

DIGITAL MODULE INNOVATION IN MULTIMEDIA LECTURES WITH A PROJECT-BASED LEARNING MODEL IN LEARNING MATHEMATICS

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Abstract

The use of multimedia as a medium of information has been utilized in various fields, including in lectures at universities. This paper discusses the development of a digital module for Multimedia lectures with a Project-Based Learning model. The research method used is research and development. The research results show that the developed digital module effectively facilitates students in completing their projects. Students succeeded in creating mathematics learning content for high school students packaged in a Learning Management System (LMS). Furthermore, 90% of students gave a positive response to Project-Based Learning lectures using the developed digital module.

Keywords : *Learning Management System; Modul Digital; Multimedia; Project-Based Learning*

INTRODUCTION

Multimedia is the use of text, graphics, animation, images, video, and sound to convey information (Najjar, 1996). In addition, Jannah, et al, (2020) revealed that multimedia can be interpreted as more than one medium, which can be in the form of a combination of text, graphics, animation, sound, and images. Because information is conveyed by several senses, namely ears and eyes, information is more easily absorbed. Information conveyed by utilizing multimedia can be designed in such a way that it is interesting, communicative, and right on target.

Multimedia is increasingly being used for computer-based teaching for both children and adults (Najjar, 1996). Stemler (1997) revealed that the use of multimedia technology provides another alternative to learning. However, the increased capabilities of multimedia applications often make the appearance of the design redundant, such as a variety of fonts or objects that are irrelevant to the information to be conveyed. Thus, in designing the media, it is necessary to consider various factors, especially the purpose of the information and its objectives. The excessive display can obscure the information you want to convey. Information goals also need to be considered, because the display for children will certainly be different from the display for adults. Therefore, the use of multimedia needs to be studied in depth so that information can be conveyed according to its goals and objectives.

In 2020, the Covid-19 pandemic forced learning activities to be carried out remotely or online. Multimedia as a digital teaching material plays a very important role in these online learning activities. Starting from the elementary school level to the tertiary level, multimedia is an alternative delivery of material. In addition, the Learning Management System (LMS) is also used to facilitate the management of digital teaching materials, delivery, and collection of assignments, as well as administering exams. In 2022, when the Covid-19 pandemic has subsided, learning activities will begin to be carried out face-to-face, but the use of multimedia and LMS will continue to be used.

Marwati, et al (2019) revealed that LMS is a web-based application designed to handle lesson content by integrating course management, student management, exercise management, assessment

management, lecture material, and feedback management. Kasim and Khalid (2016) explain things that need attention in an LMS, namely: content management system, learning content management system, and types of tools in LMS. They further conveyed that the LMS platforms suitable for the tertiary level was Moodle, A Tutor, Blackboard and SuccessFactor. Currently students rely on the internet to find information, and LMS is an essential tool for students in doing their coursework (Adzharuddin, 2013).

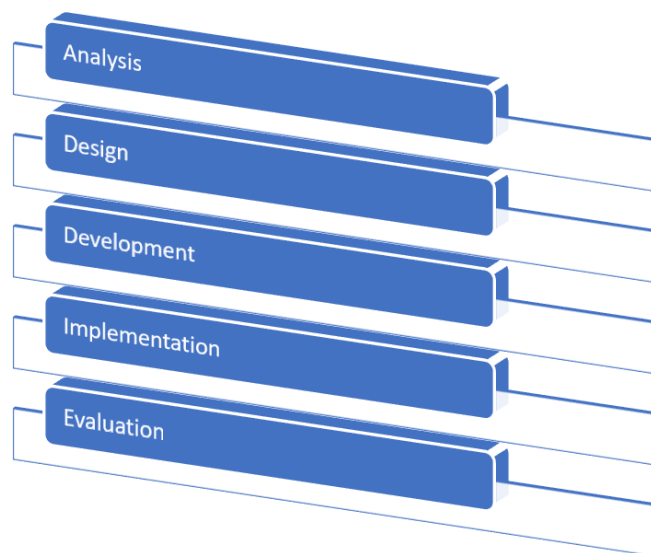
The development and use of digital teaching materials for the learning process have had various positive impacts. Jannah, et al (2020) revealed that the use of multimedia is effective in improving science learning outcomes in elementary schools. The results of the study by Ratiyani, et al (2014) show that there is an increase in student learning outcomes after using digital teaching materials. The same thing was obtained from the research results of Zaini, et al (2019), where the use of digital book-based teaching materials has higher effectiveness than printed teaching materials in improving student learning outcomes in Mathematics.

