Development of E-Learning Based Learning Media Assisted by Chamilo in Learning Physics to Improve Learning Outcomes of High School Students

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Abstract: The purpose of this research is to develop an E-learning-based learning media assisted by chamilo that can be used in teaching 12th grade high school students in odd semesters, especially in physics subjects, with the aim of delivering material and assignments in a structured manner. This research was conducted using the Research and Development (R&D) method and the Dick and Carey model. This journal discusses the results of the validation stage of the developed media. Data validation results were obtained from assessments by material physics experts, media experts, and learning experts. The validation results show positive results in these three aspects. The material aspect shows that the content presented is relevant and in accordance with the learning objectives. The media aspect shows the design and use of attractive and interactive media. Meanwhile, the learning aspect shows an efficient and interesting learning experience for students. The e-Learning product that has been developed can be a viable tool for educators in delivering material more efficiently and helping students achieve a better understanding in physics subjects. With good validation results, e-learning using Chamilo can be used as an effective and efficient learning medium to support the teaching and learning process, provide flexibility for students in accessing material, increase interaction with content, and increase efficiency in achieving learning goals.

Keywords: Chamilo; E-learning; Learning media; Static electricity

Introduction

In the era of advances in information and communication technology, digital transformation has penetrated various aspects of human life, including in the world of education (Nagel, 2020; García-Peñalvo, 2021). Education is no longer just teaching texts or memorizing manuscripts, but has transformed into a learning process that involves measurable goals and results, both inside and outside the classroom (Fathurohman, 2021). In the digital era, students in Indonesia face the problem of carrying heavy loads of books which can interfere with their growth and health (Fathurohman et al., 2022). The importance of using technology in education is increasingly being felt along with the demand to prepare young people to face the challenges of this global era. Technological advances have changed students' perspectives and learning patterns (Theobald et al., 2020; Syed et al., 2021). They grow and develop in the era of digital technology and have become an inseparable part of everyday life. Therefore, traditional approaches to learning are often less effective in attracting students' attention and interest. An educator needs to make innovative and creative learning plans by utilizing technology in the learning process.

One of the innovations that have changed the learning landscape is the use of e-Learning (Dwedar, 2023). E-Learning is a form of learning that utilizes digital technology and the internet to provide accessibility and flexibility for students (Lengyel & Naumovska, 2020). This phenomenon is increasingly

relevant given the need to strengthen the educational process in facing the challenges of the 21st century (Santally, 2019). E-Learning has emerged as an innovative solution to improve the quality and accessibility of learning. E-learning provides many advantages and conveniences for educators and students. E-Learning is a learning method that combines information and communication technology, especially the internet, in presenting learning materials (Oliván Blázquez et al., 2019; Moreno-Guerrero et al., 2020). With e-Learning, students can learn independently and flexibly, access material from various electronic devices, and participate in the learning process interactively (Virca et al., 17; Ammah, 2017; Temitope, 2015). The potential of e-Learning in increasing learning efficiency has attracted the attention of many educational institutions around the world.

One of the challenges in the world of education is how to present subject matter which is often abstract and complex in an interesting way and can be understood by students. Physics, as an essential natural science subject, is often considered a challenging subject to study (Widyaningsih et al., 2020). A teacher must act as an educator who is able to choose the best learning techniques for students as instructors, taking into account the circumstances of students, learning materials, and available learning resources, so that learning techniques can be used effectively to improve students' academic progress (Fathurohman et al., 2022; Fathurohman et al., 2023). Physics concepts that require deep understanding often make students feel difficult and less interested in studying this subject.

Chamilo is one form of using e-Learning technology as a medium for learning physics at the 12th grade senior high school level in odd semesters. The use of Chamilo as an e-Learning platform provides various benefits that can enrich students' learning experiences (Virca et al., 2017). Interactive features such as learning videos, comprehension tests, and discussion forums can strengthen understanding of physics concepts and increase students' active involvement in the learning process (Richtberg & Girwidz, 2019). In addition, the use of e-Learning also provides flexibility in access and learning time (Katili et al., 2018). Students can access learning materials online, repeat material that is difficult to understand, and learn according to their individual speed and level of understanding (Ammah, 2017). This not only allows for more personalized learning, but also increases students' learning motivation because they can feel more involved and play an active role in the teaching-learning process (Nguyen & Linh, 2021).

Even though technology has become an important part of everyday life, in many schools the use of technology in learning is still limited and uneven. Some educators or schools may be reluctant to adopt new technology for fear of changes and challenges that may arise in implementing it (Puspitasari et al., 2022). Chamilo as an e-Learning platform offers a solution that is more accessible and easy to use. With an intuitive interface and support for a wide variety of devices, Chamilo can help overcome the technological challenges that schools with limited resources may face (Barboza & Paredes, 2020). In addition, the ease of managing and presenting learning materials at Chamilo can increase efficiency and learning (Febryana & Pujiastuti, 2020; Helsa et al., 2022; Ouariach et al., 2023).

