciences (MIA) is chemistry (Nuryanto et al. 2015). According to Wasonowati et al. 2014, chemistry is one of the branches of mathematics that is still considered

problematic. Chemistry subjects are products of natural knowledge from facts, theories, principles, and laws of scientific work processes. So the implementation of chemistry learning must include three aspects: product, process, and scientific attitude. The subject matter of Alkane Derivatives is one of the materials in chemistry learning that is often a problem for students, especially class XII MIA.

The material for alkane derivatives presents a big challenge for teachers because the concepts learned in alkane-derived compounds are primarily abstract, full of concepts that must be memorized and imaginative, even though they are contextually widely used in everyday life (Wulandari et al. 2018). Students need higher thinking, analytical, and memory power to understand the material of alkane derivatives. For students to achieve the expected essential competencies and the learning process takes place effectively and efficiently, a learning model is needed, which, of course, must increase students' knowledge, attitudes, and skills (Daro'aeni et al. 2013).

One of the learning models that can be used to increase student activity is Project Based Learning (PjBL). This model uses a problem as the first step of learning. The problem is a question created as a statement, will be associated with the goal of the learning process, and be presented as a project, which the students must do. Thus, the end of this learning is in the form of a product, activity, or work. In the learning process, students are directly involved in project work so that teachers can develop science process skills in students, such as curiosity, an attitude of wanting to get something new, an attitude of not despair, and self-confidence (Mayuni et al. 2019; Nahdliyati et al. 2016). Learning models built based on project activities can challenge students in everyday life (Triana et al. 2019). Students can obtain engaging experiences through project-based learning (Muwahiddah et al. 2019). Project-based learning can provide motivation and interest in student learning (Handayani et al. 2021). This learning model makes students the center of learning (student center learning) and the role of the teacher as a facilitator to support student independence (Sastrika et al. 2013). Aini et al. (2018) stated that the project-based learning model utilizing used materials significantly affects student learning outcomes.

Learning media is a tool that allows students to understand and understand something easily and to remember it for a long time compared to delivering material through face-to-face lectures without learning aids or media (Rusman, 2013). Learning media is anything that can convey or distribute information effectively and efficiently in learning activities (Istiqlal, 2017). Interactive learning media has great potential to stimulate students to respond positively to the learning material presented and become a learning resource that can improve learning performance (Putra et al. 2017; Fauyan, 2019). Using appropriate interactive media in learning is effectively trained students' conceptual understanding (Lestari et al. 2019). The research results reinforce this by Jundu et al. (2019), who state that teachers need interactive multimedia programs to support their learning activities, so they are motivated to develop learning media. Students feel the need for learning media to make it easier to understand learning materials, one of which is I-spring. I-Spring is a tool for creating presentational learning media that can be used in the learning process, including media aspects in audio, visual, audiovisual, and various types of evaluations that have been provided. In addition, iSpring can convert PowerPoint files into attractive flash formats so that people use it directly or optimized for learning in the form of e-learning. interact directly with the material presented plus the primary material in the PowerPoint. iSpring media makes it easy to create quizzes with various types of questions and makes presentation files or teaching materials into more exciting and interactive animated media by inserting various forms of media such as text, images, animations, audio, and video and can record and synchronize video presenters, by adding flash and youtube videos (Setiawan & Rizki, 2018).

The selection of Microsoft PowerPoint was upgraded through I-Spring in this research and development because it has several advantages, including ease and can be repeated in using it. In

addition, the combination with I-Spring makes this Microsoft PowerPoint more lively and varied because it is exported into HTML5 format (Handayani & Rahayu, 2020).

Based on research on the development of the iSpring presenter media on chemical equilibrium material by Ardila (2020), the results obtained are 91.67% of media feasibility and 88.04% of material feasibility. They stated that the media iSpring presenter is very suitable to be used as a learning medium. Kusuma et al. (2018) stated that the developed PowerPoint Ispring Suite 8 interactive learning media was valid, practical, and effective. Nurdiansyah et al. (2021) concluded that the use of learning media iSpring suite 8.0 effectively reduces students' misconceptions about momentum and impulse material at SMA Negeri 1 Pontianak with a proportionate price of 85.6% reduction in the number of misconceptions in the high category. It is in line with the results of research Fadhli (2015) and Fauyan (2019), which states that the media developed effectively improves student achievement.

Based on the description above, the researchers are interested in conducting research to see: (1) How is the feasibility of PjBL-based iSpring media on alkane-derived materials according to the standards of the National Education Standards Agency (BSNP)? (2) How is the effectiveness of PjBL-based iSpring media on alkane-derived materials?

