Innovation of Learning Resources Using Project-Based Multimedia on Chemical Equilibrium Class XI Odd Semester

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Abstract. This study aims to analyze the feasibility of project-based innovative learning resources that have been developed on chemical equilibrium materials in accordance with the National Education Standards Agency (BSNP). The type of research used is research and development using the Analysis Design Development Implementation Evaluation (ADDIE) model. The innovative learning resources produced were validated by 4 validators, namely 3 material expert validators consisting of 2 chemistry teachers and 1 lecturer, and 1 media expert validator. The data collection method used is a questionnaire with a Likert scale. The analysis technique uses quantitative descriptive analysis techniques and qualitative descriptive analysis techniques.The results showed that the innovative project-based learning resources that had been developed on chemical equilibrium materials were valid and could be used for further research.

Keywords: Innovation, Chemical Equilibrium, innovative learning resources

1. Introduction

The development of science and technology in the world of education is very rapid in experiencing many challenges in order to design quality human resources that are awaited, the situation of the community being able to compete in continuous rapid development. Educators act as facilitators who promote more creative learning, namely designing the development of innovative learning resources carried out in technological or contextual aspects that are applied in the aspect of achieving learning objectives [1] Learning success is not only determined by teachers and students, but is also influenced by learning media and teaching materials used during the learning process [2]. Learning is made completely and properly. Teaching materials that are made completely and properly will affect learning so that the learning process that occurs in students becomes more leverage [3]

AISTEEL 2022, September 20, Medan, Indonesia

DOI 10.4108/eai.20-9-2022.2324701

Innovative learning resources are needed to stimulate learning motivation and improve students' higher-order thinking skills. Innovative learning resources are developed through the integration of laboratory activities and out-of-school activities which are arranged systematically and simply to support the theory of each sub-topic. To complement the learning resources, contextual case examples, picture illustrations, and examples of questions and solutions are provided.

Innovation is also carried out by combining interactive learning media, videos and animations combined in macromedia flash and utilizing online information technology [4]. One of the efforts made in innovating learning resources is integrating media and learning models. One model that can be integrated is PjBL (Project Based Learning). In-depth investigation of a topic from the real world. A well-designed project asks students to tackle real problems and important issues that occur in life, especially in the learning process. Thus, the projects carried out by students are based on direct observation so as to produce a product [5].

2. Methods

The type of research used is research and development, namely research methods used to produce certain products and test the effectiveness of these products. The development model in this study uses the Analysis-Design-Development-Implementation-Evaluation (ADDIE) model. This research focuses on the stages of analysis, design, and development. The product developed is a project-based innovative learning resource. The subjects in this study were four validators consisting of one Material Expert Lecturer, one Media Expert Lecturer, and two Chemistry Teachers. While the object of this research is a learning resource using project-based multimedia on chemical equilibrium material. The data collection technique uses a questionnaire that is arranged based on a Likert scale.

The data analysis technique used descriptive quantitative and qualitative descriptive analysis techniques. Qualitative descriptive data obtained from corrections and input from expert lecturers and teachers on the developed learning media. While the quantitative descriptive is based on the score given by expert lecturers, and the teacher on the media obtained through a questionnaire.

Table 1. Criteria for Determining Questionnaire Score

Category	Score
Very good	4
Well	3
Not good	2
Not very good	1

Source : Widoyoko (2016).

To determine the overall quality of the product, it can be done by determining the average score of all aspects given by all validators. The percentage of product quality can be determined by the formula:

$$\text{Quality of each aspect} = \frac{\sum \text{the average score obtained}}{\sum ideal\ average\ score} \quad (1)$$

The data collected was analyzed by quantitative descriptive analysis presented in the form of distribution of scores and percentages against categories with a predetermined rating scale.

