



Feasibility test for sistem pembelajaran terpadu (SiPanTer) based on moodle

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Abstract

Sistem pembelajaran terpadu (SiPanTer) or moodle-based learning system development aims to determine the feasibility of e-learning being developed. The feasibility of e-learning is based on expert validation results, namely information and communication engineering experts. The research and development model used is the Borg and Gall model adapted by Sugyono. The research and development stage consists of 10 steps, namely 1) analysis of potential and problems; 2) data collection; 3) product design; 4) design validation; 5) design revision; 6) product trials; 7) product revision; 8) trial use; 9) product revision; and 10) products. The data collection technique was carried out using expert validation sheets and teacher and lecturer response questionnaires with descriptive quantitative analysis techniques. The analysis of validator assessments and the reactions of teachers and lecturers in limited trials and extensive trials state that the e-learning developed is in the category of suitable for general use, both on campus and at school, especially in Merauke Regency.

Keywords: e-learning, moodle, SiPanTer

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INTRODUCTION

The world of technology continues to experience developments from time to time which has tremendous impacts on all aspects of human life. Currently, technological developments have entered a new era better known as Industrial Revolution 4.0 (I 4.0). Around 2010, intelligence engineering and the internet have created a link between humans and machines (Prasetyo & Trisyanti, 2018). The term "Industrial Revolution 4.0" was first used at the Hannover Exhibition in 2011, and the topic continues to develop every year, not only at the exhibition (Siahaan, 2012). Also, the I4.0

era is also known as the disruption era, which is an innovation that causes a shift in the old work system into a new work system, which can have an impact on the number of jobs lost due to turning into automation (Kasali, 2018).

One of the I4.0 frameworks is the internet of things (IoT), or the internet for everything, which means that something can happen through an internet connection. In contrast, humans are only in charge of supervising the work of the application/tool. IoT is a system that combines physical components and digital components with various work functions that build new products in the form of innovative technology (Ungurean et al., 2014; Wortmann

& Flüchter, 2015)

I4.0 has principles generally described as facilitating their application to machines. These principles can be derived based on an overview of specific fields, for example, on the world of education. These principles cover four main directions, namely: 1) interoperability (suitability); 2) transparency of information; 3) technical assistance; and 4) independent decisions (Frydenberg & Andone, 2011). The internet of things (IoT) and the internet of people (IoP) are an absolute requirement and the main component that differentiates this era from the previous generation.

The application of I4.0 principles, especially in the world of education, will experience many challenges, especially human resources (HR). This requires education providers, especially teachers, as the spearhead of education to continue to improve their abilities, especially the ability of information and communication technology (ICT). The power of ICT is one of the new literacy abilities, which is also an absolute requirement for teachers to face education in this era. This means that in addition to old literacy (reading, writing, counting), teachers also need to improve new literacy, namely digital literacy, technological literacy, and human literacy (Suwardana, 2017).

IoT, as the central part of I4.0, has a considerable impact on the world of education, which has given birth to various computer-based learning models and systems such as e-learning (electronic learning), Computer Assisted Instruction (CAI), Computer-Based Instruction (CBI), and e-teaching (electronic teaching) (Khotimah et al., 2019). Currently, the educational process can take place anytime and anywhere without being limited by time and space. A teacher can carry out the teaching and learning process (PBM) with students without meeting. They can do this via video conferencing, for example, without being limited by distance and time. So, teachers and students can do PBM virtually like a meeting in class.

Papua is one of the provinces in the frontier, outermost, and underdeveloped (3T) regions. This makes the various educational facilities and infrastructure very limited, includ-

ing laboratories. Laboratories are needed in multiple subjects, especially natural sciences. However, the existence of the internet allows students to learn through virtual laboratories. This is just one of the many benefits of IoT in learning, especially learning physics.