In this research, a digital module was developed for Multimedia lectures using the Project Based Learning (PjBL) method. Project Based Learning is a student-oriented learning process with a deep learning approach through exploratory activities with real problems (Condliffe, et al, 2017). Project Based Learning can improve student academic achievement (Rais, 2010). A clear work program challenges students to explore themselves and produce useful work. In this paper, we will examine the development of digital modules to support multimedia lectures using the PjBL method.

METHOD

The research method used in this research is research and development (Research and Development). Research and development methods are research methods that produce a product and then test the effectiveness of the product (Taufikurahman, et al, 2021). The development of digital teaching materials used in this study uses the model developed by Martin, et al, (2015), namely analysis, design, development, implementation, and evaluation (ADDIE). Each of these stages is illustrated in Figure 1, with the following explanation: At the analysis stage, the designer builds a clear understanding of the gap between the knowledge possessed by students and the desired results, based on the results of the analysis phase, at the design stage, the designer determines instructional objectives, teaching materials, practical activities and feedback, media, and assessment, At the development stage developed a prototype. At this stage, an evaluation is also carried out to ensure that the prototype developed is following the instructional objectives, At the implementation stage, the prototype developed was tested on 7th-semester students of the FPMIPA UPI Mathematics study program who attended Multimedia lectures, as many as 46 people. Lectures are conducted using the Project Based Learning method, which is done in groups. The topics studied in lectures are implemented to create junior high school mathematics subject matter content that is published on the web learning, The evaluation phase is an activity to assess the achievement of instructional objectives arranged at the design stage. At this stage, information from users and implementers is collected, compiled, and analyzed. The Digital Multimedia module implemented in lectures using the PjBL method is then evaluated through a questionnaire. The contents of the questionnaire regarding the benefits of multimedia lectures, useful topics, the suitability of the material with the PjBL, and the use of the LMS. The results of the questionnaire were then analyzed by calculating the percentage of each question item.

Figure 1. Research Stages



RESULT AND DISCUSSION

Result

The results of the research that has been carried out can be described as follows:

a. Analysis Stage

Based on a literature study regarding the revitalization of learning systems in response to the industrial era 4.0, the skills that students need to have to include the ability to read, analyze, use information in the digital world, and the ability to communicate and master design science (Ghufron, 2018). In addition, students also need to be given space and opportunities to reflect on their ideas and opinions and use reasoning in solving problems.

However, the results of the end-of-semester evaluation that had been carried out by the lecturers, showed that the output of multimedia lectures was not optimal. This can be seen from the results of the design of some students who are excessive so that the material message is conveyed less effectively, and the output is not properly utilized by the public. Therefore, in multimedia lectures it is necessary to develop digital teaching materials that facilitate students in creating and producing work in the form of a quality and efficient project.