Table 2. Classification of Product Quality Assessment

Average	Validity Criteria
3.26 – 4.00	Valid and does not need revision (very feasible)
2.51 – 3.25	Sufficiently valid and no revision needed (pretty decent)
1.76 – 2.50	Invalid, some of the module content was revised (less feasible)
1.00 – 1.75	Invalid and need a total revision (not feasible)

3. Results and Discussion

3.1. Analysis Stage (*Analysis*)

The basis used in the product development of this research development is the determination of materials and needs analysis carried out in the early stages of the research process. Needs analysis was carried out through interviews with the school where the research was conducted. The researcher conducted interviews with the chemistry teacher of class XI. The data and information obtained by the researcher indicate that there are problems, namely learning chemistry in class XI is difficult to understand because it is in the form of theoretical explanations by the chemistry teacher. The teaching materials used are only printed books, and there is no use of Project Based Learning-based teaching materials in chemistry learning focused on Chemical Equilibrium material. Curriculum analysis is carried out to see the suitability of the teaching materials discussed with the core competencies of the subjects, learning objectives, reviewing the syllabus, and suitable learning strategies, and reviewing the literature that matches the teaching materials. In addition, there is potential, namely students have a high curiosity and enthusiasm for learning.

3.2. Design Stage (Design)

At this stage, the design of project-based innovative learning resources is carried out which is a description of learning resources in the form of learning materials, learning videos, practicum videos. Then the selection of material for high school chemistry subjects for class XI is carried out, where the material chosen is chemical equilibrium. This material was chosen because it is in accordance with the author's competence. Chemical equilibrium material contains the introduction, the concept of chemical equilibrium, factors - factors that affect equilibrium, chemical equilibrium constant in concentration (Kc), chemical equilibrium constant in partial pressure (Kp), and chemical equilibrium in industry.

3.3. Development Stage (Development)

The basic form of project-based innovative learning resource development products on chemical equilibrium material can be presented objectively, clearly, and thoroughly including: (a) Cover, (b) Introduction, (c) Table of Contents, (d) Instructions for use , (e) Core

Competencies and Basic Competencies (f) learning indicators (g) Concept Maps (h) keywords (i) Learning Activities, (j) Summary, (k) Glossary, and (l) Bibliography. Innovative project-based learning resources are created with project packages, project creation guidelines, and project report writing formats. In addition, interactive learning videos are made as a medium for delivering the contents of learning resources to students which are equipped with practical videos.

Data regarding the feasibility of this project-based innovative learning resource was obtained by conducting validation from material experts and media experts. The instrument used is a questionnaire or questionnaire. Material expert validation was carried out by one chemistry lecturer and two chemistry teachers. The validation results from the three material experts can be seen in the following diagram:

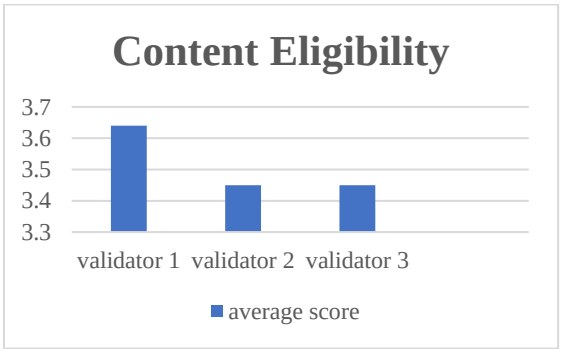

Figure 1. Graph of Feasibility Analysis Results Contents of innovative project-based learning resources

From Figure 1 it can be observed that the content feasibility is 3.64 for validator I, 3.45 for validator 2 and 3.45 for validator 3. Where the results show that project-based innovative learning resources developed on chemical equilibrium materials are feasible to use. Then based on the explanation above, it can be seen that the analysis of the chemical equilibrium learning media that has been developed referring to the modified BSNP in the aspect of content feasibility has an average value of 3.51 and it can be concluded that project-based innovative learning resources are very feasible to use and do not need to be revised.

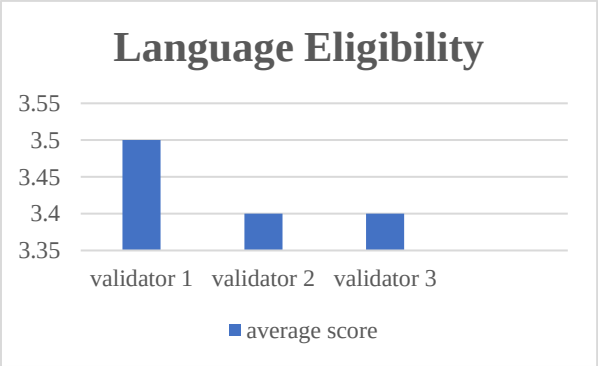

Figure 2. Graph of Feasibility Analysis Results of project-based innovative language learning resources

From Figure 2 it can be observed that the feasibility of the language is 3.5 for validator I, 3.4 for validator 2 and 3.4 for validator 3. Where the results show that project-based innovative learning resources developed on chemical equilibrium materials are feasible to use. Then based on the explanation above, it can be seen that the analysis of chemical equilibrium learning media that has been developed referring to the modified BSNP on the language feasibility aspect has an average value of 3.4 and it can be concluded that project-based innovative learning resources are very feasible to use and do not need to be revised.

