Moodle-Based E-learning Development by Implementing Gamification Concept

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Abstract: This research aims to produce moodle-based e-learning media by applying the concept of gamification to the subject “Visual Communication Design in Industry 4.0”, targeting class X students at SMK Negeri 5 Kendari. This research uses the R & D (Research and Development) method by applying the ADDIE model research procedure (Analysis, Design, Development, Implementation, Evaluation). The type of data used in this research is quantitative data derived from primary data. The data obtained in this study came from the results of public tests which included media experts, material experts, and field tests conducted by students. The data generated was then analysed using descriptive techniques to test the feasibility of the media. The results of the feasibility test conducted by three media experts stated "Very Feasible" with an average percentage of 93.89%, the results of the feasibility test conducted by three material experts stated "Very Feasible" with an average percentage of 97.08%, and also the results of the feasibility test conducted by students stated "Very Feasible" with an average percentage of 87.97% so that the gamification-based e-learning media developed is very feasible to use as learning media.

Abstrak: Tujuan dari penelitian ini adalah untuk menghasilkan media pembelajaran e-learning berbasis moodle dengan menerapkan konsep gamifikasi pada pokok bahasan “Desain Komunikasi Visual dalam Industri 4.0”, dengan sasaran peserta didik kelas X SMK Negeri 5 Kendari. Penelitian ini menggunakan metode R & D (Research and Development) dengan menerapkan prosedur penelitian model ADDIE (Analysis, Design, Development, Implementation, Evaluation). Jenis data yang digunakan dalam penelitian ini yaitu data kuantitatif yang bersumber dari data primer. Data yang diperoleh dalam penelitian ini berasal dari hasil uji publik yang meliputi ahli media, ahli materi dan uji lapangan yang dilakukan oleh peserta didik. Data yang dihasilkan kemudian dianalisis menggunakan teknik deskriptif untuk menguji kelayakan media. Dari hasil uji kelayakan yang dilakukan oleh tiga orang ahli media menyatakan “Sangat Layak” dengan rata-rata persentase 93,89%, hasil uji kelayakan yang dilakukan oleh tiga orang ahli materi menyatakan “Sangat Layak” dengan rata-rata persentase 97,08%, dan juga hasil uji kelayakan yang dilakukan oleh peserta didik menyatakan “Sangat Layak” dengan rata-rata persentase 87,97%. Sehingga media e-learning berbasis gamifikasi yang dikembangkan sangat layak untuk digunakan sebagai media pembelajaran. E-learning berbasis moodle dengan menerapkan konsep gamifikasi dalam dunia pendidikan memberikan kemudahan dalam proses belajar mengajar.
A. Introduction

The development of information technology is currently very rapid, both hardware and software development itself. So, it is not surprising that with this technological development, the world of education has also had a positive impact. As is known, currently, the world of education must be connected to the development of technology itself. Many new things have emerged and can be used as facilities that can support the learning process. Technology in education can be in the form of applications or media designed in such a way and used in classroom learning practices and even as learning resources or references in studying science. Therefore, in the development of technology in the world of education, teachers are not the only source of learning, but teachers are given access and freedom to use various types of technology to enhance learning with various learning media that are easily accessible free of charge or paid so that the learning process is more exciting and students more easily understand the material.

Based on the results of observations made at Vocational High School (SMK) Negeri 5 Kendari through interviews with school principals and subject teachers for the Basics of Visual Communication Design (DKV) subject in class X, it turns out that e-learning has yet to be used. In addition, in the learning process, the teacher needs media in the form of e-learning to facilitate learning activities, and students experience problems in the process of understanding the material due to limited facilities, such as Infocus projectors, while supporting learning activities must be supported by good equipment or facilities and infrastructure. Also, apart from the limited facilities available at school, the learning process still depends on the teacher and the limitations of the Basics of Visual Communication Design subject books. SMK Negeri 5 Kendari is also very supportive of the use of e-learning. This is proven because students can bring smartphones to school, and the availability of connected Wifi at school makes it easier for students to access e-learning. In addition, e-learning can be accessed anytime and anywhere. This means that e-learning is not tied to place and time. This e-learning can be accessed without a time limit, meaning that students can access all activities in e-learning even if they are at home, so there is no reason for students to miss material if they cannot attend school. Therefore, we need media so that students more easily understand the material being taught, hoping that the learning media used can increase motivation, interest, knowledge, and student learning outcomes.

