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Analysis of the Feasibility Level of the Moodle Integrated WordPress-Based Chemistry Learning Website to Improve Student Learning Outcomes on the Elements Periodic System Material

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Abstract: Analysis of the Feasibility Level of the Moodle Integrated WordPress-Based Chemistry Learning Website to Improve Student Learning Outcomes on the Elements Periodic System Material. This study aims to determine the feasibility of a WordPress-based integrated chemistry learning website Moodle to improve student learning outcomes on the material of the periodic system of elements seen from content and construct validity. The type of research used is Research and Development (R&D) with a 4D development model, namely Define, Design, Develop and Disseminate. In this study, the development model is limited to the development stage. This research was conducted using a learning website review sheet instrument and a learning website validation sheet divided into a content validity sheet and a construct validity sheet. Based on the analysis of the validation results, the data obtained if the chemistry learning website developed obtained a percentage of 89.59% for content validity in the very valid category and got a percentage of 86.67% for construct validity, including the very valid category used as a learning medium.

Keywords: Learning website, WordPress, Moodle, learning outcomes.

Abstrak: Analisis tingkat kelayakan Website Pembelajaran Kimia Berbasis Wordpress Terintegrasi Moodle untuk Meningkatkan Hasil Belajar Peserta Didik pada Materi Sistem Periodik Unsur. *Penelitian ini bertujuan untuk mengetahui tingkat kelayakan website pembelajaran kimia berbasis wordpress terintegrasi Moodle untuk meningkatkan hasil belajar peserta didik pada materi sistem periodik unsur dilihat dari validitas isi dan konstruk. Jenis penelitian yang dipakai adalah Research and Development (R&D) dengan model pengembangan 4D, yaitu Define, Design,, Develop dan Disseminate. Pada penelitian ini, model pengembangan dibatasi pada tahap develop (pengembangan). Penelitian ini dilakukan menggunakan instrumen lembar telaah website pembelajaran dan lembar validasi website pembelajaran yang terbagi menjadi lembar validitas isi dan lembar validitas konstruk. Berdasarkan analisis hasil validasi, didapatkan data jika website pembelajaran kimia yang dikembangkan memperoleh persentase 89,59% untuk validitas isi dengan kategori sangat valid dan mendapatkan persentase 86,67% untuk validitas konstruk termasuk kategori sangat valid digunakan sebagai media pembelajaran.*

Kata kunci: *Website pembelajaran, wordpress, moodle, hasil belajar*

▪ INTRODUCTION

Research conducted in several countries shows that chemistry is one of the least preferred subjects (Ristiyani & Bahriah, 2016). The reason is the many abstract things that are studied in chemistry. It is this abstraction that causes many chemicals to be challenging to reach or Difficult. One of them is the material of the periodic system, which discusses the rules of abstract chemical classification. The periodic system of elements (SPU) is a conceptual chemical material because the discussion of the material is too small (Surya, 2020). Research conducted by Ratmansyah provides data if some students from one school in Surabaya have difficulty understanding the periodic system; in addition to the complex material, the periodic system is also not studied in 2-3 meetings (Rahmatsyah, & Dwiningsih, 2021).

In the material on the periodic system of elements, the history of the grouping of chemical elements, the rules for the periodic system of elements, and the properties of the periodic system of elements is explained, which consists of metallic properties, ionization energy, ion radius, electron affinity, and electronegativity of an element. (Oktavia, Sadiana, & Asi, 2019). According to Murtandho (2014), the periodic system of elements (SPU) is one of the chemical materials that is considered difficult by most high school students. This material is deemed difficult due to more memorization, making it difficult for students to understand the periodic system of elements. In addition, students often have difficulty determining the basis of grouping and from the theory contained in this material. Therefore, many sub-materials in the periodic system need to be delivered with appropriate learning methods and media. If the periodic material system is not delivered with inappropriate learning media, then students will find it difficult to accept learning on the material. Through learning media, teachers can present subject matter that is abstract into concrete so that it is easily accessible to students (Nurrita, 2018).

According to Sebrina and Putri (2021), e-learning is one of the most effective learning strategies or methods to reach vast places at a relatively low cost. Therefore, it is appropriate to use it to improve students' understanding of the material being taught. E-learning is learning built with an electronic or computer system that can support the learning process. Using E-learning in learning often uses collaboration from audio/data, video/data, and audio/video technologies. One of the purposes of using E-learning is to help deliver learning materials so that the materials can be used and studied by all parties in need. E-learning will facilitate learning anytime and anywhere as long as there is an internet connection (Septiani, 2018). One of the open-source e-learning that is often used is Moodle. Moodle is the Best Learning Content Management System (LCMS) (Cavus & Zabadi, 2014). However, Moodle will be much effective if integrated with the WordPress Content Management System (CMS). The process of building a learning website will be more effective and easier to do if you use CMS WordPress because WordPress has settings that are much more flexible and easy to integrate with other plugins or CMS. WordPress has many features to develop a unique website page as a medium for learning chemistry on the periodic system of elements. One of the advantages of creating a CMS WordPress-based website is the availability of Plugins and Templates that make it easy to build a web page, even without coding at all (Batara, 2015).

