Development e-Teaching Material Based Moodle Web

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Abstract. This study aims to determine the teaching materials used in schools are in accordance with the National Education Standards Agency and to develop e-learning teaching materials based on Moodle web media on solubility and solubility results. The type of research used is R&D (Research and Development) which is modified ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The research samples were class chemistry books, chemistry lecturers, IT experts, and chemistry teachers. The research instrument was a validator assessment sheet. Based on the results of the analysis obtained the percentage of eligibility of teaching materials used in school is 85% with a very feasible category, 2) the percentage of feasibility of teaching materials developed is 93.5% and the eligibility of Moodle e-learning 87.5%, so the teaching materials are based on Moodle is categorized as very feasible. So it can be concluded that the chemical teaching materials used in schools are in accordance with the National Education Standards Agency; Moodle Web-based teaching materials that have been developed can using in chemistry learning.

1. Introduction

Along with the development of science and technology, educators as facilitators must be more creative in developing the learning process, one of which is by innovating in the development of teaching materials, both in terms of technology and applied approaches which are very important for the achievement of learning objectives [1]. One of the efforts that can be made to create the best learning for students is to use a variety of learning resources. Teaching materials are part of the learning resources. Teaching materials play an important role in helping students achieve learning goals. Teaching materials developed with various variations make learning activities more interesting [2]. Innovations in teaching and learning activities are very interesting to discuss, because it is believed that the application of the right teaching strategy improves student achievement in learning chemistry. Improving the quality of education can be done through innovation in teaching materials in learning [3-5]. Teaching materials are materials, information, tools / media used by lecturers to conduct learning including creating an atmosphere that encourages students to learn. Teaching materials are prepared with the aim of providing materials for learning in accordance with the demands of the applicable curriculum by taking into account student needs which include student characteristics and environment. Teaching materials can help students find alternative teaching materials besides textbooks that are sometimes difficult to understand. Good teaching materials must always follow developments in technology, art, and the realities of life in a society that is always global [6]. In recent years, e-learning has become increasingly attractive to the public and educational institutions as it supports the concept of lifelong learning and knowledge has become increasingly important. Various educational programs around the world offer new forms of education that are often supported by information and
communication technology (ICT). In fact, technological advances have revolutionized the teaching and learning process [7].

The development of information technology causes the need for a concept and a learning mechanism based on information technology to be inevitable. The concept which became known as e-learning has influenced the transformation of conventional education into digital form, both in content and in the system. With teaching materials on e-learning, it can be visualized in various formats and forms that are more dynamic and interactive so that learners or students are motivated to be further involved in the learning process [8]. The tendency to develop e-learning as an alternative to learning in various educational institutions is increasing in line with developments in the field of communication and information technology. Infrastructure in the telecommunications sector that supports e-learning is not only a monopoly of big cities, but has gradually begun to be enjoyed by those in cities at the district level [9].

MOODLE (Modular Object-Oriented Dynamic Learning Environment) is a learning management system that is gradually gaining popularity in the world. Moodle is software designed to assist educators in making quality internet-based learning courses [10]. Moodle has a flexible design, is easy to use and prioritizes student-centered learning. Moodle can be accessed via the internet using a computer/laptop and other gadgets [11]. In the Moodle application, you can enter text, graphics, animation, simulation, audio and video. Media that can display animation is a medium that can reduce difficulties for students to receive learning material. With animation, we can make analogies to visualize abstract subject matter. Conceptual visualization in the form of animation and analogy really helps students understand chemistry [12].

Chemistry as an element in science is very important and interesting because chemistry is related to human life. Chemical material contains abstract concepts that are quite difficult for students to understand [13]. Teachers as educators and facilitators are expected to be able to use appropriate learning models and media according to the character of the material [14]. Based on the content standards of high school chemistry subjects, one of the subjects studied in class XI IPA is solubility and the product of solubility. Solubility can be defined as the maximum amount of a substance that can dissolve in a certain amount of solvent at a certain temperature. The solubility depends on the type of solute. In a saturated electrolyte solution containing crystals of insoluble electrolyte solids, there is an equilibrium between the solid and its ions in solution. Especially for electrolyte solutions (salts or bases which are difficult to dissolve) [15]. This material requires students to be able to combine mastery of concepts and apply them in chemical calculations. If students do not understand the existing concepts, then students have difficulty solving problems related to solubility material and solubility product [16].

2. Materials and Methods

2.1 Population and Sample
The population in the study were Chemistry Lecturers, IT Experts, and Chemistry Teachers. The research samples were chemistry books.

2.2 Research procedure
2.2.1 The Analysis Stage
The teaching materials analysis were the teaching materials used in schools. After the analysis is carried out, the next step is to determine the teaching material to be analysis. The material analysis was chemistry class XI Semester II, namely Solubility and Solubility Times.

