

The Design of Learning Media to Support Online Learning in Computer Network Courses

Novi Hendri Adi^{1,*}, Ambiyar², Syahril³, Fadhilah⁴, Army Trilidia Devega⁵, Afif Rahman Riyanda⁶

^{1,5} Faculty of Engineering, Universitas Ibnu Sina

^{2,3,4} Faculty of Engineering, Universitas Negeri Padang

⁶ Department of Information Technology Education, Universitas Lampung

*Corresponding author. Email: novihendriadi@gmail.com

ABSTRACT

Computer Network course is a compulsory subject for students of the Informatics Engineering Study Program, Faculty of Engineering, Universitas Ibnu Sina. The problem that occurs in the learning process is that in delivering learning materials, lecturers still use simple learning media, namely in the form of PowerPoint, and use zoom media which has limited time on free accounts, this causes the material delivered is still less than optimal. To overcome these problems, it is necessary to have a learning media that can support online learning in computer networking courses. The purpose of this research is to design a computer network learning media to support the online learning process. This study uses the Development Life Cycle (SDLC) method with the Waterfall approach. The results of this study produce computer network learning media products to support online learning, which consists of several stages. The first stage begins with conducting a needs analysis and conducting initial observations and interviews, the second stage was designing to define the display concept plan, the third stage, implementing the media that had been designed and carried out concretely, the fourth stage is testing of the learning media that has been carried out and also testing whether the designed media is easy to use. The last stage is the process of modifying the learning media to improve the learning media that will be used based on the results at the testing stage. The conclusion of this research is to produce a product, namely learning media that is easy and practical to use.

Keywords: *Learning Media, Development Life Cycle System, Computer Network.*

1. INTRODUCTION

Science and technology are developing from time to time, causing human needs to increase and increase. To deal with these technological developments, is to develop human resources and upgrade skills so that we are able to compete to face the challenges of technological developments[1]. This technological development also has an impact on the implementation of education in Indonesia. In order to meet the future through the world of education. In the implementation of education in the learning process has taken advantage of the advantages of technology. 21st century learning culture, the learning process is no longer centered on the teacher, but learning is centered on students who are expected to be more active in analysing,

understanding and searching for learning materials[2].

Universitas Ibnu Sina is a university that has just changed its status from three high schools to universities. Universitas Ibnu Sina has three faculties and eight study programs. One of the three faculties is the Faculty of Engineering which has an Informatics Engineering study program. The Informatics Engineering study program has a curriculum with Computer Networking courses. Initial interviews that have been carried out using learning media are essentially used to help lecturers in the learning process. To improve learning achievement and learning motivation, one of them is by using learning media[3]. At this time the learning process is carried out online, in accordance with a

circular from Universitas Ibnu Sina, that the learning process must be carried out online in an effort to prevent the spread of the Covid-19 virus. The media used in the online learning process is the zoom platform which has a limited time to use it, because the lecturer only has a free account. In addition, during the process of delivering supporting media materials, they still use simple PowerPoint media. The use of simple learning media causes a lack of student understanding of the material presented. Then the use of simple learning media also causes a lack of attractiveness and motivation for students. An educator must be able to find alternatives to overcome the problems of learning and be able to use effective learning media[4]. Learning has a very important role, with the interactive learning media used to motivate students in the learning process[5].

Based on the problems above, it is necessary to find solutions and innovate the use of learning media to make it more practical. One way to convey information to students is to use learning media[6]. In research [7], in her research the design of android-based elementary school learning media. This research uses waterfall software engineering method. The results of the research are to produce android-based elementary school learning media to help the learning process become more fun and can increase knowledge and hone skills in understanding lessons. according to[8] in their research on the design of android-based static and dynamic electricity learning media, which in their research used the waterfall method, produced an Android-based static and dynamic electricity learning media that was easy to use for students and teachers in the learning process[8].

Learning resources that are the result of a combination of hardware and software are part of the learning media[9]. In general, learning media serves to help students and teachers in the learning process so that it can facilitate the delivery of material during the learning process[10]. The benefits of learning media according to Yamin in the journal m.khairani are: 1). Turning abstract learning into fun, 2). The learning process will change the teacher's role to be productive and positive, 3). Students will be interactive in the learning process, 4). Can uniform the delivery of learning materials[11]. Macromedia flash is one of the learning media in the form of software that can interpret various media, such as images, sound, video, and animation which is also the right software to create visual presentations.[11]. Macromedia Flash is one of the superior products of Adobe Systems on computer software that can be used to create very attractive bitmaps and animations

that run on computer application programs. One of the advantages of macromedia flash can be easily understood and can attract students' interest in the learning process.