Learning media is a container or source used in conveying messages or learning materials teachers use and then forward to students. The media serves to connect information or learning materials from teacher to student. Learning media are tools teachers use to help convey information to students during the learning process (Audie, 2019; Nurrita, 2018; Yanto, 2019). Alwi (2017) reveals that "the use of media in the learning process is absolute and cannot be ignored (Jauhari, 2018) also concludes that the media has a huge function and influence on the learning process, especially on students' sensory organs. According to him, using learning media guarantees more understanding of the material being taught. One of the learning media that can be used is e-learning.
E-learning or electronic learning is teaching and learning activities carried out through networks, both formal and non-formal learning, and e-learning offers learning benefits not bound by place and time, such as face-to-face learning systems. That is, it can be done anytime and anywhere. According to (Elyas, 2018), e-learning is a system that is needed to anticipate the times supported by current technological developments. Meanwhile, according to (Yustanti & Novita, 2019), e-learning is internet technology-based learning used to make learning materials more accessible to students and improve skills. Therefore, here researchers will design an e-learning application that is more interesting and different from other e-learning by using a Moodle-based LMS (Learning Management System) by applying one concept, namely gamification.

Gamification or gamification is the process of implementing game designs and concepts into the learning process with the aim of making learning even more enjoyable. In other words, gamification is an approach to solving non-game problems using game components. According to (Marisa et al., 2020), "Gamification is the use of game elements to solve non-game problems with the aim of increasing the performance of the system being solved by increasing student motivation". Meanwhile, gamification is the application of techniques and strategies from a game to non-game contexts that aim to solve a problem. This method makes the material or technology more attractive by encouraging users to engage in the desired behavior. The goal is to increase user participation, motivation, and achievement. The function of gamification is to provide opportunities for students to be more active during teaching and learning activities with the concept of games in cyberspace (Islami & Soekamto, 2022; Kristiadi & Mustofa, 2017).

Based on several previous studies that utilized gamification in the learning process, gamification was applied to previous research according to research (Rusmaini et al., 2021) with research results: 1) The attendance rate using the gamification model in the learning process reached 98.28%. 2) The value of the pre-test and post-test increased from 66.38 to 82.20 after using the gamification model. This means that it has increased by 15.82; 3) four skills are obtained, namely, the ability to convey responses, the ability to explain ideas, the ability to protest ideas, and the ability to express reasons. (Handani et al., 2016) With research results: 1) The concept of gamification has been successfully implemented into systems or e-learning using the MDA (Mechanic, Dynamic, Aesthetic) framework, 2) The material presented in e-learning is designed into several levels to facilitate users in learning 3D Animation. (Prasistayanti et al., 2019) The research results show differences in learning outcomes and creative thinking abilities of students who use the internet, gamification, and content-based e-learning as well as research conducted by (Permata et al., 2020) with the results of the research showing that students' interest in learning increased by 3.30% by using the gamification plan implemented on Kahoot and Quizizz. The use of gamification in learning will help increase interest in learning Mathematics.

The similarities and differences in research conducted by researchers with previous research are that they both apply the concept of gamification in e-learning and the learning designs developed. As for the differences in research conducted by researchers with
previous studies, namely the location of the research and the subjects used as objects in the research of researchers, of course, differences in places and objects will affect the results of the research. So, the media has a function that plays an essential role in students' understanding of the material to be taught.

Based on the description above, it can be seen that learning media is very important in supporting the learning process used by the teacher as a liaison for information from teacher to students whose goal is that the material provided can be well understood by students so that learning objectives are achieved. Existing problems can be solved by having e-learning that is interesting and accessible to students anytime and anywhere by applying a gamification concept so students do not feel bored with the materials provided by the teacher and by having e-learning media with the application. The concept of gamification is expected to make it easier for students to understand and master the teaching materials subject teachers provide. This study aimed to produce moodle-based e-learning learning media by applying the concept of gamification to the subject "Visual Communication Design in Industry 4.0".