b. Design Stage

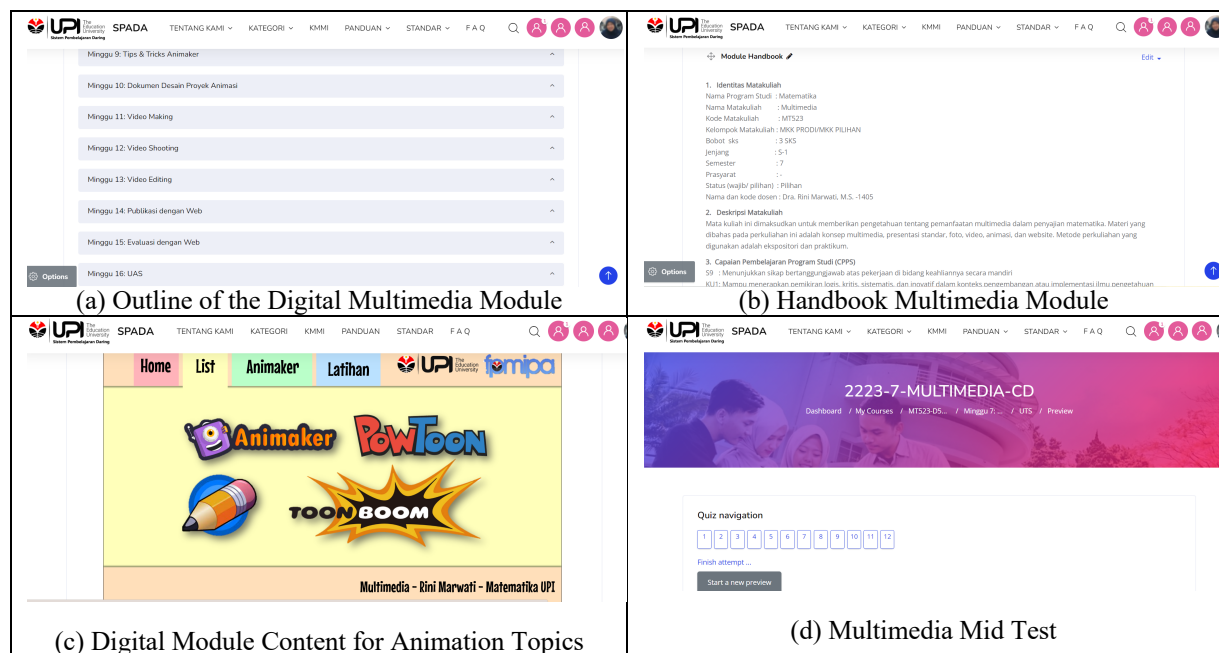
The product developed in this study is in the form of a digital module for Multimedia courses which can optimize students to be able to produce a project-based audio-visual learning media product. Referring to the handbook module, after attending Multimedia lectures, students are expected to be able to make good and interesting presentation slides, create interactive learning games, organize or manage files on drives, make good and efficient animations, make informative videos, and compile or construct web as a means of publication. Based on these topics, the contents of the digital module developed are as follows: Text material includes all lecture material in text form which is uploaded to the Learning Management System (LMS) with the PDF file type, PowerPoint slides are presented at each meeting by publishing PowerPoint files via Google Slides so that students can study the slide shows directly without the need to download the file. But for students who want to download slides, a URL is also provided which will download immediately if clicked, Videos are provided for application usage examples. Videos are displayed using share embeds in the LMS Labels tool, Infographics are provided to review the material shown in the slides. The infographic file type is JPG and published in the LMS using the

picture tool via Labels., Motion graphics are used as animation in Introduction to Multimedia materials and animation materials. Motion graphics are published in a similar way to videos, Tests are given at the beginning and in the middle of the course. Test questions are stored in the LMS question bank with the type of multiple-choice questions with more than one correct answer. The final assessment exam is in the form of a video presenting the results of the group's project.

c. Development Stage

The module contents designed at the design stage are then constructed and implemented in an LMS with the Moodle platform. Tools used in the LMS include activities (Assignment, Attendance, Quiz), and resources (File, Label, URL). The display of the digital module can be seen in Figure 1. Figure 2(a) shows an outline of Multimedia lectures for 1 semester in outline. Figure 2(b) shows the Multimedia lecture handbook module, containing course objectives, topics, assessments, and literature. Figure 2(c) shows an example of material contained in the form of PowerPoint slides that students can run directly through the LMS. Figure 2(d) shows an example of a midterm test.

Figure 2 Digital Multimedia Module



So that the digital modules developed are following instructional objectives, the digital modules are validated by several experts through questionnaires. The aspects that are assessed are the suitability of the content of the material with the RPS and presentation. The results of the validation questionnaire show that the digital module developed is appropriate and feasible to use.

d. Implementation Phase: Project-Based Learning

Using the digital modules that we have developed as a learning resource, students are given projects in groups to compile and manage audio-visual teaching materials. Each group manages two high school mathematics material topics. Each topic contains a material title, Learning objectives, Material, Practice, Test, and Game. The duration of the project is 10 weeks, where every week each group reports on the progress of the project.

The project results of each student group are published in the web learning 'eLMath'. This web learning is an LMS with the Moodle platform. An example of web learning resulting from students through project-based lectures can be seen in Figure 3. Based on the measuring or evaluation tools contained in the module handbook, students have fulfilled the instructional objectives of the lectures, namely students

can develop their creativity to produce or modify original work, utilize tools in applications so that the results of the project are interesting and applicable, produce works that are interesting and right on target.