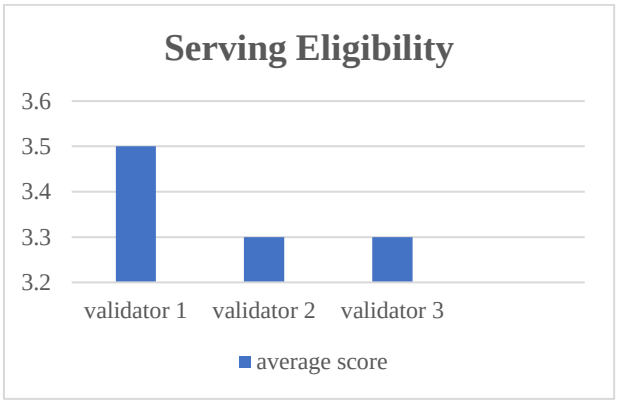

Figure 3. Graph of Feasibility Analysis Results Presentation of project-based innovative learning resources

From Figure 3 it can be observed that the feasibility of the presentation is 3.5 for validator I, 3.3 for validator 2 and 3.3 for validator 3. Where the results show that project-based innovative learning resources developed on chemical equilibrium materials are feasible to use. Then based on the explanation above, it can be seen that the analysis of the chemical equilibrium learning media that has been developed referring to the modified BSNP in the aspect of presentation feasibility has an average value of 3.37 and it can be concluded that project-based innovative learning resources are very feasible to use and do not need to be revised..

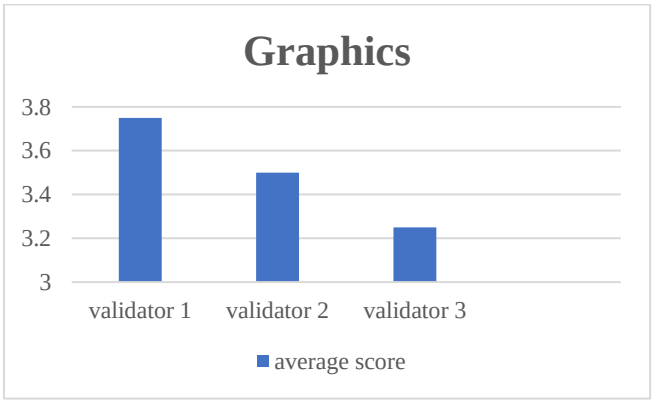

Figure 4. Graph of Graphic Analysis Results of Project-Based Innovative Learning Resources

From Figure 4 it can be observed that the feasibility of the language is 3.75 for validator I, 3.5 for validator 2 and 3.25 for validator 3. Where the results show that project-based innovative learning resources developed on chemical equilibrium materials are feasible to use. Then based on the explanation above, it can be seen that the analysis of chemical equilibrium learning media that has been developed referring to the BSNP which has been modified in the graphic aspect has an average value of 3.5 and it can be concluded that project-based innovative learning resources are very feasible to use and do not need to be revised.

This media expert validation was carried out to find out like a product in the media field, there was one media expert validator who was a lecturer at the State University of Medan. The obtained results of media expert validation are 86% with very feasible criteria.

4. Conclusion

Based on the research results from the description of the research results, conclusions can be drawn from the research, namely: This research and development produces Project-Based Innovative Learning Resources products with Chemical Equilibrium material for Class XI students. Development is carried out using Research and Development and the development model in this study uses the Analysis-Design-Development-Implementation-Evaluation (ADDIE) model. The teaching materials developed have gone through the validation stage of the validators, namely by three material experts and one media expert with the results of obtaining scores on each aspect, namely: the content feasibility aspect has an average score of 3.51, the language feasibility aspect has an average the average value is 3.4, the presentation feasibility aspect has an average value of 3.37, the graphic aspect has an average value of 3.5 and the acquisition of media expert validation results is 86%, so it can be concluded that project-based innovative learning resources are very feasible to use and do not need to be revised.

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