Limited facilities and infrastructure in Papua Province, especially in Merauke Regency, are not an excuse to continue to be left behind in the education sector. The results of research on ICT literacy skills show that physics teachers in Merauke Regency have excellent abilities (Bahri et al., 2020). Thus, based on the conditions stated above to provide internet-based education, the human resource capacity has been met. Meanwhile, the central government continues to enjoy the internet in all corners of Indonesia, especially Papua, through the sub-district internet service center (PLIK).

Therefore, even though Merauke is categorized as one of the 3T areas, it is not an obstacle to providing education that utilizes IoT. The availability of human resources and the internet in Merauke is the main asset to make this happen. In addition to educators, the survey shows that internet access can improve student integrity in learning activities (Suana et al., 2017). However, so far, no school has implemented online learning or e-learning. As one of the Educational Personnel Distribution Institutions (LPTK) in South Papua, Museums University does not yet have this system. Therefore, we need a learning system that utilizes the internet to stimulate e-learning institutionally, both at schools and universities, especially in Papua's southern region. E-learning is a learning system that combines several learning systems, namely traditional learning, distance learning, and various learning models (blended learning), to improve teaching processes and services (Darmawan, 2014). This system's existence will provide knowledge and a place to practice, especially for lecturers and prospective teachers to face the world of education in the I4.0 era.

Several previous studies have become the basis for the development of e-learning. The first research was a study that developed a moodle-based physics learning device for students of the Mataram Teachers' Training Col-

lege Physics. This study focuses on learning tools in textbooks and assessment instruments and is equipped with moodle guides (Herayanti et al., 2017). Similar research was also conducted by Sunarno et al. (2019) regarding the development of e-learning based learning media at SMK Ethika Pontianak. This activity's primary focus is the development of e-learning which contains various subjects accompanied by teaching materials (word, PowerPoint, PDF), video conferences, and a collection of evaluations in the form of quizzes (Suharni et al., 2019). Apart from these two studies, Apriani and Broto (2017) developed an android application in the form of a moodle-based physics workbook for high school students. This research's primary focus is to produce physics workbooks that can support mobile learning (Apriani & Broto, 2017).

From the three studies above, it can be concluded that moodle-based media development only focuses on one target subject, namely a particular school or department on campus. Also, learning tools that are integrated into e-learning media are not carried out in an integrated manner. Therefore, the e-learning that researchers will develop is e-learning that teachers can access at schools and lecturers on campus in the Merauke Regency area.

METHOD

This research is a type of research and development (R&D). The resulting product is a web-based integrated learning system design. The type of development model used is the Borg and Gall development model that has been adopted by Sugyono. The product development procedure can be seen in Figure 1 (Sugiyono, 2015).

This study's subjects were 24 physics/science teachers at 24 SMA/MA/SMK and equivalent in the city of Merauke and eight lecturers at the Universitas Musamus (Unmus), physics education department. This subject is divided into two main parts: the limited trial and broad trial groups. The little trial group consisted of 4 teachers from 4 schools and two lecturers from the Unmus, physics education department, while the broad trial



Figure 1. Product development procedure

group consisted of 20 teachers and six lecturers.

The data collection instruments used were the media expert validation sheet (ICT) and the teacher and lecturer response questionnaire sheets. An expert validation sheet is a validation sheet used by ICT experts in assessing the feasibility of a product, in this case, a learning website or e-learning. Meanwhile, the teacher and lecturer response questionnaire sheets contain various positive and negative statements regarding the developed products.

The data analysis steps were carried out as follows. Give a score using a rating scale (Likert scale) to find out the responses of respondents/validators; Processing the score by calculating the percentage of total score per item with the formula:

$$P = \frac{\sum x}{\sum x_i} \times 100\% \tag{1}$$

Information :

- P : percentage of score
- $\sum x$: total score of each item
- $\sum x_i$: total ideal score (highest score)

Calculating the percentage of total responses with the formula (Riduwan, 2011):

$$P_{total} = \frac{\sum P}{n} \tag{2}$$

Information :

- P_{total} : percentage of total responses
- $\sum P$: total percentage of the acquisition score
- n : number of items/statements

Determine the response criteria for all

items. This response is used to determine product development's feasibility, as seen from respondents' validity and responses.