The use of e-Learning at SMA Negeri 1 Namang, even though it has been implemented, has not yet reached the expected maximum level. Learning that is done with conventional platforms sometimes seems monotonous, causing students' interest and enthusiasm for the learning process to decrease. The obstacles faced include the level of difficulty for educators and students in understanding and optimizing the use of this technology. Therefore, a solution is needed that can overcome this challenge and improve learning outcomes at SMA Negeri 1 Namang.

By paying attention to the positive benefits of e-Learning in improving physics learning in high school, it is important to further explore the development of e-learning based learning media assisted by Chamilo as a necessary effort. This research will focus on the development and testing of learning media based on E-learning assisted by chamilo at SMA Negeri 1 Namang. The main objective of this research is to produce e-learning-based learning media assisted by chamilo which can be declared feasible as e-learning based learning media assisted by Chamilo in physics learning to improve student learning outcomes in class 12 odd semester SMA Negeri 1 Namang.

Method

The research method applied is the Dick and Carey research and development model, which consists of ten development steps (Dick et al., 2009). The stages used in this study include the ten stages of the Dick & Carey model, but only up to stage nine, namely the revision stage. The tenth stage, namely Design and Conducting a Summative Evaluation, was not carried out in this study. This study focuses on the feasibility test of the validity of learning media products based on chamilo-assisted E-learning.

Validation data was obtained through a validation test sheet which contained 41 questions from three aspects, namely e-learning design, feasibility of e-learning media content, and language. A modified Likert scale from Riduwan (2012) was used to score

answers, where a score of 4 was used for the Strongly Agree (SS) category, a score of 3 for Agree (S), a score of 2 for Disagree (TS), and a score of 1 for Strongly Disagree (STS). Then, calculations are carried out to get the highest score and the score given by each validator.

Furthermore, the validation value is determined by comparing the score obtained with the highest score. The validity assessment was carried out using modified criteria according to Alwan (2017) which provides several categories on the rating scale used. There are four categories to measure the level of validity of a data. If the score obtained is in the range of 90-100%, then the data can be categorized as "Very valid". If the score is in the range of 80-89%, then the data is categorized as "Valid". The score range of 60-79% falls into the "Quite valid" category, while scores below 59% fall into the "Invalid" category. By using this scale, the level of validity of a data can be analyzed and assessed based on the range of scores obtained.

The results of this data analysis will be the basis for evaluating the feasibility of the validity of Chamilo-assisted E-learning-based learning media which was developed in support of the learning process for SMA N 1 Namang students in Physics subjects, especially in Static Electricity material. This research provides a strong methodological foundation for the development and use of technology in supporting the learning process in today's digital era.

Results and Discussion

Based on the results of designing E-learning based learning media products with the help of Chamilo that have been made by researchers, several parts of e-learning have been successfully designed properly. First, in the e-learning "Home" section, there is a home page that includes navigator features for logging in, signing up, accessing profiles, and viewing a list of courses that have been taken. Before registering, users are required to fill in some of the required data. After successfully registering, the main page will display information about the number of users who have registered in the e-learning system. Managers also have the ability to register users into available classes, so users can access the My Course List Page. This section provides easy initial access for users and managers in managing users and providing access to learning materials. The design and functionality of the Home section has been well thought out, ensuring easy user access to learning materials. On the homepage, there is also a navigator feature to log in, sign up, profile, and list my courses. Users can register by filling in some of the required data, and after being registered, users will be able to access the list of my courses page which is presented in Figure 1.

Figure 1. The form of the homepage after logging in

Second, the "My Courses" section, after logging in and signing up, users can access the list of my courses page which displays a list of available courses on e-learning using Chamilo shown in Figure 2.

Figure 2. View of my course list

Users can directly access Static Electricity Class XII High School Physics courses and start the learning process. This view is good enough and helps users in selecting the course they want to access. The "My Courses" section displays a list of available courses in e-learning using Chamilo. Users can directly access certain courses, such as Static Electricity Class XII High School Physics Course. In this section, users find it easy to view and access the selected courses.

Figure 3. Appearance part page class "Electricity Static"

Third, the "Static Electricity Page" section, users can find course descriptions, lists of dynamic electricity material, learning videos, paths, evaluation tests, assignments, links, documents, and learning progress as shown in Figure 3.