B. Method

Figure 1. Research Flow

This research uses the R & D (Research and Development) method. The R & D method is a method for making a product while testing its effectiveness, reveals that the R
& D method can be interpreted as a research method used to make a product and test its effectiveness. This research, in its development, uses the ADDIE model research procedure (Analysis, Design, Development, Implementation, Evaluation), which is presented in the following figure;

![ADDIE Development Model](image)

**Figure 2. ADDIE Development Model**

This research begins with the analysis stage by carrying out needs analysis activities related to learning materials in the form of teaching modules and identifying problems in the field, in this case, class X majoring in Visual Communication Design at SMK Negeri 5 Kendari with 17 students. The second stage, namely design, consists of designing an interface outlined in a storyboard to provide an overview of the e-learning that will be designed and implemented. Furthermore, the Development stage contains design activities, and then product testing is carried out by three media experts and three material experts. Then, after it is declared that gamification-based e-learning is feasible, the next stage is implementation, namely the trial stage. The field that is the subject in this study. Furthermore, evaluation, this stage can occur in the four previous stages to make improvements to e-learning from various inputs obtained from the questionnaires distributed in the previous stages, with the aim that inputs and suggestions from the completed questionnaire carry out revisions.

Data collection instruments in this study used observation instruments, interviews, questionnaires (questionnaire method), and documentation. The data analysis technique used is descriptive, which describes the results of observations of e-learning media with the concept of gamification, and tests the validity and feasibility of the product to be implemented at SMK Negeri 5 Kendari. Data in the form of numbers resulting from calculations or measurements can be processed by adding up, comparing to the expected amount, and obtaining a certain percentage, which can be written using the calculations below:

\[
\text{Eligibility Percentage (%) } = \frac{\text{Observed Score}}{\text{Expected Score}} \times 100\%
\]
After the data is collected and analyzed using a qualitative descriptive analysis technique that is expressed by categorizing ratings and performance on a predetermined rating scale, after presenting it in percentage form, the next step is to describe each piece of information. In this study, a Likert scale was used with four answer choices to obtain quantitative data, which can be seen in the table below:

<table>
<thead>
<tr>
<th>Percentage of Achievement</th>
<th>Score</th>
<th>Interpretation Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>76 – 100 %</td>
<td>4</td>
<td>Very Eligible</td>
</tr>
<tr>
<td>56 – 75 %</td>
<td>3</td>
<td>Qualified</td>
</tr>
<tr>
<td>40 – 55 %</td>
<td>2</td>
<td>Inadequate</td>
</tr>
<tr>
<td>0 – 39 %</td>
<td>1</td>
<td>Very inadequate</td>
</tr>
</tbody>
</table>

C. Result and Discussion

Result

This research produces moodle-based e-learning by applying the concept of gamification that can be used in the learning process. In detail, the description of each ADDIE stage is presented as follows:

The first stage is analysis, in which needs analysis is carried out by examining general information and core competencies from the Basics of Visual Communication Design subject and identifying problems by direct observation and interviews. The implementation of this activity is presented in Figure 3 below;

Figure 3. Stages of Analysis

The second stage is design. After carrying out the previous analysis stages and all data is collected, this design stage is carried out by designing the interface and learning design in Moodle-based e-learning by applying the concept of gamification in the form of storyboards. One of the activities carried out at this stage is presented in Figure 4 below;
The third stage is development, which is developing or realizing the results of the previous design stage. The testing stage follows it, carried out by media and material experts. The results of the validation carried out by media experts and also material experts can be seen in the following table:

![Figure 4. Design Stages](image)

![Figure 5. Media Expert Response To E-learning](image)

