



Development of Moodle-Based E-Learning Media on the Topics of Atomic Structure

Irma Amalia¹, Ratih Permana Sari^{1*}, Molani Paulina Hasibuan¹, Muhammad Nazar²

¹Department of Chemistry Education, Universitas Samudra, Indonesia

²Department of Chemistry Education, Universitas Syiah Kuala, Indonesia

Abstract: The goal of this study is to develop e-learning media based on Moodle for atomic structure material, as well as to determine the feasibility of the media and the teacher's response to it. With the ADDIE method derived from Dick and Carrey, this study is included in Research and Development (R&D). Media experts, materials experts, and chemistry teachers are among the study's subjects. Expert validation questionnaires and teacher response questionnaires. The study's findings were that e-learning media based on moodle on atomic structure material had a media feasibility score of 92.8 percent with very feasible criteria and a material feasibility score of 91.7 percent with very feasible criteria. The responses chemistry teachers from Langsa Senior High School yielded an average of 87 percent with very interesting criteria. On the basis of these findings, it can be stated that the Moodle-based e-learning media designed for the atomic structure material is suitable for use in the learning process.

Keywords: e-learning, learning media, moodle, development, atomic structure

Abstrak: Penelitian ini bertujuan untuk mengembangkan media pembelajaran e-learning berbasis moodle pada materi struktur atom dan mengetahui kelayakan media serta mengetahui respon guru terhadap media pembelajaran yang dihasilkan. Penelitian ini termasuk dalam penelitian dan pengembangan atau Research and Developmen (R&D) dengan metode ADDIE yang diadaptasi dari Dick and Carrey. Subjek penelitian adalah ahli media, ahli materi dan guru kimia. Teknik pengumpulan data yang digunakan adalah angket validasi ahli dan angket respon guru. Hasil penelitian berupa media pembelajaran e-learning berbasis moodle pada materi struktur atom dengan penilaian kelayakan media sebesar 92,8% dengan kriteria sangat layak dan penilaian kelayakan materi sebesar 91,7% dengan kriteria sangat layak. Hasil respon guru kimia di SMA Negeri Langsa menunjukkan presentase rata-rata 87% dengan kriteria sangat menarik. Berdasarkan hasil tersebut, dapat disimpulkan bahwa media pembelajaran e-learning berbasis moodle pada materi struktur atom yang dikembangkan layak digunakan dalam proses pembelajaran.

Kata kunci : e-learning, media pembelajaran, moodle, pengembangan, struktur atom.

▪ INTRODUCTION

During the epidemic that is currently affecting Indonesia, the development of information technology is accelerating. In order to continue to be able to carry out diverse activities, all people must employ information technology, especially in the case of the Covid-19 pandemic (Hidayatullah, *et all.*, 2020). Face-to-face study must be temporarily delayed and replaced by distance learning due to the pandemic's influence on education. Online learning is defined as the use of the internet network and information technology to conduct teaching and learning activities without having to meet in person, allowing the learning process to continue without requiring students to attend school (Firmansyah & Kardina, 2020).

Teachers, as the most essential component in formal education, must be encouraged to adapt to the implementation of learning that formerly relied on traditional face-to-face techniques and has now shifted to online learning (Setyorini, 2020). Online learning necessitates the use of technology in order to continue the teaching and learning process. Technological advancements are utilized as learning media in the teaching and learning process. The usage of learning media in the teaching and learning process considerably enhances the learning process' efficacy (Tekege, 2017). Learning media can generate new desires and interests, motivate and stimulate learning activities, and even have psychological effects on students when used in the teaching and learning process (Romadhon & Munoto, 2018).

Chemistry learning situations in the classroom really need learning media that support increasing student understanding because many chemistry materials are in the form of abstract concepts, mathematical equations and symbols so that they require media in the form of animations and graphics (Setiawan, *et al.*, 2015). Although the multimedia teaching method has been applied, it is still insufficient. The usage and method needs to be improved, and the means need further improvement and exploration. Effective application of multimedia in science teaching can change the form of information, integrating graph, text, sound and image on PC, strived optimally to be able to foster creativity and motivation in learning activities to improve the quality of education (Cope, *et al.*, 2011; Magner, 2014; Wiana, 2017; Yu, 2018).