Based on this, researchers want to innovate on learning media by designing a learning media as a supporter of online learning in the Computer Network course. The purpose of this research is to design a computer network learning media to support the online learning process and it is hoped that this learning media can help students in the online learning process. This learning media can also be opened repeatedly on student commuters. This learning media has been integrated and is also an inseparable part of the learning process[3].

2. METHOD

In this study, researchers used the Waterfall System Development Life Cycle (SDLC) method in solving research problems. The use of the SDLC method with the waterfall approach is one of problem solving in research. The implementation is carried out in five stages which are carried out sequentially including analysing, carrying out designs, coding, testing learning media and making improvements.[12][13][14]. For modelling in this study using Unified Modelling Language (UML), is a tool used for documentation and can perform specifications of the software designed[15][16]

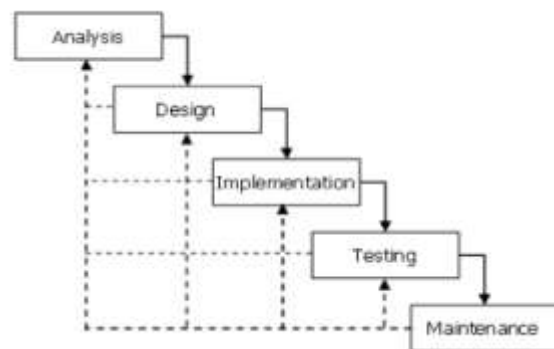


Figure 1. Waterfall method

In the waterfall method above, the first stage to be carried out is to analysed the needs of the learning media that will be designed. After the needs analysis is complete, enter the second stage, namely designing learning media according to needs. Then the third stage is implementing the media that has been designed. Then in the fourth stage, testing of the media that has been implemented is carried out, and testing is carried out whether the designed media is easy to use[7]. To get the results of the test, the researchers used a questionnaire instrument to be

filled out by users, namely lecturers and students. From the questionnaire, practical data will be obtained and data processing will be carried out to get the percentage using the formula[17].

$$\text{Practicality} = \frac{\text{Total answer score for each item}}{\text{items ideal score}} \times 100\%$$

The determination of the results of the questionnaire that has been tabulated can be grouped into categories of scores against the analysis of the practicality of the learning media used as follows.

Table 1. Practicality score

No	Value Range	Class
1	81-100	Very Practical
2	61-80	Practical
3	40-60	Practical enough
4	21-40	Less practical
5	0-20	Not practical

3. RESULT AND DISCUSSION

In designing learning media, there are five stages, in accordance with the waterfall method used. The first stage is to analysed the needs of the learning media that will be designed, starting with data collection through observation and interviews with lecturers who will use learning media.

The first stage is to analysed the needs of the media to be designed. Stages of needs analysis and problem definition by collecting with users about the RPS used, determining the concept of the content of the material and analyzing the characteristics of students.

The second stage is designing learning media by designing media with UML modelling by designing use case diagrams, sequence diagrams, class diagrams, activity diagrams and designing learning media interfaces. The interface design consists of the initial loading menu before entering the initial interface, the initial display menu, the main display menu, the material display menu, the content display menu, the Rencana Pembelajaran Semester (RPS) display menu, the evaluation display menu, the evaluation content display menu, the results display menu. evaluation, researcher profile display menu and user manual display menu of learning media.