Installing CMS WordPress can use the Self-Hosting and Share-Hosting systems. The Self-Hosting installation process will facilitate the process of integrating WordPress CMS with other CMS (Molnar & Schechter, 2015). One of them is with CLMS Moodle.

So with this convenience, more varied websites can be built using two CMS simultaneously using a sub-domain system.

This integration system makes Moodle's integrated WordPress CMS effective in delivering mater ial on the periodic system of elements. Because there are many features in CMS WordPress. That makes it easy to visualize abstract material such as the periodic system of elements. The integration of CLMS Moodle also makes it easier for writers to develop e-learning with messaging features, discussion forums, task collection, and online quizzes (Harahap, 2015). The integration of these two platforms will also give birth to new advantages in flexibility in editing learning content. That is the decisive reason why CMS WordPress is suitable to complement the Moodle CLMS (Rhomdani, 2016). Based on the background described, the author views the need to develop an Integrated CMS WordPress-based chemistry learning website.

▪ METHOD

This study uses the Research and Development (R&D) research method with the Thiagarajan 4D development model, namely with four stages, Define, Design, Develop (development), and Disseminate (dissemination), which is limited to the Development stage. On the validation of learning media. The product development in this research is in the form of a chemistry learning website. The website developed will be assessed by media experts and materials experts and then revised to get better results. Then tested it on students as users of learning media.

This research will refer to four stages of development, starting from the definition stage to determine and define the learning requirements, the design stage to (a) develop learning tools (b) choose media that are suitable for the purpose and deliver the subject matter (c) choose the format and development stage which includes device validation and revision. The data from the validation results of the learning website by the media expert chemistry lecturer were analyzed using quantitative descriptive methods to provide an overview and explain the results of the validity of the development of a learning website with the percentage of the scores on the website-based learning media validity assessment sheet. The percentage of the questionnaire data was obtained based on the Likert scale calculation in the following table (Riduwan, 2016).

Table 1. Likert Scale Validation

Scale	Kategori
1	Not very good
2	Not good
3	Pretty good
4	good
5	Very good

The formula used to calculate the percentage is as follows:

$$P\ (\%) = \frac{sum\ of\ result\ scores}{criteria\ score}\ x\ 100$$

With:

P = validation percentage

Criteria score = *highest score of each item x number of items x number of validators*

The percentage of results from the validation sheet obtained based on the Likert scale will be interpreted with the following criteria:

Table 2. Criteria for Interpretation of Validity Scores (Riduwan, 2016)

Percentage (%)	Category
0-20	Totally invalid
21-40	Not valid
s41-60	Quite valid
60-80	Valid
81-100	Very valid

A learning media developed is declared feasible to be used in the learning process if the percentage of each aspect is ≥ 61% (Riduwan, 2016).

▪ RESULT AND DISCUSSION

Define Stage

a. Final Preliminary Analysis

Several journals containing research on the development of media for the periodic material system of elements provide data if the teacher has a little difficulty conveying the sub-material. Several interviews conducted by media researchers, revealing data if learning media can be effective in helping the process of delivering material on the periodic element system. So that this Moodle integrated chemistry learning website is expected to help teachers provide understanding for students, so they are not confused with the concepts contained in the material for the periodic system of elements. Supported by an attractive website display, one of these learning media can increase students' motivation to learn and understand the material of the periodic system of elements so that students will experience improved learning outcomes.

b. Student Analysis

The use of personal computers (PCs) and mobile devices (HP) in education is now massive. It is, moreover, coupled with the Covid-19 Pandemic, which forced the world of education to adapt to situations and conditions. who must balance the use of these devices by high school students with the adjustment of learning media. Thus, the device is used as a means of playing games and for learning. In providing material, there must be media that can accommodate various learning activities—starting from giving material, discussed to collecting assignments that can do synchronously or asynchronously. Therefore, the e-learning Moodle integrated website learning media needs to be made to support learning in education.

c. Material Analysis

The material analysis aims to develop concepts in the sub-materials that students will study. The sub material taught refers to the learning objectives of class X students in the Mathematics and Natural Sciences department. For example, the matter of the periodic system begins with the introduction or development of the periodic table. They are starting from the Dobereiner Triade theory, the Newlands Octave theory, Mendeleev, and the modern periodic system. This material also explains the periodicity system of groups of elements and their periodic properties in a concept. So that with this

website-based learning media can facilitate student understanding and improve student learning outcomes.