Learning media serves as a facilitator in the implementation of learning methods in order to improve the quality of student-teacher interaction, as well as the quality of learning process activities, and hence the quality of student learning outcomes (Widyastono, 2017). Learning via the internet and computer networks, as well as acquiring teaching materials through computer electronic networks, is referred to as e-learning. E-learning can transcend the limitations of the traditional face-to-face-based teaching and learning process, which are limited by space and time, allowing students and teachers to maintain a controlled contact at any time and from anywhere (Azis, 2015). Moodle is an e-learning platform that may be used for online learning.

Moodle is a piece of software that allows you to create systems and learning processes utilizing computers (laptops) and other devices. Moodle stands for Modular Object-Oriented Dynamic Learning Environment, which refers to a dynamic learning environment based on an object-oriented model. Moodle includes a reading module, an assignment module, a chat module, a forum module, a choice module, a quiz module, and other features. The material given in Moodle can be delivered in a variety of formats, including presentation files, pictures, photos, and videos (Irianti & Wijaya, 2017).

Moodle was selected as one of the Learning Management systems (LMS) providing an excellent platform for resources and a communication tool that has several features, namely: discussion forums, files exchange, email notification, notification dashboard, progress review, in-search course, and module pages as well as optimized architecture compared to other e-learning. These systems and systems are able to increase students' learning motivation so that their learning outcomes will also be seen (Subramanian, *et al.*, 2014).

The online learning process overwhelms teachers and students. Because it has supporting facilities to explain the material, Moodle-based e-learning media can be used in the online learning process. According to the above description, the researcher wants to provide an alternative by developing a moodle-based e-learning media that can

present learning that is more interesting and accessible to students during online learning. As a result, the research was titled "Development of Moodle-Based E-learning Media on Atomic Structure Material".

▪ **METHOD**

The study was conducted at Samudra University, Faculty of Teacher Training and Education and Langsa Senior High School from January to April 2021. This research is a sort of research and development, also referred to as R&D. According to Sukmadinata (2005), development research is a process or set of procedures that may be followed in order to create a new product or improve an existing one. The ADDIE development stage (Analysis, Design, Develop, Implement, and Evaluate) was created by Dick and Carey and is employed here. However, this study was only carried out until the stage of development. The next stage will be carried out in further research.

Conducting a needs analysis is the first step in developing e-learning. This stage of analysis is carried out by giving respondents structured interview sheets and needs analysis questionnaire sheets. This stage entails many plans for the development of e-learning and the systematic implementation of the learning process. The initial product design and media assessment instruments are created during the design phase. The initial product design is completed by creating e-learning designs in general, such as selecting a website domain, hosting, and the Moodle application.

This stage resembles the form of an e-learning production process, which includes: (1) the initial e-learning creation process, which involves website domain and hosting, Moodle installation, and learning material creation. (2) Designing e-learning display and managing the e-learning page's appearance involves menu layout settings, navigation buttons, text selection, and theme selection for the appropriate e-learning background. (3) Uploading learning materials to the website (4) Validation of learning media by media and material experts, (5) Revision of the product based on the validation results. (6) The teacher's response to the produced learning media.

Data from the validation results of e-learning media based on Moodle on the atomic structure material were analyzed descriptively using percentages with assessment criteria (1) less feasible (21-40%), (2) quite feasible (41-60%), (3) feasible (61-80%), and (4) very feasible (81-100%) are the criteria for the learning media assessment scale (Irianti & Wijaya, 2017). A questionnaire given to five teachers at Langsa Public High School was used to conduct data analysis techniques on teacher responses. The purpose of the teacher's response was to determine the attractiveness of the e-learning media that had been created.

▪ **RESULT AND DISCUSSION**

E-learning media on atomic structure material that may be utilized as learning media and independent learning resources for class X students are the results of development study. Collecting information on students' abilities, skills, and learning obstacles is the first step in conducting a needs analysis (Sukiman, 2012). The analysis was done in two ways: using needs analysis questionnaires and conducting structured interviews. According to the findings of the interviews, online learning is ineffective, and teachers need learning media that can be employed in online learning on atomic structure material. The results of a needs analysis conducted by five chemistry teachers at Langsa Senior High School yielded an average of 85% with criteria strongly agree in the development of e-learning media, based on the criteria of strongly agreeing.

Teachers' creative learning, according to Arifin and Setiawan (2012), can motivate students to improve their learning outcomes. The utilization of new learning media, strategies, and insights to ensure that students are not bored while learning.