2.2.2 Design Stage
In this stage, teaching materials are designed to be developed according to the results of the previous analysis. Furthermore, the design stage is carried out by determining the elements needed in teaching materials such as the framework for teaching materials. Researchers also collect references that will be used in developing material in teaching materials. Researchers also compiled instruments that will be
used to assess the teaching materials developed with the assessment aspects, namely aspects of content feasibility, language feasibility, presentation feasibility and graphic feasibility.

2.2.3 Development Stage
The development stage is the stage that includes the stages of developing teaching materials according to the design obtained after being analysis. Teaching materials will be validated by expert validators. Validators are asked to provide an assessment of the teaching materials developed based on the points of the feasibility aspect and provide suggestions and comments related to the content of teaching materials which will later be used as a benchmark for revision of improvements and improvements to teaching materials.

2.4 Research Instrument
The research instrument used was the National Education Standards Agency assessment sheet which included: content feasibility, language feasibility, presentation feasibility and graphic feasibility.

2.5 Data analysis technique
The data analysis technique in this research is descriptive, which is to explain a problem. The data obtained is quantitative data, in the form of responses and suggestions for improvement of the validator to the teaching materials developed and learning outcomes. The analysis steps are as follows: analysis the teaching materials used in schools analysis the subject matter developed, namely solubility and solubility products designing and developing teaching materials, teaching materials that have been developed will be evaluated by expert validators, formula used to determine the feasibility of teaching materials, processing data, and conclusion.

3. Results and Discussion
This research is a Research and Development (R&D) model with Analysis, Design, Development, Implementation and Evaluation (ADDIE). The results and discussion of the research are as follows:

3.1 Analysis Stage
In this stage, the researcher analysis the teaching materials used in school (Book 1) and comparative teaching materials (Book 2). The teaching materials analysis were in the form of student books at school which were used for teaching and learning activities on the solubility material and the product of solubility. The analysis stage uses the National Education Standards Agency's assessment sheet, the value of book eligibility can be seen in Table 1 as follows:

| No. | Criteria                  | Book 1 | Validation Criteria               | Book 2 | Validation Criteria               |
|-----|---------------------------|--------|-----------------------------------|--------|-----------------------------------|
| 1.  | Content eligibility       | 2,96   | Valid and revised                 | 3,00   | Valid and does not need revision  |
| 2.  | Language Eligibility      | 3,50   | Valid and does not need revision  | 3,57   | Valid and does not need revision  |
| 3.  | Serving Feasibility       | 3,31   | Valid and does not need revision  | 3,60   | Valid and does not need revision  |
| 4.  | Graphic Worthiness        | 3,94   | Valid and does not need revision  | 3,89   | Valid and does not need revision  |
|     |                           | 3,42   | Valid and does not need revision  | 3,5    | Valid and does not need revision  |

Table 1. Feasibility of Book 1 and Book 2
Based on the calculation results, the percentage value of book 1 eligibility is 85%, categorized as very feasible. Meanwhile, the percentage value of book 2 eligibility is 87% categorized as very feasible.

The results of student book analysis 1 can be seen in Figure 1 as follows:

**Figure 1. Average Bookworthiness 1**

The results of student book 2 analysis can be seen in Figure 2 as follows:

**Figure 2. Average Bookworthiness 2**

From the results of the analysis carried out, then the design and development of teaching material is carried out on the solubility material and the solubility product.

### 3.2 Design Stage

In this stage, the researcher designs the teaching materials that will be developed and makes Moodle media as a learning medium.

#### 3.2.1 Making Instructional Material Design

In this stage conducts the design of teaching materials that have been previously analysis. The design of teaching materials is based on the syllabus and the results of the analysis. The advantages of each book are taken to be used in the design and development of teaching materials. Teaching materials developed with several references from the internet. Furthermore, the teaching material presents complete
solubility and solubility product, there are phenomena and problems that are often encountered in life, students are required to find answers to every problem with practicum, there is a url or e-book source on material that can be accessed, and added chemical info, chemistry figures and motivational words. The appearance of the teaching material design can be seen in Figure 3 as follows:

Figure 3. Design of Teaching Materials

3.2.2 Design MOODLE Web
In addition to teaching materials, researchers also created e-learning based learning media, namely Moodle. The Moodle application is an installable software tool. To run Moodle requires hosting and a domain so that the software can be accessed online. Furthermore, creating link to access Moodle easily and quickly. The link of Moodle is url:elearningkimiaapps.online. The next step is to create an admin account as a user to get access to Moodle. After having an account, the admin can login by entering a username and password. Moodle web display can be seen in Figure 4 as follows:
3.3 Development Stage