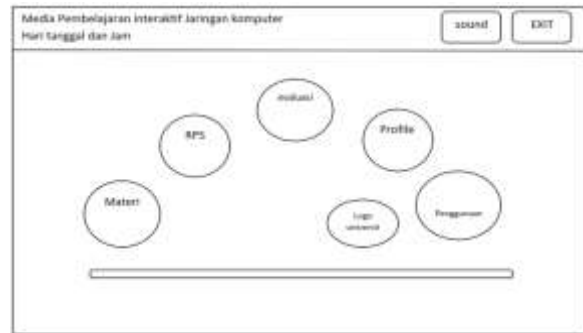


Figure 2. Learning media interface display

The third stage is implementing the media that has been designed and realizing the media that has been designed so that it can be implemented concretely. 1). The initial display that is implemented contains the name of the course that has a start button. 2). The main menu contains the display of matrices, lesson plans, evaluations, profiles and the use of learning media. 3). Material selection menu containing weekly meeting materials. 4). Menu contents of material from weekly meetings. 5). The menu of the evaluation that gave about the evaluation from the first meeting to the fifteenth meeting, 6). The menu of evaluation questions contains questions and answer choices. 7). Menu from the results of the evaluation answers containing scores of correct and incorrect answers and 8). The usage menu which contains instructions for the use of learning media.



Figure 3. Main menu

The fourth stage is testing carried out to verify whether the software is running as needed by using a black box. Then a practical test was also carried out on the use of learning media that had been designed. Following are the results of testing using black boxes that were carried out to users[18].

Table 2. Black box test

No	Interface	Content	Response
1	Initial view of learning media	Contains courses and buttons to get started	in accordance
2	Main View of learning media	Contains learning materials, lesson plans, learning evaluations, profiles and instructions for using learning media Try the contents of all the main menus	in accordance
3	Display of learning materials	Contains learning materials from the first meeting to the fifteenth meeting	in accordance
4	Learning media evaluation display	Contains learning evaluations in the form of quiz questions consisting of material from one meeting to fifteen meetings	in accordance
5	Learning Media Assessment System Display	Contains the results of the quiz that has been done and has a score value of what is true and false when you have finished working on the quiz	in accordance
6	Display instructions for using learning media	Contains instructions for use of learning media	in accordance

After testing the device system to the next user, a practical test of the media will be carried out aimed at lecturers and students who will use learning media. This test is carried out to see whether the learning media that has been designed is easy to use. This test uses an instrument in the form of a questionnaire consisting of four aspects of assessment, namely: Technical, design and content of learning media. Based on the results of the questionnaire that has been filled out by two lecturers, it can be seen as follows.

Table 3. The results of the lecturer's response to the learning media

No	Rated aspect	Response score			Category
		lectur e	lectur e	Averag e	
1	Technical	92%	92%	92%	Very Practical
2	Design	88%	92%	90%	Very Practical
3	Contents	86%	80%	83%	Very Practical
Average				88,33 %	Very Practica l

Based on the data shown in table 3, that the results of the first lecturer's responses on the technical aspects of the learning media got a score of 92% and the results of the responses from the second lecturer on the technical aspects of the learning media got a score of 92%, so that the average of the results of the responses of the two lecturers was 92% are included in the very practical category.

The results of the first lecturer's response to the design aspect of learning media got a score of 88% and the results of the responses from the second lecturer got a score of 92%, so that the average of the results of the responses of the two lecturers was 90% which was included in the very practical category. The results of the responses of the first lecturer on the aspect of learning media content got a score of 86% and the results of the responses on the second lecturer on the aspect of learning content was 80%, so that the average of the results of the responses of the two lecturers on the content of learning media was 83%, which was included in the very category. practical. Overall, the results of the two lecturers' responses to the technical aspects, design, and content of learning media got a score of 88,33% which was in the very practical category in the use of learning media. The following is a graph of the practical results of the lecturer's responses

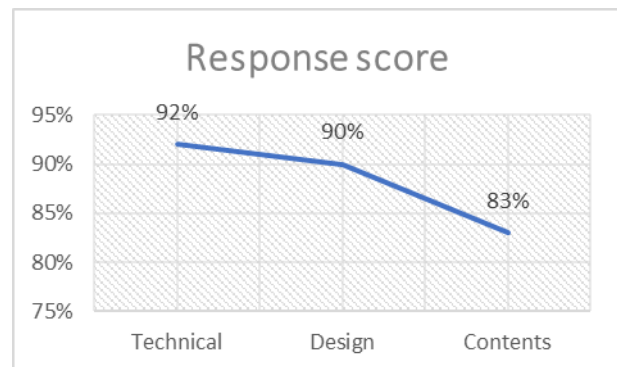


Figure 4. Graph of lecturer response results

In addition to conducting practicality tests on lecturers in computer network courses, this learning media will also conduct practical tests on students. This learning media also requires input from student responses. The following is the data obtained from the practical test to students.