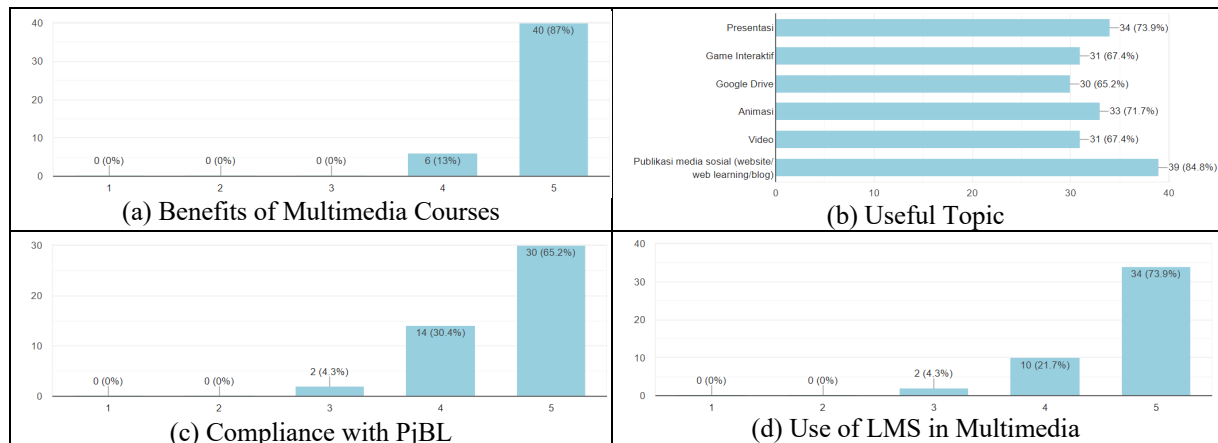
Figure 3 Web Learning Student outcomes through PjBL



e. Evaluation Stage

As a reflection of the development of digital Multimedia modules and PjBL-based lectures, we distributed questionnaires via Google Form to Multimedia class students. Of the 46 students who filled out the questionnaire, the results were shown in graphical form in Figure 4.

Figure 4 Results of the Digital Module Implementation Questionnaire in project-based Multimedia lectures.



Based on Figure 3, the results of the questionnaire can be described as follows:

- 87% of students stated that the lecture material was 'very useful', and 13% of other students stated that it was 'useful'.
- The order of the topics from the most useful is as follows:
Web learning (84.8%), Presentation (73.9%), Animation (71.7%), Interaktif Game (67.4%), Video (67.4%), Drive Management (65,2%)
- For the level of suitability of the material with the PjBL method, 65.2% of students stated 'Very Appropriate', 30.4% of students stated 'Appropriate', and only 4.3% of students stated 'Quite Appropriate'.
- Concerning the intensity of using LMS SPADA in Multimedia lectures, 74.9% of students stated 'Very Often', 21.7% of students stated 'Often', and 4.3% of students stated 'Quite Often'

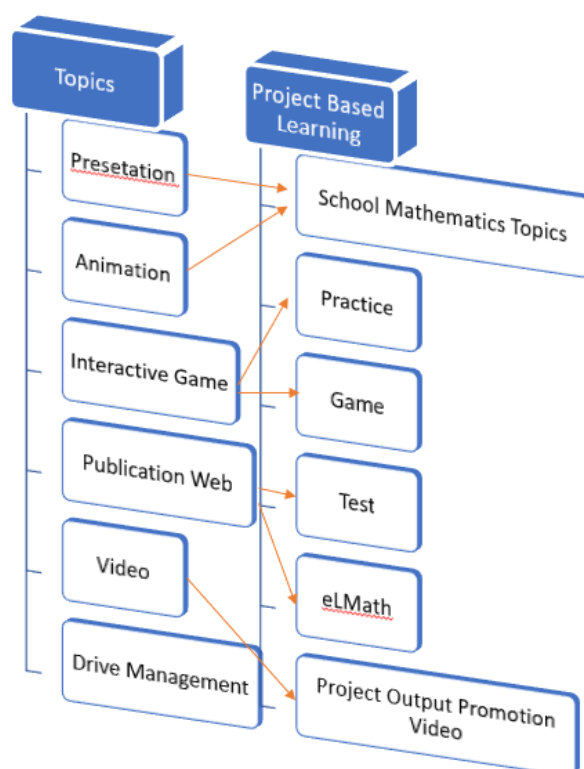
Based on the results of implementing digital modules in project-based multimedia lectures, students stated that the products developed were very useful, and the material was very suitable for project-

based lectures. In other words, 90% of students gave a positive response to Multimedia lectures using PjBL-based digital modules.