In this stage the development of Moodle web-based teaching materials (products) on the solubility material and solubility product. The solubility teaching materials and the solubility product that have been developed can be seen in Figure 5 as follows:
In this stage, Moodle-based teaching materials are validated using the modified National Education Standards Agency (BSNP) eligibility standards. The assessment was carried out by three validators, namely expert lecturers (Prof. Dr. Retno Dwi Suyanti, M.Si), IT experts (Muhammad Basri, S.Kom, M.Kom) and chemistry teacher (Farida hanum S.Pd). The teaching materials developed were assessed for their feasibility according to BSNP, namely content feasibility, language feasibility, presentation feasibility and graphic feasibility. The results of the assessment of Moodle web-based teaching materials by the validator can be seen in Table 2 as follows:

| No. | Criteria                | Lecture | Teacher | Average | Valid Criteria                        |
|-----|-------------------------|---------|---------|---------|---------------------------------------|
| 1.  | Content eligibility     | 3.46    | 3.76    | 3.61    | Valid and does not need revision      |
| 2.  | Language Eligibility    | 3.85    | 3.85    | 3.85    | Valid and does not need revision      |
| 3.  | Serving Feasibility     | 3.57    | 3.85    | 3.71    | Valid and does not need revision      |
| 4.  | Graphic Worthiness      | 3.59    | 4.00    | 3.79    | Valid and does not need revision      |
|     | **Average**             | **3.74**|         |         | **Valid and does not need revision** |

The average score of solubility teaching materials and the product of solubility developed can be seen in Figure 6 as follows:

![Figure 6. Average Assessment of Teaching Materials](image-url)

Based on the results of the percentage of the solubility of the teaching materials and the product of solubility of 93.5%, it can be concluded that the solubility teaching material and the product of solubility are categorized as very feasible. While the results of the percentage of eligibility for Moodle media were 87.5%, it could be concluded that Moodle media was categorized as very feasible.

This study aims to determine the teaching materials used in schools are in accordance with the BSNP and to find out the Moodle web-based teaching materials developed are in accordance with the BSNP. This research begins with the analysis stage. The results of the analysis of teaching materials used in schools which were assessed according to the National Education Standards Agency (BSNP) obtained the value of content feasibility (2.96), language feasibility (3.50), presentation feasibility (3.31) and graphic feasibility (3.94). Then an average of 3.42 is obtained with valid criteria and does not need revision. Furthermore, teaching materials developed using Moodle-based e-learning are limited to solubility and solubility product.

After the designed teaching material is complete, it is developed based on Moodle web, then validated with expert validators. Moodle can be accessed by entering the url: elearningkimiapps.online,
then researchers / students enter the username and password for the Moodle account. The results obtained from the mean value of validation of teaching materials on content feasibility (3.61), language feasibility (3.85) and presentation feasibility (3.71), graphic feasibility (3.79) and an average feasibility (3,74) with valid criteria and does not need revision. The percent value of the feasibility of teaching materials is 93.5%. Then it can be concluded that the solubility teaching material and the solubility product are categorized as very feasible. Meanwhile, for the feasibility value of Moodle e-e-learning media by IT experts, the percentage of Moodle media's feasibility is 87.5%, it can be concluded that Moodle web is very feasible. The next stage, the teaching materials are implemented to see the increase in student learning outcomes taught with solubility and solubility products using Moodle-based e-learning.

Furthermore, the research researched by Purmadi (2016) with the research title "Development of Web-Based Teaching Materials Based on Student Learning Styles for Physics Subjects" obtained an increase in learning outcomes by 31.87%, so it can be concluded that web-based teaching materials are effectively used in learning. Another study by Muazizah (2016) entitled "The Effectiveness of the Use of Moodle-Based E-learning with the Guided Inquiry Approach to Student Learning Outcomes" obtained an average of 83.33 learning outcomes with 91.67% completeness, the conclusion is that the use of e-learning is based on Moodle is effective in improving student learning outcomes on hydrocarbon material. Learning with the e-learning system has weaknesses resulting in low student learning outcomes, namely the lack of internet access, and difficulty understanding without face to face [17].

4. Conclusion
Based on the results of data analysis and discussion, it can be concluded that the results of the analysis of textbooks or chemistry books used in school obtained an eligibility percentage of 85% which is categorized as very feasible. The results of the standardization of the development of solubility teaching materials and the solubility product based on Moodle Web by expert validators obtained content feasibility (3.61), language feasibility (3.85) and presentation feasibility (3.71), graphic feasibility (3.79) and obtained an average feasibility (3.74) with valid criteria and does not need revision. The percent value of the feasibility of teaching materials is 93.5%. Then it can be concluded that the solubility teaching material and the solubility product are categorized as very feasible. Meanwhile, for the feasibility value of Moodle Web by IT experts, the percentage of Moodle Web feasibility is 87.5%. It can be concluded that Moodle Web is very feasible.

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