The design stage of this development research entails creating the initial design of e-learning media as well as developing feasibility instruments. Infinityfree offers domain registration and hosting through <http://infinityfree.net>. Version 3.6.10 of Moodle was chosen. "The result of the design stage is a blue print in the form of an Outline of the Training Program," according to Pribadi (2014). The researcher notices that the blue print is similar to the design framework for the learning media that will be generated in this case. According to Hassan et al. (2012), instructional design must be followed while creating learning media for distance learning, and technology must be used to provide better and more effective learning. Figure 1 depicts the design of e-learning media.

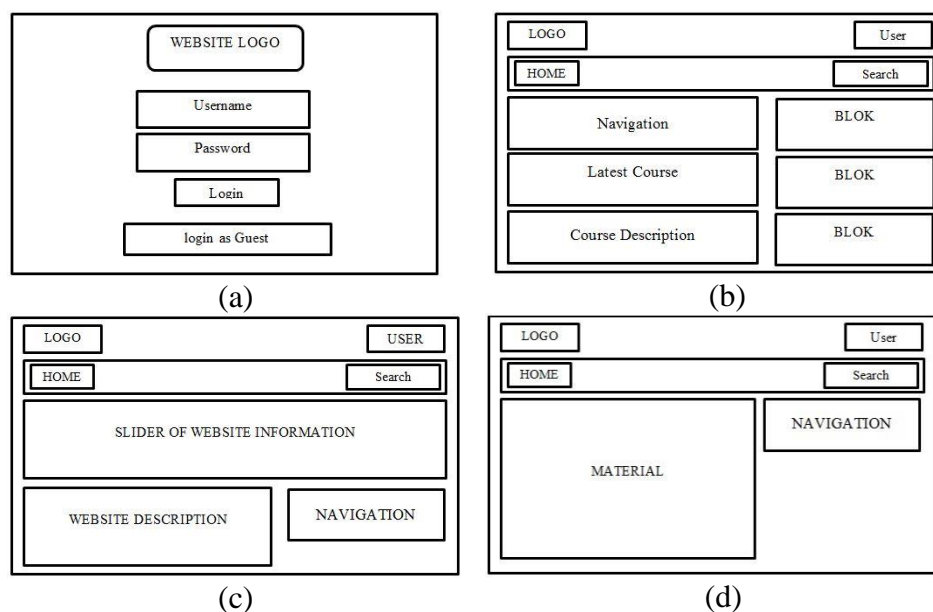


Figure 1. E-learning Media Design, (a) Sign-In Display, (b) Dashboard Display, (c) Main Page Display, (d) Material Display

The stage of learning media design and translating it to the actual display is known as media development (Prasetya and Kusdinar, 2016). The initial creation of e-learning and the uploading of learning materials into e-learning are both part of the media development stage. Using Moodle, the created media design is turned into an e-learning-based learning media. The infinityfree website domain is used as the base for creating e-learning media. <http://learningkimiakturatom.epizy.com> is the domain used to access e-learning media on atomic structure material. This domain is used as a link to e-learning materials. The development of e-learning media is carried out in accordance with the designs created during the design stage. The development process entails replacing the conventional Moodle display with a more appealing and comfortable learning media presentation for use as a virtual class. Figure 2 shows a display of the learning media that has been created.