d. Task Analysis

This analysis aims to identify the tasks that need to be done by students in learning that is supported by a learning website. Based on the results of the concept analysis on the Elements Periodic System Material, it can be identified the tasks carried out by students in the learning prose, including (1) Understanding the differences between each periodic table theory, (2) Determining places based on atomic numbers, (3) Identifying classified not based on their periodicity properties.

e. Analysis of Learning Objectives

Based on the material analysis and task analysis. The indicators of achievement of learning outcomes are described, among others; (1) Students can explain the development of the periodic system of elements according to Dobereiner, Octave, Mendeleev, and the Modern periodic system of elements, (2) Students can explain the advantages and disadvantages of the development of the periodic system according to Dobereiner, Octave, Mendeleev, and the Modern periodic system of elements, (3) Students can group the elements in the periodic table of elements according to Dobereiner, Octave, and Mendeleev, to the modern periodic system of elements, (4) Students can present the results of the Student Worksheet discussion about the development of the periodic system of elements.

Design Stage

a. Media Selection

The learning media needed to implement the periodic element system learning material is adjusted to material analysis and task analysis. Based on this analysis, it is determined that the media required in learning for the periodic element system material is a laptop or cellphone, more specifically the use of a browser to access the chemistry learning website on the elemental periodic system material.

b. **Format Selection**

The selection of media formats is intended to design or design the content of learning media that is adapted to the learning material. The selected media development format is a concept that can cover all learning objectives from the material on the periodic system of elements. The components of this learning website are composed of the front page, menus, instructions, core and essential competencies, material pages, videos, e-learning moodle, and exercises.

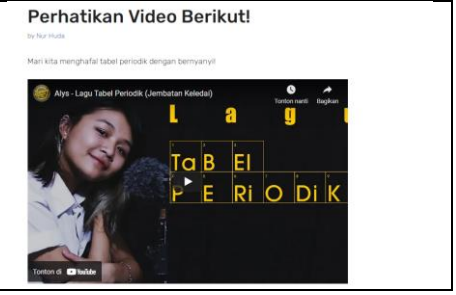
c. Preliminary Design

In this case, the result of the initial design is the design of the media used to obtain the data needed in the development process. The design of learning media is based on the results of the analysis that has been carried out in the previous stage so that it arrives at this design stage. This initial design phase will produce an initial product that will develop at the development stage. This chemistry learning website's contents are built with the WordPress content management system (CMS) and the Moodle Content Learning Management System (CLMS). Some of the plugins used to create this website are Elementor pro, Generate Press theme, and others. Here is the front page view of the learning website.

Figure 1. Front page of the website

The chemistry learning website that has been designed will produce draft I, which chemist lecturers then review for input and suggestions. The next step after the review process is to revise it to have draft II, which continues at the device validation stage. The revised results of the study of the learning website can be seen in **Table 3** below:

Table 3. Revision table of media review results

No	Suggestion	Revised Results
1	On the start page, an opening is given, so it doesn't go directly to the menu.	
2	Each page is given a password (locked) so that learning can be more structured.	
3	Learning instructions are given to make it easier for students when accessing the chemistry learning website..	
4	A video that does not discuss the material is given so that students do not get bored.	

Development Stage

Learning Website Validation

The chemistry learning website that has been designed will produce draft I, which chemist lecturers then review for input and suggestions. The next step after the review process is to revise it to have draft II, which continues at the device validation stage. The revised results of the study of the learning website can be seen in Table 3 below:

After being revised from the review of media expert lecturers, the learning website entered the validation stage, which aims to determine the feasibility of the website as a learning medium to improve student learning outcomes. A learning media can be declared feasible with one criterion, namely validity (Nieveen, N. 1999). This validation was carried out by two expert lecturers who tested content and construct validation. The results of the proof can be seen in **Table 4**:

Table 4. Table of the percentage of validation results

No	Validity	Percentage (%)	Category
1	Contents	89,59	Very Valid
2	Construct	86,67	Very Valid

Based on table 3, it is known that if the chemistry learning website developed gets a percentage of 89.59% for content validity and 86.67% for construct validity; the two validity categories are very valid so that they are suitable for use as learning media.

a. Content Validity

Content validity is a test of the feasibility of a learning website based on the suitability of the material used to improve student learning outcomes based on content criteria and presentation criteria. This validity ensures that the measurement includes an adequate set of aspects and represents the concept given to students (Hendryadi. 2017). The results of the validation of the contents of this learning website can be seen in Table 5 below:

Table 5. Table of percentages of content validity

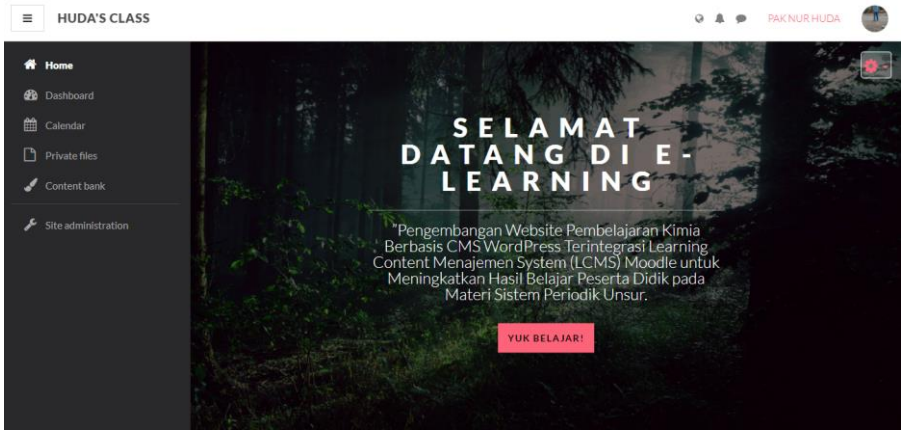
No	Validity Criteria	Persentase (%)	Category
1	Contents	85,00	Very Valid
2	Presentation	92,14	Very Valid

The process of making materials is adjusted to the selected essential competencies. Based on the table, it is known that the content validity criteria which contain the relevance of basic competencies, learning objectives, amount of material, depth of material content, and sources (references) get a percentage of validity of 85% including in the very valid category so that it can be concluded that this learning website is on the material aspect. Chemistry is appropriate.

On the criterion aspect of presentation validity, this chemistry learning website gets 92.14% with a very valid category. Thus, the learning website developed is feasible to improve student learning outcomes on the material of the periodic system of elements. In the presentation criteria, the display of colors, fonts, and the neatness of the menu are essential aspects to support the feasibility of this website as a learning medium. In addition, the speed of loading the website also affects students' comfort

when accessing the website. There is also a Moodle-based e-learning integration on this website to make it easier for teachers to provide a variety of asynchronous learning activities. The following is an image of the e-learning page that can access via the link *kelas.rnhlearning.com*:

Figure 2. Moodle-based e-learning page



b. Construct Validity

Construct validity is a description that describes the data to what extent the measuring instrument shows results that follow the theory. This validity is essential to note to measure the appropriateness of the learning media used. So, suppose this validity assessment is still not valid. In that case, a media must be revised and developed to reach validity as a measuring tool used to assess whether it is ready for the research process (Ihsan, 2015). The analysis of the construct validity test on this learning website is seen from two criteria, namely language and graphics. The following is Table 6, which is the result of the feasibility test of construct validity for this chemistry learning website:

Table 6. Table of percentage results of construct validity

No	Validity Criteria	Persentase (%)	Kategori
1	Language	80,00	Valid
2	Graphics	86,67	Very Valid

Language Criteria

This language criterion relates to writing written learning website content following the General Indonesian Spelling Guidelines (PUEBI) on the rnhlearning.com website so that the website content is easy to understand. Students will be much easier to understand or capture the material if the contents are written based on the correct Indonesian spelling. There is no double interpretation of the concepts or theories conveyed on the learning website. Of course, the contents of the learning website are written in clear, straightforward, and communicative language so that readers can understand the contents easily (Indrastuti, 2018). Writing the contents of this chemistry learning website obtains a percentage of 80%, which is included in the valid category to make it feasible to use. This percentage shows that the content of this chemistry learning website is written in the good and correct language and uses standard vocabulary so that it does not cause misconceptions or multiple interpretations. It can be

concluded, with this percentage, the language used in this learning website is in the appropriate category for use.

Graphic Criteria

This graphic criterion concerns the aesthetic and dynamic layout of the learning website. In addition, graphics are also related to typography which determines the readability of content in learning sites. The addition of illustrations and pictures in terms of layout is also assessed from this visual aspect. Assessments are the balance of design selection, font and size, appropriate background, color selection, and structure of the text, images, and tables. On this learning website, in terms of getting a percentage of 86.67%, it is included in a very valid negotiation. So in terms of graphics, this learning website is feasible to use.

▪ CONCLUSION

Based on the results of the analysis of the study and validity, it can be concluded that the Moodle integrated chemistry learning website is suitable to be used as a learning medium to improve student learning outcomes on the material of the periodic system of elements in terms of content and construct validity with a very valid category. Furthermore, this learning website will make it easier for teachers to deliver learning materials synchronously and asynchronously to increase the effectiveness of the learning carried out. Next, the step taken is to apply learning media to determine the effectiveness of the learning website to support student understanding.

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