The criteria for the results of e-learning testing for three media experts are presented in the diagram, with the average percentage of the three media experts consisting of 2 Information Technology Education lecturers and 1 Information Technology and Systems lecturer, namely 93.89% in the category "Very Feasible" to be tested in the field with some suggestions/inputs from one of the media experts. The breakdown of the average percentage of the assessment results is 95.00% for media expert one, a lecturer in Information Technology Education. 90.00% from the results of the percentage of media experts two, a lecturer in Information Technology Education, and the last a total percentage of 96.67% from media experts 3 Information Technology Systems. As for the percentage results carried out by material experts, they are as follows:
The picture above results from the average material expert assessment of gamification-based e-learning, which was assessed using a questionnaire. Data obtained from material expert 1, with an average score of 96.25%, is included in the "Very Eligible" category, while material experts 2 and 3, with an average value of 97.50%, are in the "Very Eligible" category. Obtained an average percentage score of 97.08% with the category "Very Eligible" to be tested on students with revisions according to the suggestions.

The fourth stage is implementation, after going through the testing stages carried out by media experts and also material experts and declared "feasible" to be implemented, then implemented by class X students majoring in Visual Communication Design at SMK Negeri 5 Kendari who were the subjects in this study, with the results the percentage is declared "Very feasible", the test results can be seen in the following table:

<table>
<thead>
<tr>
<th>No</th>
<th>Kode Respondent</th>
<th>Skor (%)</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Respondent 1</td>
<td>90.91</td>
<td>Very worth it</td>
</tr>
<tr>
<td>2.</td>
<td>Respondent 2</td>
<td>84.09</td>
<td>Very worth it</td>
</tr>
<tr>
<td>3.</td>
<td>Respondent 3</td>
<td>86.36</td>
<td>Very worth it</td>
</tr>
<tr>
<td>4.</td>
<td>Respondent 4</td>
<td>100.00</td>
<td>Very worth it</td>
</tr>
<tr>
<td>5.</td>
<td>Respondent 5</td>
<td>75.00</td>
<td>Worth it</td>
</tr>
<tr>
<td>6.</td>
<td>Respondent 6</td>
<td>86.36</td>
<td>Very worth it</td>
</tr>
<tr>
<td>7.</td>
<td>Respondent 7</td>
<td>90.91</td>
<td>Very worth it</td>
</tr>
<tr>
<td>8.</td>
<td>Respondent 8</td>
<td>84.09</td>
<td>Very worth it</td>
</tr>
<tr>
<td>9.</td>
<td>Respondent 9</td>
<td>84.09</td>
<td>Very worth it</td>
</tr>
<tr>
<td>10.</td>
<td>Respondent 10</td>
<td>90.91</td>
<td>Very worth it</td>
</tr>
<tr>
<td>11.</td>
<td>Respondent 11</td>
<td>88.64</td>
<td>Very worth it</td>
</tr>
<tr>
<td>12.</td>
<td>Respondent 12</td>
<td>88.64</td>
<td>Very worth it</td>
</tr>
<tr>
<td>13.</td>
<td>Respondent 13</td>
<td>88.64</td>
<td>Very worth it</td>
</tr>
<tr>
<td>14.</td>
<td>Respondent 14</td>
<td>84.09</td>
<td>Very worth it</td>
</tr>
<tr>
<td>15.</td>
<td>Respondent 15</td>
<td>88.64</td>
<td>Very worth it</td>
</tr>
<tr>
<td>16.</td>
<td>Respondent 16</td>
<td>93.18</td>
<td>Very worth it</td>
</tr>
<tr>
<td>17.</td>
<td>Respondent 17</td>
<td>90.91</td>
<td>Very worth it</td>
</tr>
<tr>
<td>Rata-rata</td>
<td>87.97</td>
<td>Very worth it</td>
<td></td>
</tr>
</tbody>
</table>
The table above shows that of all the respondents, with 17 people, 1 gave an assessment in the appropriate category, and 16 other respondents stated that it was very feasible. Gamification-based e-learning is very feasible to use, with an average percentage score of 87.97% with a very feasible category. So it can be concluded that the development of moodle-based e-learning by applying the concept of gamification based on the validation results carried out by media experts, material experts, and students' responses to e-learning was declared "very feasible" to use.