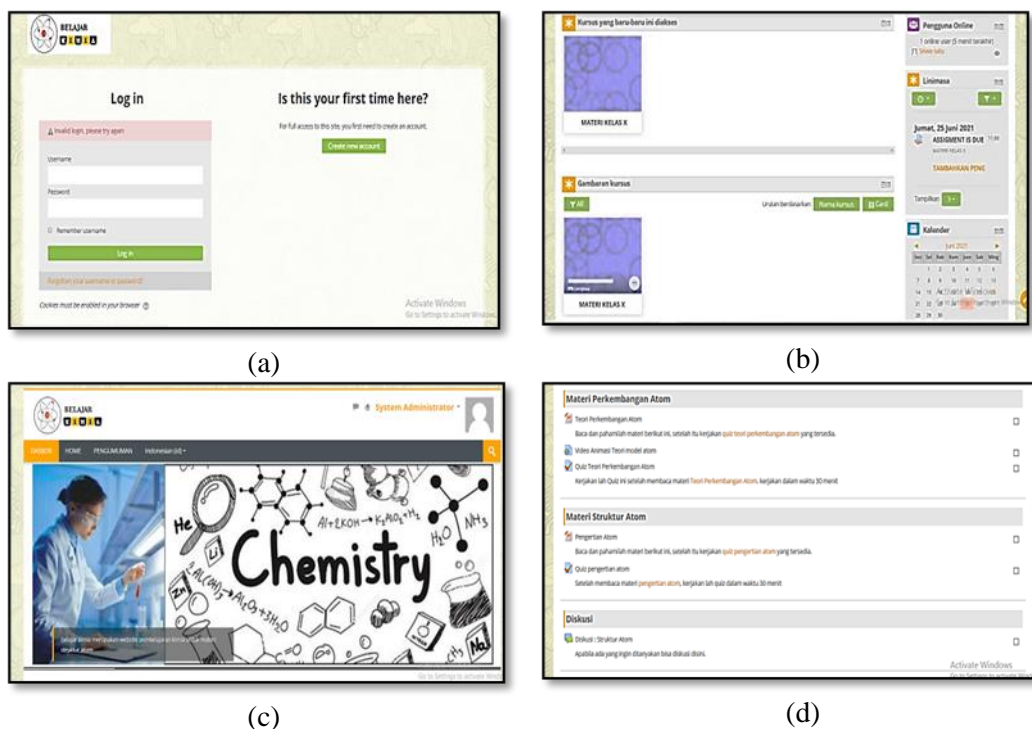


Figure 2. Display of E-learning Media, (a) Sign In Display, (b) Dashboard Display, (c) Main Page Display, (d) Content Display

Teaching materials in the form of atomic structure materials are available in the e-learning media. Learning materials are created in accordance with the indicators. PowerPoint files are used to create learning materials. The material is separated into two sections: understanding of atoms and theory of atomic development, each of which is accompanied by a brief video explanation of the learning material as well as a link to an explanation of the atomic model's development. Learning materials are available in the form of YouTube videos. Quizzes, assignments, and glossaries are created after the learning materials are produced. There are 20 questions on the quiz, and five essay questions on the assignment.

Feasibility of e-learning media

Expert validation data are used to determine the feasibility of e-learning media. Product validation is a technique for gathering feedback on how to improve materials or media (Putra, et al., 2015). The feasibility results of media and materials experts can be seen in Figure 3.

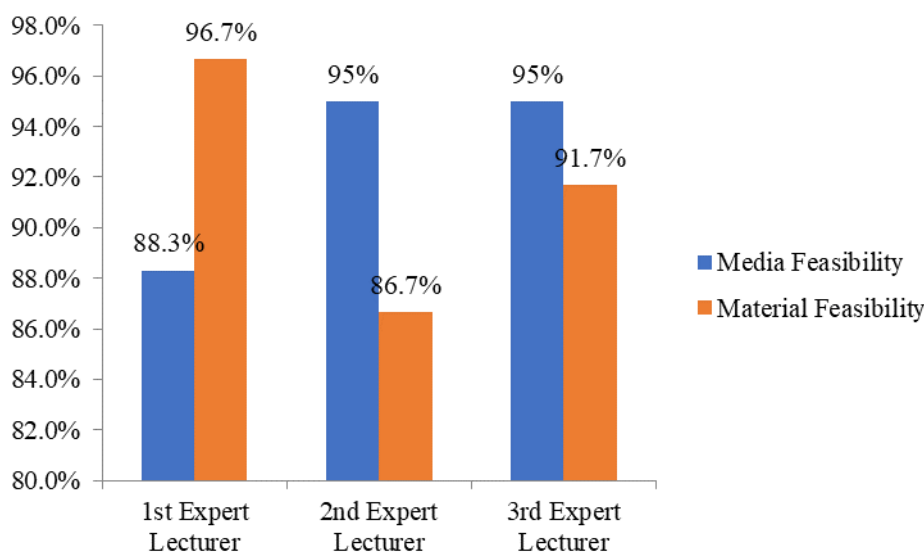


Figure 3. Feasibility of media and material experts

Validator 1 scored 88.3 percent with the criteria of "very feasible," validator 2 scored 95 percent with the criteria of "very feasible," and validator 3 scored 95 percent with the criteria of "very feasible," as shown in Figure 3. The average percentage of the media expert's assessment of e-learning media was 92.8 percent, with the criteria of "very feasible." Validator 1 scored 96.7 percent with the criteria of "very feasible," validator 2 scored 86.7 percent with the criteria of "very feasible," and validator 3 scored 91.7 percent with the criteria of "very feasible." Overall, the material expert's assessment of e-learning media received a 91.7 percent average score on the "very feasible" category. E-learning can be utilized as a learning media based on the results of the assessment and improvement.