The feasibility of product development can be seen in the following table (Sugiyono, 2015).

Table 1. Eligibility of e-Learning

Percentage (%)	Eligibility Criteria
0 - 20	very unworthy
21 - 40	not feasible
41 - 60	decent enough
61 - 80	Well worth it
81 - 100	very worthy

RESULTS AND DISCUSSION

The type of website used in building e-learning is a type of CMS (Content Management System), a type of website that has been developed and ready to use. Because the targeted product is the development of a learning system, an LMS (Learning Management System) is chosen, which fulfills the characteristics of good e-learning. Several learning management systems can be used, including ATutor, Moodle, Dokeos, Ganesha, Eliademy, Claroline, Sakai, and Chamilo (Kurniawati et al., 2020). But in the end, LMS Chamilo was chosen because it was much easier to manage than Moodle, even though Moodle had far more advantages than Chamilo.

The e-learning validation was carried out to determine the feasibility of this media being used. Guarantee carried out in this development activity is devoted to e-learning only. This is because the development is focused on the media only, not on the material. Validation is carried out by two validators who are experts in the field of ICT. Both are lecturers at the Department of Informatics, Musamus University, Merauke. The results of expert validation can be seen in Figure 2.

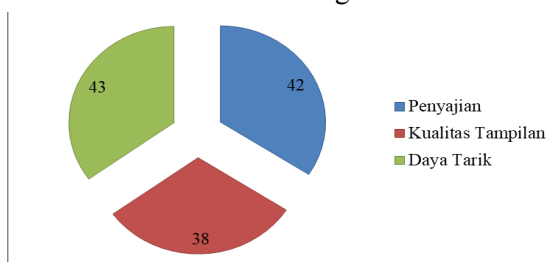


Figure 2. The results of the validator's assessment per aspect

Based on the data, the total score of the two validators is 123. Meanwhile, the ideal score of this instrument is 17 (number of items) x 4 (maximum score) x 2 (number of validators) = 136. both validators are 90.4%.

In general, the two validators commented a lot regarding this application system's management, especially in the learning evaluation section. At this stage, validator I suggest completing the training system with an attractive pre-test to motivate students before learning. Validator II suggested ending the learning material with various exciting and interactive media such as video or presentation media. The use of interactive media in learning is crucial to facilitate and arouse student motivation (JH, 2018).

This revision is carried out at this stage, especially in the display section and course menus displayed on student pages. There are two main changes made, especially those suggested by the validator. The LMS theme and logo on the dashboard should be replaced if possible and display the test and evaluation menu on the student screen.

After the revision was made, there was a change in the web dashboard, and the Chamilo logo had been replaced with an image/icon designed with the words "SiPanTer," which at the bottom was equipped with the words "Integrated learning system." Meanwhile, the creation of material in other media such as videos and presentations is made on different platforms to be linked. This is also done in making test/evaluation instruments using Google Forms.

An online learning system must be able to motivate its users, especially students. This is very important, considering learning with an online system is monotonous. The content is "that's all," which is, of course, different from face-to-face. One of the validators suggested doing a pre-test before learning began, which stimulated students to be active. The use of icebreaking videos in learning is also advised to attract the attention of students in education. Also, icebreaking can provide a refreshing atmosphere for students during learning activities (Sunarto, 2012).

Other validators see that the material

shown in each subject/course is very little. Content Creator only displays material in pdf form without any different fabric types so that later students/students who learn like reading ordinary textbooks. This is, of course, in line with validator I that each learning material must be equipped with various media.

After revisions to the corrections, suggestions, and comments of the two validators, limited testing was carried out. This lizittle trial phase was carried out on six respondents consisting of 4 teachers and two lecturers. The responses of respondents can be seen in Table 2. The reactions from 6 respondents can be seen in Figure 3.