This research produces moodle-based e-learning by applying the concept of gamification that can be used in the learning process. E-learning begins with a subject description. Subject descriptions and learning outcomes are an introduction to what material will be studied at the ongoing meeting, making it easier for students to know what to do. The appearance of the subject description page is presented in the following figure:

![Figure 7. Subject Description Page](image)

In e-learning, there is also a topic description page. The topic description explains the material to be studied at the ongoing meeting. The appearance of the subject description page is presented in the figure as follows:

![Figure 8. Topic Description Page](image)

Furthermore, e-learning also contains material in the form of PDF files, while the appearance of the subject description page is presented in the figure as follows:
Furthermore, gamification-based e-learning also contains interactive learning videos utilizing the interactive features of H5P. The appearance of the subject description page is presented in the figure as follows:

![Figure 9. Material Page](image)

Gamification-based e-learning is also equipped with games. The presentation of games in e-learning uses additional features from Moodle in the form of crossword games in the millionaire activity. The appearance of the subject description page is presented in the figure as follows:

![Figure 10. H5P Learning Video Page](image)

![Figure 11. Games Page](image)
Furthermore, gamification-based e-learning also presents an evaluation in the form of multiple choice or multiple choice with several questions. From the results of the development of gamification-based e-learning, which has been tested on media and material experts and field tests on class X DKV students, the gamification-based e-learning developed is feasible.

![Figure 12. Evaluation Page](image)

**Discussion**

The characteristics of gamification-based e-learning consist of (1) topic descriptions; (2) Material; (3) learning videos; (4) games; (5) evaluation. The characteristics contained in e-learning are described as follows:

The first characteristic topic description; This page contains a description of the topics that will be discussed in the material for Visual Communication Design in Industry 4.0, aiming that students or students can find out what material will be discussed in the ongoing meeting.

The second characteristic, material, is presented in e-learning utilizing the Resource feature. This section will describe the material in PDF form that students can study and download. The resource feature in PDF form makes it easier for students or students to access the material provided by the teacher. According to S. F. Pane et al (in Purnama, 2022), PDF files can store data, be it two-dimensional documents, letters, text, or images. Also, files stored in PDF format are not susceptible to viruses and cannot change the existing format when opened on another device.

The third characteristic learning videos are presented in gamification-based e-learning that utilizes the H5P feature in Moodle. According to Wehling et al (in Bakri, 2021) that the H5P feature provides benefits in making the material in the video more interactive. According to (Ramiyana & Ramdhan, 2020), H5P is content and learning materials available in e-learning LMS to make it easier for everyone to create, compare and reuse interactive HTML5 content.

The fourth characteristic, games presented in e-learning, utilize additional features from Moodle, namely the crossword game. (Pujiasih, 2020) Concluded that games can be
used to motivate students learning because games can make students or students more focused on learning and make students not bored with learning. (Hidayatulloh et al., 2020) Explains that using games in the learning process can increase motivation and make learning more fun.

Moreover, the last characteristic is valuation; presented in the form of multiple choice, evaluation in e-learning is given a time limit of 15 minutes for eight multiple choice questions that students or students must answer. According to Suhaartman (in Magdalena et al., 2021), multiple-choice tests have several advantages: the ability to measure different cognitive levels (from memory to evaluation), easy assessment, fast, and objective. They can cover a variety of materials in one test. The form of the multiple choice test is also suitable for tests with many participants whose test results must be announced immediately.

D. Conclusion

Moodle-based e-learning, by applying the concept of gamification, is one of the learning media that can be used as an alternative in the learning process that has passed the validation stage and is declared "very feasible" to be used in the learning process. The development of Moodle-based e-learning by applying the concept of gamification to the Basics of Visual Communication Design subject was successfully developed and declared "very feasible" to use based on the results of validation tests by media experts, material experts, and field tests.

The implications of this research can be utilized and implemented in the online learning process, facilitate student independent learning, can be used as an alternative in the learning process, make it easier for students to understand material that is not understood in class, and make it easier to access material without any time and place restrictions.

For future researchers, it is recommended to conduct research related to the implementation of gamification-based e-learning because researchers only research the e-learning development section.

References