This finding was match with reseach done by Tee, *et all.*, (2013); Cheng & Chan (2019); Zakaria (2013) proposed their study that students showed their satisfaction according to moodle used as online learning media for learning. Based on a study of the results of research conducted and in line with the study of relevant research results, it can be concluded that the use of E-learning can improve learning experience, motivation, efficiency and student learning achievement (Popovici and Mironov, 2015). This result can be reference by others chemistry lecturer who want to develop online learning media for general chemistry subject.

Teacher Response

The result of the data recapitulation of response questionnaire distributed to five representative teachers from state high school in Langsa City with the first teacher giving 92.5 percent in the "very interesting" category, the second teacher giving 92.5 percent in the "very interesting" category, the third teacher giving 80 percent in the "very interesting" category, the fourth teacher giving 92.5 percent in the "very interesting" category, and the fifth teacher giving 77.5 percent in the "interesting" category. Figure 3 shows the assessment of the chemistry teacher's response from the material and presentation aspects of e-learning.

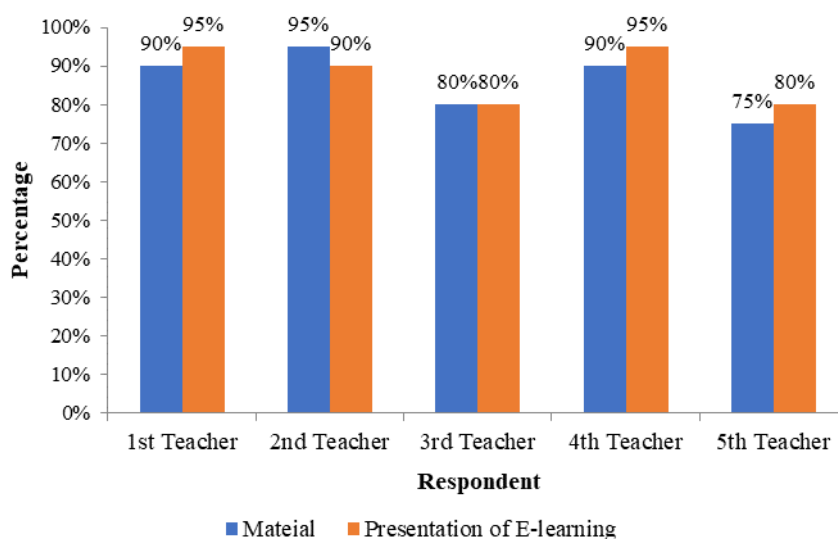


Figure 4. Results of Teacher Response

The material aspects and presentation of e-learning aspect received an average score of above 80% from five teachers, indicating that e-learning media is eligible for use in the learning process. The findings of the assessment of teacher responses to e-learning media yielded an average of 87 percent with the criteria "very interesting". This finding was match with reseach done by (Febaliza and Oktariani, 2020) based on the results of online learning media by using moodle for general chemistry subject can be used as learning media to give students experience in online learning. The results of their study proposed that online learning media by using moodle in a school can improve students' learning outcomes, increse students' confidence and attitude, facilitate students' collaboration and discussion between other students as well as teachers without limited time and space (Afdal, 2012). Based on the results of teacher responses that we have analyzed, it can be concluded that the application of teaching materials through Moodle in chemistry learning allows teachers to overcome difficulties faced by students in the learning process and evaluate student learning outcomes.

▪ CONCLUSION

The study concludes that that e-learning media in atomic structure material is needed, based on a needs analysis with an analytical questionnaire result of 85% with the criteria of "strongly agree" and structured interviews. Based on the assessment of media experts worth 92.8 percent and material experts worth 91.7 percent with very feasible criteria, Moodle-based e-learning media is eligible for use in learning. Five chemistry teachers gave an 87 percent positive reaction to Moodle-based e-learning media on atomic structure material, based on very interesting criteria. So that, online learning media by using moodle for general chemistry subject can be used as learning media to give students experience in online learning. Others researcher can be developed similar media towards others subject.

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