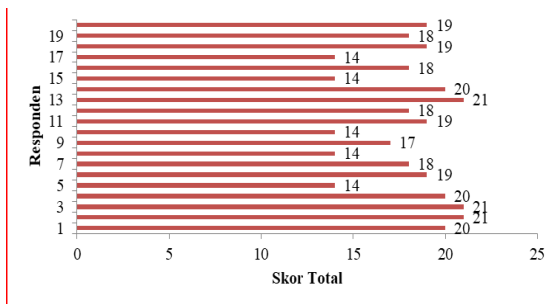


Figure 3. Respondents' responses to SiPanTer in a limited trial

The average percentage of respondents' answers is $P = 74.6\%$. Based on these results, in general, it can be seen that the integrated learning system (SiPanTer) falls into the category of feasible to use.

In this section, several revisions have been made, especially on indicators with a low evaluation of respondents. Apart from that, improvements were also made based on the suggestions given by the respondents. The things that are fixed at this stage are as follows. 1) Maximizing the features available in SiPanTer, especially in the class/subject/course menu. This is done to increase the efficiency of using the system in the management of learning, which is expected to impact student achievement. 2) Make improvements to the font, both in terms of type and size used in the learning device, especially in the material section so that it is easy to read by users at all levels, whether students, students, teachers, or lecturers;

3) Improved the layout of images and text in the application. This is done as a suggestion from some respondents who have difficulty understanding the learning material because the structure of the images and text is not quite right; 4) Maximizing the presentation of menus in the application so that it is more attractive to teachers/lecturers in teaching it to students/students. This has also been accompanied by improved web user guides to make it easier for users to access the system; 5) Provide a lot of information through various types of exciting material. This is very important to increase the effectiveness of using this system while increasing literacy for users, especially digital literacy.

At this stage, changes are also made to the LMS used. If previously using the Chamilo LMS, this revision uses the Moodle LMS. However, this is just an LMS replacement while the main menu, such as courses/courses, is still the same. The main reason for changing this LMS is that some additional features are not available on the Chamilo LMS, while Moodle can be found through the plugins menu.

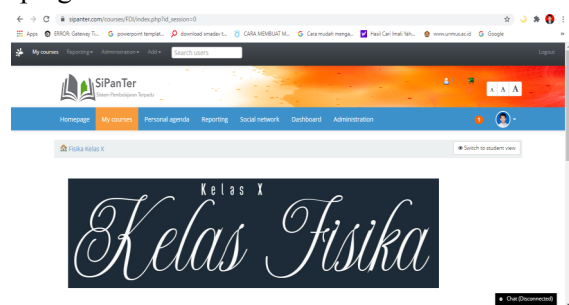


Figure 4. Display When a limited trial was carried out with the LMS Chamilo

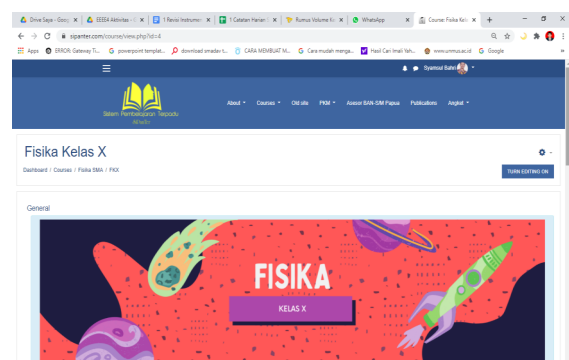


Figure 5. Display After replacing the LMS with Moodle

Teachers and lecturers' response in this limited trial is a trial using e-learning on a small scale. This trial was conducted on four teachers and two lecturers. If you look at the results of teachers' and lecturers' responses to each item of the statement, five things have a percentage in the inappropriate category. On the fifth indicator, which is about using SiPanTer features, respondents have an inadequate response. This is because they have just been introduced to this new system, so they are not very familiar with its features. The results showed that most respondents, especially teachers, rarely or even most of them never use e-learning (Bahri et al., 2020).