2. Method

2.1. Sample and Population

The population in this study were all students of class XII IPA at Senior High School in Indonesia in the semester of the 2021/2022 academic year with a revised 2013 curriculum on Alkane Derivatives. Sampling in this study was taken using a purposive sampling technique based on a recommendation by a chemistry teacher in class XII IPA 4 with a total of 34 students. In this study, the sample class was taught using the i-spring media based on Project Based Learning.

2.2. General Procedure

This research refers to the R&D model, which includes the following stages: (1) It is defining and analyzing the beginning in the form of observation, through interviews and literature study after that find the need for iSpring media as a learning medium; (2) Design (design), this stage is designing media and materials. So the researchers found the iSpring framework to be developed (initial draft); (3) In developing, the researcher develops the media design; then it will be validated by the material and media expert validators that have been determined. After that, they will make revisions, and the product is repaired and is suitable for use; and (4) This stage is disseminated by distributing the iSpring media after revisions are made, and the data will be analyzed.

2.3. Data Analysis

The data from this study are quantitative data obtained from the responses of respondents consisting of lecturers and teachers to chemistry teaching materials on alkane-derived materials according to the BSNP teaching material assessment standards, which include aspects of content feasibility, language feasibility, and presentation feasibility. Media validation is carried out as i-Spring media based on Project Based Learning. The pre-test and post-test data on student learning outcomes can be seen to find out the application of media in learning. Improving the ability of learning outcomes using the i-Spring media based on Project Based Learning is calculated from the %N-gain value.

The instrument used in this study was a BSNP assessment questionnaire and also a test instrument to measure student learning outcomes. The BSNP assessment questionnaire will be

assessed by media experts and material validators, as well as the test instrument; it will be done by students in the form of multiple choice questions.

The data obtained were analyzed with the feasibility of the BSNP and improving learning outcomes as follows:

Learning Media Eligibility Criteria. The rating scale used in the modified BSNP eligibility questionnaire is 1 to 4, where 1 is the lowest score, and 4 is the highest score. The data analysis technique used to analyze the data from the validation results from lecturers and teachers is the averaging technique. The formula used to calculate the validation data is as follows (Table 1):

$$\bar{X} = \frac{\Sigma X}{n}$$

$\bar{X}$ = average value
ΣX = number of validator assessment answer
n = number of statements/number of validators

Table 1. Eligibility Criteria

Average	Eligibility Criteria
3.26-4.00	Valid and does not need to be revised (very feasible)
2.51-3.25	Sufficiently valid and does not need to be revised (decent)
1.76-2.50	Not valid, and some of the content needs to be revised (less feasible)
1.00-1.75	Invalid and need to be revised (not feasible)

Test of Increase In Average Learning Outcomes (N-gain Test). The average increase in learning outcomes test aims to determine the average increase in students' cognitive learning outcomes before and after treatment in the experimental group. The increase can be calculated using the normalized gain regular formula (Meltzer, 2002):

$$(g) = \frac{(S_{post}) - (S_{pre})}{S\ maksimum\ - (S_{pre})}$$

3. Results and Discussion

At the research stage define, the researchers found that in learning activities, teachers have not used teaching materials that can attract students' attention when learning takes place. Even students tend to be inactive in learning activities because teachers use learning methods that are too monotonous and only focus on the teacher.

At the design stage, the first page contains the title of the material, namely alkane derivative compounds, and the names of the thesis supervisors and researchers. Furthermore, it includes basic competencies, indicators, and learning objectives. Before entering the material's content, the researcher presents problems related to everyday life as a requirement in the project-based learning model. Learning using innovative project-based teaching materials has been designed to make students the frequency to learn according to the competency requirements needed (Purba et al. 2019; Nainggolan et al. 2020). In the content section, there are directions for making student projects in groups, the nomenclature of compounds, quizzes, isomerism, properties, and their uses in everyday life. The following is an i-Spring media based on Project Based Learning (Figure 1).

After designing the materials and media, validation was carried out on the developed media spring. The validator consisted of two chemistry teachers and one chemistry lecturer. The instruments used are content feasibility instruments, language feasibility, presentation feasibility, and media graphic feasibility based on the feasibility of BSNP materials and media adapted to the needs

of learning materials and media assessment. The following Table 2 presents the results of validating the feasibility of alkane-derived compounds.