Figure 4. Display of the "eye description" section static electricity course

Figure 5. Display of the "static electricity concept map" section

The appearance of the Static Electricity class page is very informative and provides a variety of relevant learning resources, so that it can improve the quality of learning (Samsinar, 2020). The "Static Electricity" page offers course descriptions and various learning materials presented in Figures 4 and 5. This section provides quite complete and varied information in presenting learning materials to users. The following shows the course description.

Fourth, the "Document/Learning Material Page" display provides various static electricity materials according to the 2013 curriculum and syllabus for class XII high school semester I. The material is presented in Word, PDF, and presentation (PPT) formats. Users can download this material for offline study, thereby providing the flexibility to study without having to be connected to the internet all the time on the "Documents/Learning Materials" page shown in Figure 6. The existence of materials in various formats makes it easier for users to study flexibly and independently according to their preferences.

Figure 6. Display of the "material" section

Fifth, the "Test" or evaluation page gives users a competency test that must be completed within a certain time. The duration of the exam is adjusted for each material chapter, and the validation instrument used refers to previous research on the development of Chamilo e-learning. The data from the validation questionnaire filled out by experts is used to evaluate the effectiveness and suitability of the exam in the context of e-learning. The display of the evaluation page is presented in Figure 7.
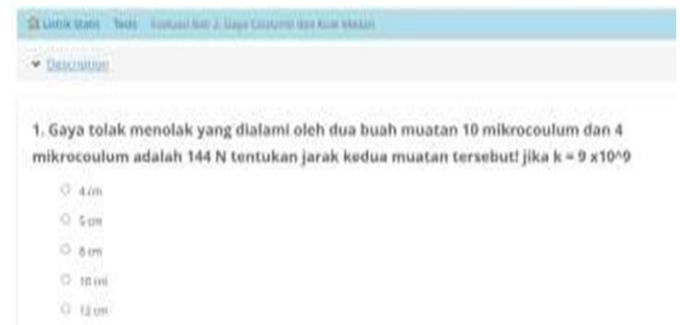

Figure 7. Display of the "static electricity multiple choice" evaluation section"

Overall, the results of the design of the e-learning display using Chamilo show several parts that have been well designed. However, it should be noted that minor improvements in areas such as data entry for registration, interface navigation improvements, and evaluation instrument adjustments can improve the overall user experience. These results provide guidance for further development so that this e-learning learning media can provide maximum benefits in the learning process.

Detailed data from this study can be used to analyze the validity of e-learning devices that use chamilo-assisted e-learning-based learning media. that has been developed. The data comes from the results of validation tests conducted by experts in the field of material physics. The validation test sheet consists of 16 questions which are divided into three aspects, namely the completeness of the presentation (6 statements), the

basic concept of the material (6 statements), and the suitability of the presentation of the material with the learning objectives (4 statements).
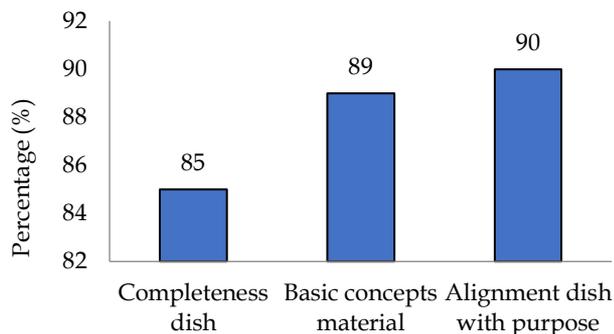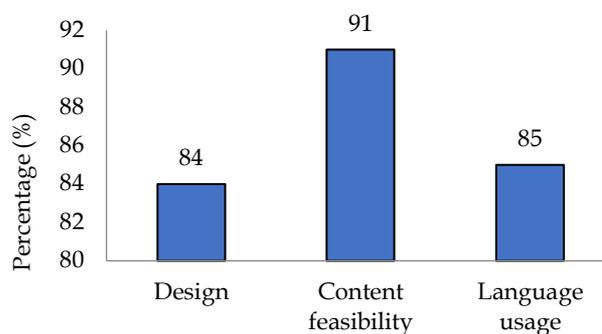

Figure 8. Diagram of the results of the validation test results by material physics experts

Figure 8 shows the results of the validation test for E-learning based learning media products assisted by chamilo by physics material experts. Based on the data, the completeness aspect of the presentation reaches 85% in the "Good" category. This indicates that the material presented in e-learning is quite complete, but there is still room for improving the content of the material to make it more comprehensive. This result is in line with Nazhifah et al. (2023) which emphasizes the importance of providing complete and well-structured material in order to achieve learning objectives.