Also, the statement items that had an inadequate response were about the respondent's difficulty reading text or writing on the web. Text or paper on the web dramatically affects user motivation in using this e-learning. Therefore, improvements were made, especially on the type of text, the text's size, and the text background that had to be contrasted. Another factor that affects this text's legibility is the layout of the material, images, and other content. The structure of images on the web makes it difficult for users to understand the material so that it needs to be done correctly and adequately. The layout of text and pictures and a combination of both are part of assessing the feasibility of a media being developed so that this section should not be ignored (Serevina, 2018).

Meanwhile, related to the enthusiasm for teaching using SiPanTer, the respondents have low confidence in using this application. This also happened because respondents were only recently introduced to this system. Another indicator that has a low rating from respondents is SiPanTer's ability to provide information about learning physics. This joint assessment is due to the lack of knowledge in this case, including the learning materials presented in the SiPanTer due to the temporary development of various media types supported by this system. This is also by validator 2's suggestion currently being worked on in the product revision stage.

Some teachers tried to make their courses in this limited trial by adding their materials,

media, and students. However, an unexpected thing happened when the system error and the website that had been developed could no longer be accessed. Of course, this is closely related to the LMS's ability to deal with user traffic, and of course, it is closely associated with the security system. One of the factors that may be the cause is the absence of user hacking in this system. Everyone is free to register as a teacher or student. In the end, the entire system that had been built was no longer accessible, so the researchers decided to replace the LMS.

The LMS used here is the Moodle LMS. From the beginning of SiPanTer's development, Moodle has been included in the LMS list that can be used. It's just because of limited capabilities, so this LMS is not used. The main reason for using this LMS is that it has various features that can fulfill input and suggestions from validators and teachers, and lecturers at this limited trial stage.

However, keep in mind that this new system's construction is still made like the old system, including its contents. Of course, it's just that it has a difference in appearance because it has a different type of LMS. The results of the development of the new LMS were re-consulted with media experts, and several respondents then paid attention to in detail the main menus/features that previously existed.

Extensive trials were carried out by distributing questionnaires to teachers and lecturers, both printed and online questionnaires created via a google form. Extensive testing activities were carried out on 20 physics/science teachers at 24 schools and six lecturers at the Department of Physics Education at Musamus University, Merauke. The teacher and lecturer response data on this extensive trial can be seen in Figure 6.

The main focus of this second revision is the result of low respondent responses on 4 points and some suggestions and comments from respondents, both through questionnaires and during interviews with several teachers. 44% of respondents stated that they could not use important features in SiPanTer. In this section, several essential components

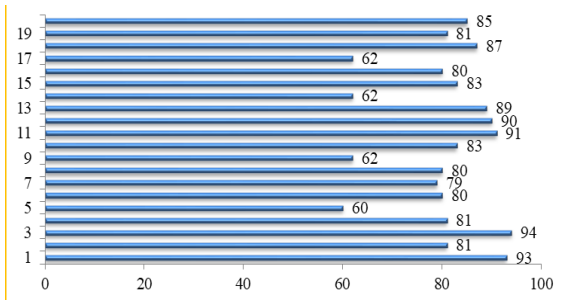


Figure 6. Respondents' responses to SiPanTer in a broad trial

are added through the plugin menu, such as adding a questionnaire and attendance features so that users don't need to use third-party applications or other applications linked to Moodle.

Another revision made is the main e-learning view. Respondents' ratings are pretty low on this point. Therefore, a revision was made by replacing the default moodle theme, namely using the "Classic" theme, which only has two main menus for settings, namely "General Settings" and "Advanced Settings." The article used to change the basic appearance of e-learning is to use the theme "Eguru". This theme has several advantages over classic tunes. In addition to the general settings menu, this theme also displays a slider containing the main features of the application or other images. The most important thing is that there is a menu to edit the e-learning header and footer so that developers can display basic information about e-learning.