Table 2. Material Feasibility Validation Results

No.	Aspect	Validator			Average	Category
		1	2	3		
1.	Content eligibility	3.23	3.70	2.85	3.26	Valid and does not need to be revised
2.	Language eligibility	3.35	3.70	2.93	3.32	Valid and does not need to be revised
3.	Serving eligibility	3.33	3.80	2.90	3.34	Valid and does not need to be revised
	Average				3.31	Valid and does not need to be revised

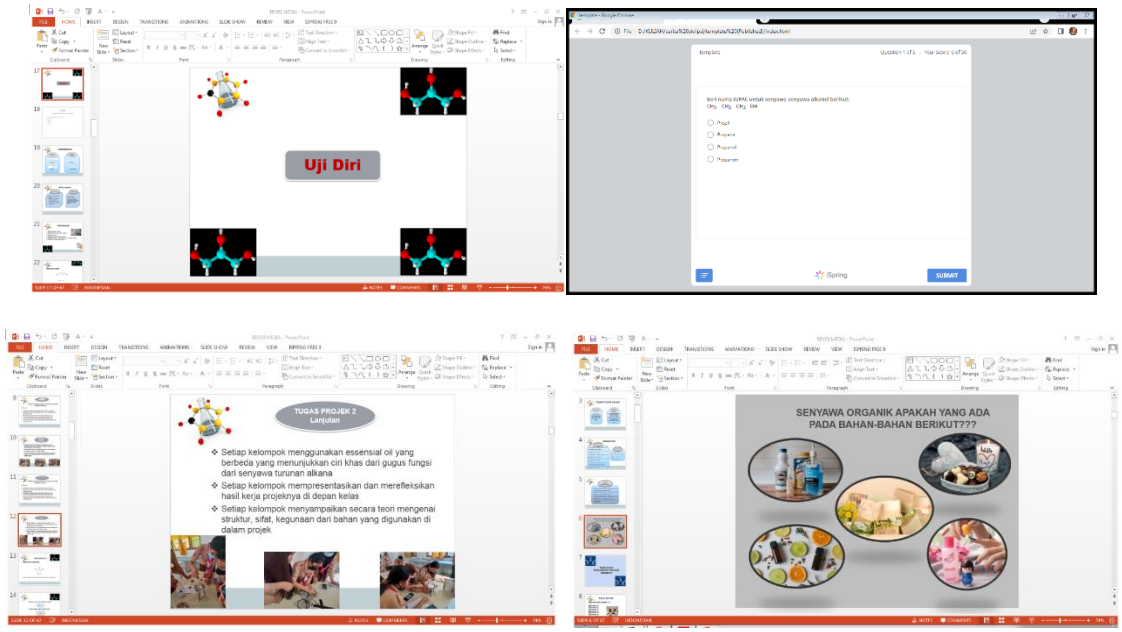

Figure 1. I-Spring Media

Based on table 2, it can be seen that the results of the assessment of the material are 3.31. It shows that the material of the developed alkane derivative compounds is valid and does not need to be revised again. Furthermore, media validation is carried out as shown in Table 3.

Table 3. Results of Media Feasibility Validation

No.	Aspect	Evaluation			Average	Category
		V1	V2	V3		
1.	Excellent and consistent color composition	3.0	4.0	4.0	3.67	Valid and does not need to be revised
2.	Consistent graphic layout	4.0	3.0	3.0	3.33	Valid and does not need to be revised
3.	Easy-to-read text	3.0	4.0	4.0	3.67	Valid and does not need to be revised
4.	The whole chart forms a harmonious pattern	4.0	4.0	3.0	3.67	Valid and does not need to be revised
5.	Attractive ness content	4.0	4.0	3.0	3.67	Valid and does not need to be revised
6.	Relevance *content*	3.0	3.0	3.0	3.00	Quite valid and does not need necessary revised
	Average				3.51	Valid and does not need to revise

For the average media assessment, the result is 3.51, which shows that the media is valid and does not need to be revised. Below is presented Figure 2 showing the implementation of Project Based Learning by students.

Figure 2. Students Implementing Projects

After obtaining valid media, it is applied to students. The results show an average N-gain of 0.52. It can be concluded that the i-Spring media is based on project-based learning. It can improve student learning outcomes on the material of alkane derivative compounds with a medium N-gain category. This research is in line with Ayu (2019) and Santika (2019), which state that i-Spring media can help students understand the material. Furthermore, research conducted by Purba et al. (2020) states that project-based learning models effectively improve skills and knowledge (Nisa et al. 2022; Siahaan et al. 2021).

4. Conclusion

Based on the research results, it can be concluded: (1) The developed i-spring media based on PBL on the alkane derivative compounds material meets the BSNP criteria. The results showed that material feasibility = 3.31 and media feasibility = 3.51 with valid criteria and does not need to be revised, and (2) i-spring media based on project Based Learning could improve student learning outcomes with an n-gain of 0.52 medium category.

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