Table 4. Student responses to the media

No	Rated aspect	Response score	Category
1	facility	84 %	Very Practical
2	Motivation	86 %	Very Practical
3	attractiveness	86 %	Very Practical
4	use	87 %	Very Practical
Average		86 %	Very Practical

Based on the data above, there are aspects of assessment in the ease of using learning media with a score of 84% which are in the very practical category, the motivational aspect is obtained by a score of 86% which is in the very practical category, the attractiveness aspect of learning media is obtained a score of 86% which is in the very practical category and aspects of the attractiveness of learning media. the usefulness of learning media obtained a score of 87% which is in the very practical category. Of the four aspects, the overall average is 86% with a very practical category. These results indicate that learning media can facilitate students in understanding the material. The following is a graph of the practical results of student responses

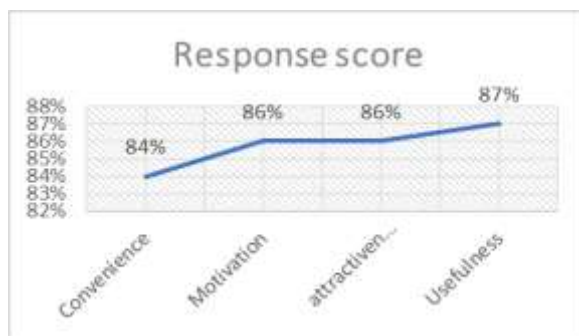


Figure 5. Graph of student response practicality results

The fifth stage of Maintenance, at this stage is the stage of refinement of the learning media after testing. This stage contains improvements from the results of testing that have been carried out, where there are several comments from respondents on the colour display of the learning media.

4. CONCLUSION

The design of learning media using the waterfall method approach by following five stages, namely the first stage is to analyze needs, the second stage is

to design learning media according to needs, the third stage is to implement the designed learning media, and the fourth stage is to implement testing of learning media by distributing instruments to lecturers in computer network courses and also to students, the fifth stage is to maintain learning media and make improvements in accordance with the suggestions given by learning media users. The results of this study produce a learning media product that is used in computer networking courses. With this learning media, it is hoped that it will be able to help support the online learning process and also be able to increase student motivation in the learning process.

AUTHORS' CONTRIBUTIONS

The researcher finished writing this article together with the writing team

ACKNOWLEDGMENTS

Thank you to both parents for giving the best prayers, and all my friends who have provided support in this research.

REFERENCES

- [1] V. Tasril and R. E. Putri, "Perancangan Media Pembelajaran Interaktif Biologi Materi Sistem Pencernaan Makanan Manusia Berbasis Macromedia Flash," *J. Ilm. Core IT*, vol. 7, no. 1, pp. 21–26, 2019.
- [2] R. Novita and S. Z. Harahap, "Pengembangan Media Pembelajaran Interaktif Pada Mata Pelajaran Sistem Komputer Di Smk," *J. Inform.*, vol. 8, no. 1, pp. 36–44, 2020, doi: 10.36987/informatika.v8i1.1532.
- [3] J. Kuswanto and F. Radiansah, "Media Pembelajaran Berbasis Android Pada Mata Pelajaran Sistem Operasi Jaringan Kelas XI," *J. Media Infotama*, vol. 14, no. 1, 2018, doi: 10.37676/jmi.v14i1.467.
- [4] K. N. Laila, F. P. M. Hb, and A. Irsadi, "Efektifitas Media Pembelajaran Androplanteae Berbasis Android Pada Materi Dunia Tumbuhan Untuk Siswa Sma," *J. Biol. Educ.*, vol. 5, no. 2, pp. 110–115, 2016, doi: 10.15294/jbe.v5i2.14651.
- [5] D. T. P. Yanto, "Praktikalitas Media Pembelajaran Interaktif pada Proses Pembelajaran Rangkaian Listrik," *INVOTEK J.*