Furthermore, the basic concept aspect of the material reaches 89% in the "Very Good" category. This shows that the material compiled in e-learning has been well designed and easily understood by students. The aspect of suitability of the presentation of the material with the learning objectives reaches 90% and is categorized as "Very Good". These results confirm that e-learning has succeeded in presenting learning materials that are relevant and in accordance with the learning objectives that have been set. This is in accordance with learning design theory which emphasizes the importance of aligning learning objectives with the content of the material presented (Mangengke & Dwiningsih, 2020).

Overall, the average percentage of achievement from these three aspects reaches 88%, which is also categorized as "Very Good". These results provide an indication that the developed e-learning product meets high eligibility standards to be used as an effective and efficient learning medium.

In the validation test by media experts, the following data has been obtained. There are 41 questions on the validation test sheet which consist of three aspects, namely e-learning design with 22 statements, the feasibility of e-learning media content with 14 statements, and language with 5 statements.

Figure 9. Diagram of the results of the validation results test by media experts

Figure 9 shows the results of the validation test of E-learning based learning media assisted by chamilo by media experts. The design aspect of e-learning reaches 84% in the category of e-learning based learning media assisted by Chamilo meet proper standards. These results are in line with learning design theory which emphasizes the importance of an attractive appearance and layout in learning media to increase student interest and motivation in learning (Sary & Isnawati, 2023).

Aspects of the feasibility of learning media content based on E-learning assisted by Chamilo reached 91% and was categorized as "Very Good". These results indicate that the content used in Chamilo-assisted E-learning based learning media is very relevant, interesting, and supports learning. This is in accordance with the learning design theory which emphasizes the importance of presenting interesting and relevant content in learning media to increase student engagement and understanding (Geni et al., 2020).

The use of language in e-learning also gets good results with a percentage of 85%. The use of good and easy-to-understand language in e-learning is important to help students understand the material better (Gunawan et al., 2021). Overall, the average percentage of achievement from these three aspects reached 86.67%, which was also categorized as "Very Good". These results confirm that learning media based on E-learning is assisted by chamilo has successfully met the eligibility criteria in terms of design, content, and language, making it suitable to be used as an effective and interesting learning medium.

The data obtained from the validation test of E-learning based learning media assisted by chamilo by learning experts includes the following information. There are 16 questions in the validation test sheet which are divided into three aspects, namely presentation of learning material (6 statements), learning activities (6 statements), and learning assessment (4 statements).

Figure 10 shows the results of the validation test of E-learning based learning media assisted by chamilo by learning experts. The aspect of e-learning design reaches

85% in the "Good" category. This indicates that the e-learning design meets the standards required to deliver learning material. These results are in line with learning design theory which emphasizes the importance of designing effective and efficient learning experiences (Suda, 2016).
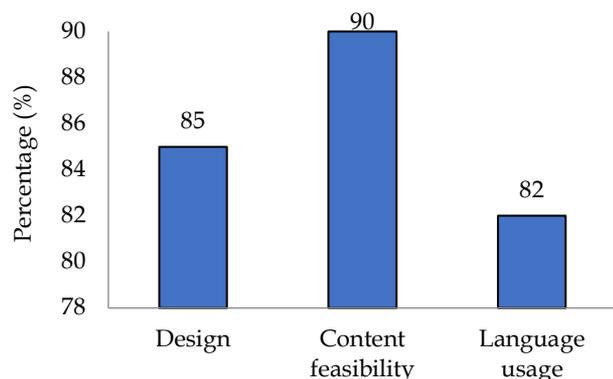
Figure 10. Diagram of the results of the validation results test by learning experts

Overall, the validation results by learning experts show that e-learning has a "good" rating. The suggestion given is to add more courses in the list displayed on the e-learning platform. With an average percentage of 85.33% for all aspects evaluated, it can be concluded that the development of e-learning is effective in conveying structured material and assignments to students. Overall, the percentage achievement of these three aspects reached 85.33%, with the "Good" category.

Conclusion

The validation results of Chamilo-assisted E-learning-based learning media showed positive results in three aspects of assessment, namely material, media, and learning with an average percentage of 88%, 86.67%, and 85.33% respectively. A good level of achievement in the material aspect indicates that the content presented in e-learning is well structured, relevant to the curriculum, and able to accommodate learning needs. Furthermore, the media aspect has also achieved satisfactory results, indicating that the design and use of media in e-learning is quite interesting, interactive, and supports an effective learning process. Meanwhile, in the learning aspect, e-learning has succeeded in applying the right strategy to create an efficient and interesting learning experience for students. This shows that learning media based on E-learning assisted by chamilo can be a suitable learning medium to support the teaching and learning process. With quality e-learning, students can access learning materials flexibly, increase interaction with content, and increase efficiency in achieving learning goals.

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