Another part that was revised was introducing several essential features in e-learning to teachers through the appearance of these features on each topic/meeting. During the trial, each session only displays material. The teacher/lecturer thinks that the part/material cannot answer student/student problems, especially as a source of independent learning. Therefore, several important features are added at each meeting, such as discussion forums, attendance lists, pretests, learning videos, and other menus that can support learning. The revision of this section can be seen in Figure 7 and Figure 8.

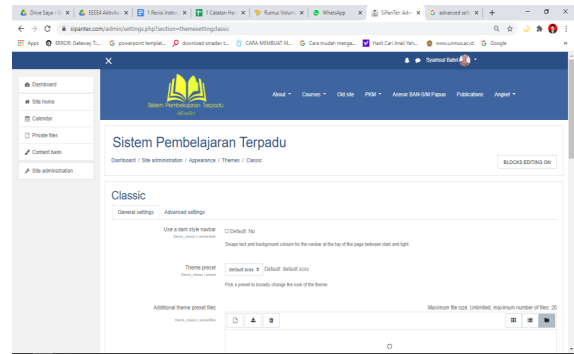


Figure 7. The appearance of the "Classic" theme menu

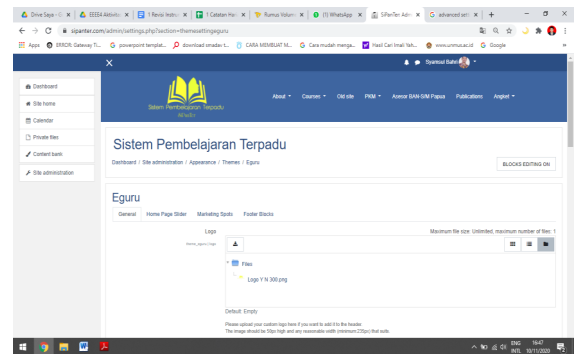


Figure 8. The appearance of the "Eguru" theme menu

There have been many revisions being made in this extensive pilot phase. However, before entering into improvements based on some suggestions/comments, it is necessary to first look at some statement items with low scores. Based on the results of lecturers and teachers' responses, it can be seen that 4 statement items have low scores. The use of SiPanTer features is still a problem for teachers and lecturers. This is the same as the problems encountered previously in the limited trial phase. This means that respondents are not used to using e-learning like this.

When this trial was carried out, respondents had already used a new LMS, namely Moodle, which at the time of limited trials used the Chamilo LMS.

Another statement item that received an inadequate response was the less attractive appearance of e-learning. The solution that can be done here is to change the moodle theme. Every LMS has a built-in piece, including moodle. Moodle itself has a built-in part. In Moodle version 3.9, there are two pre-installed themes, namely the Classic and

Boost themes. To change the appearance of e-learning, the main thing that needs to be done is to change the theme.

To change the moodle theme, you can install it on the plugin menu. In this e-learning, the Eguru theme is used because it is considered according to some respondents' input.

Meanwhile, 2 statement items have a low response, namely, the ease with which users learn physics using SiPanTer. This response is still inadequate because currently, the focus of e-learning development is on the system, not on the material. However, along with this development, researchers continue to add various interactive materials and media variations to make it easier for users to learn.

CONCLUSION

Based on the data validation analysis results, respondents' responses in limited trials, and extensive tests, it can be concluded that SiPanTer is suitable for e-learning in schools and on campus, especially in Merauke Regency. This development product can be used as a reference for researchers or other e-learning application developers, both in a small scope such as a department/class or enormous. This product is also expected to be widely used by lecturers on the Musamus University campus and teachers at high schools in Merauke City. The suggestions based on the results of this study are that in conducting similar research, it is necessary to explore the LMS to be used and know the characteristics of potential product users.

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