- Inov. Vokasional dan Teknol., vol. 19, no. 1, pp. 75–82, 2019, doi: 10.24036/invotek.v19i1.409.
- [6] O. Candra, E. Elfizon, S. Islami, and D. T. P. Yanto, “Penerapan Multimedia Interaktif Power Point Pada Mata Diklat Dasar Dan Pengukuran Listrik,” *CIRCUIT J. Ilm. Pendidik. Tek. Elektro*, vol. 4, no. 2, p. 87, 2020, doi: 10.22373/crc.v4i2.6660.
- [7] D. Driyani, “Perancangan Media Pembelajaran Sekolah Dasar Berbasis Android Menggunakan Metode Rekayasa Perangkat Lunak Air Terjun (Waterfall),” *STRING (Satuan Tulisan Ris. dan Inov. Teknol.*, vol. 3, no. 1, p. 35, 2018, doi: 10.30998/string.v3i1.2725.
- [8] M. A. Zaus, R. E. Wulansari, S. Islami, and D. Pernanda, “Perancangan Media Pembelajaran Listrik Statis dan Dinamis Berbasis Android,” *INTECOMS J. Inf. Technol. Comput. Sci.*, vol. 1, no. 1, pp. 1–7, 2018, doi: 10.31539/intecom.v1i1.140.
- [9] A. Muhson, “Pengembangan Media Pembelajaran Berbasis Teknologi Informasi,” *J. Pendidik. Akunt. Indones.*, vol. 8, no. 2, 2010, doi: 10.21831/jpai.v8i2.949.
- [10] N. Hendri Adi, A. L. Fernandes, and H. Hermansyah, “Pengembangan Media Pembelajaran Berbasis Android Pada Mata Kuliah Fisika Dasar,” *Cetta J. Ilmu Pendidik.*, vol. 3, no. 1, pp. 103–114, 2020, doi: 10.37329/cetta.v3i1.414.
- [11] majidah khairani, “Pengembangan Media Pembelajaran Dalam Bentuk Macromedia Flash Materi Tabung Untuk Smp Kelas Ix,” *J. Iptek Terap.*, vol. 10, no. 2, pp. 95–102, 2016, doi: 10.22216/jit.2016.v10i2.422.
- [12] A. Suryadi, “Rancang Bangun Sistem Pengelolaan Arsip Surat Berbasis Web Menggunakan Metode Waterfall (Studi Kasus : Kantor Desa Karangrau Banyumas),” *J. Khatulistiwa Inform.*, vol. 7, no. 1, pp. 13–21, 2019, doi: 10.31294/jki.v7i1.36.
- [13] T. Yunasto and A. Machmudi, “Online : ejournal.stmikbinapatria.ac.id/index.php/DS/issue/ ISSN : 1978-5569 PERANCANGAN MEDIA PEMBELAJARAN SENI MUSIK MENGENAL NOTASI UNTUK KELAS V DI SDN 1 TIRTO, GRABAG,” vol. 16, no. 1, pp. 30–42, 2020.
- [14] F. Hartog et al., “濟無 No Title No Title No Title,” *Angew. Chemie Int. Ed.* 6(11), 951–952., vol. 3, no. 2, pp. 121–161, 1967.
- [15] M. Tabrani and I. Rezqy Aghniya, “Implementasi Metode Waterfall Pada Program Simpan Pinjam Koperasi Subur Jaya Mandiri Subang,” *J. Interkom J. Publ. Ilm. Bid. Teknol. Inf. dan Komun.*, vol. 14, no. 1, pp. 44–53, 2020, doi: 10.35969/interkom.v14i1.65.
- [16] S. R. Ningsih, “Implementasi E-Learning Sebagai Media Pembelajaran Online Bagi Siswa Sekolah Menengah Kejuruan (Smk),” *JOISIE J. Inf. Syst. Informatics Eng.*, vol. 5, no. 1, pp. 20–28, 2021.
- [17] R. Rifandi, D. Ahmad, and M. U. Gusteti, “Praktikalitas Media Video Tutorial sebagai Suplemen Digital Learning pada Mata Kuliah Persamaan Diferensial Biasa,” *J. Eksakta Pendidik.*, vol. 4, no. 1, p. 27, 2020, doi: 10.24036/jep/vol4-iss1/436.
- [18] A. Suryadi, “Perancangan Aplikasi Game Edukasi Menggunakan Model Waterfall,” *J. Petik*, vol. 3, no. 1, p. 8, 2018, doi: 10.31980/jpetik.v3i1.352.