Discussion

In this research, a digital module has been developed for multimedia lectures. The developed module is implemented with Project Based Learning (PjBL) learning. The link between Multimedia and PjBL lecture topics/materials can be seen in Figure 5. Presentation and Animation Materials are implemented in the creation of school subject matter. Interactive Game material is implemented in Training and Games, Web Publishing material is implemented in LMS 'eLMath' content arrangement, and Video material is implemented to make short videos about the results of projects made by groups and can be used as promotional videos. Drive Management Material is used to manage all project work so that collaboration between team members can go according to plan and support each other.

Figure 5. Linkage of materials and results of PjBL activities



Through lecture activities with PjBL which are facilitated with digital modules developed, students have completed a project of making audio-visual teaching materials on two topics of high school mathematics material which are published on the web. Teaching material products produced by students have met informative, interactive, creative, and evaluative standards. This is following the results of research by Kusadi, et al (2020) which states that the Project Based Learning (PjBL) model can produce a variety of ideas in products and increase student creativity.

Based on the results of the implementation, students stated that the digital modules developed were very useful, and the material was considered very suitable for project-based lectures. This shows that the digital modules developed are considered effective in supporting the lecture process. This digital module developed directs students to carry out the learning process independently and makes it easier for students to find information related to material. This is in line with Zaini, et al (2019) who states that the use of digital media is a means and source of learning for students to make it easy to learn their material.

CONCLUSIONS AND SUGGESTIONS

From the description above, it can be concluded that the digital module developed and implemented in the LMS helps students to take Multimedia lectures using the PjBL method. Topics/lecture materials have been designed in such a way that they can be developed into collaborative projects. Students have completed their project, which is to produce informative, interactive, creative, and evaluative mathematics learning content for junior high school students, packaged in a web learning. Based on the implementation results, 90% of students gave a positive response to the PjBL approach of Multimedia lectures using digital modules. Based on this, it can be suggested that the results of PjBL in the form of school mathematics learning published in 'eLMath' can be tested and implemented in formal educational institutions such as homeschooling.

REFERENCES

- Condliffe, B. (2017). Project-Based Learning: A Literature Review. Working Paper. MDRC.
- Ghufron, M. A. (2018). Revolusi Industri 4.0: Tantangan, Peluang Dan Solusi Bagi Dunia Pendidikan, Seminar Nasional dan Diskusi Panel Multidisiplin Hasil Penelitian & Pengabdian kepada Masyarakat, 2 agustus 2018.
- Jannah, I. N., Hariyanti, D. P. D., Prasetyo, S. A. (2020) . Efektivitas Penggunaan Multimedia dalam Pembelajaran IPA di SD. *Jurnal Ilmiah Sekolah Dasar*, (4)1.
- Kasim, N. N. M., & Khalid, F. (2016). Choosing the right learning management system (LMS) for the higher education institution context: A systematic review. *International Journal of Emerging Technologies in Learning*, 11(6).
- Martin, F., Hoskins, O. J., Brooks, R., & Bennett, T. (2013). Development of an interactive multimedia instructional module. *The Journal of Applied Instructional Design*, 3(3), 5-18.
- Marwati, R., Fujihira, T., Furuoka, A., Yulianti, K. (2019). 'Surala Ninja!': a mathematics e-learning based on a learning management system as an alternative learning in elementary school. *Journal of Physics: Conference Series*, 1280(4).
- Najjar, L. J. (1996). Multimedia information and learning. *Journal of educational multimedia and hypermedia*.
- Kusadi, N. M. R., Sriartha, I. P., & Kertih, I. W. (2020). Model pembelajaran project based learning terhadap keterampilan sosial dan berpikir kreatif. *Thinking Skills and Creativity Journal*, 3(1), 18-27.
- Rais, M., (2010) Model Project Based-Learning Sebagai Upaya Meningkatkan Prestasi Akademik Mahasiswa, *Jurnal Pendidikan dan Pengajaran*, Jilid 43, Nomor 3, 246-252.
- Ratiyani, I., Subchan, W., Hariyadi, S. (2014). Pengembangan Bahan Ajar Digital Dan Aplikasinya Dalam Model Siklus Pembelajaran 5e (Learning Cycle 5e) Terhadap Aktivitas Dan Hasil Belajar. *Pancaran*, Vol. 3, No. 1, hal 79-88.
- Stemler, L. K. (1997). Educational characteristics of multimedia: A literature review. *Journal of Educational Multimedia and hypermedia*, 6, 339-360.
- Taufikurrahman, Budiyo, Isnandar Slamet. (2021). Development of mathematics module based on meaningful learning, *AIP Conference Proceedings* 2330, 040032 (2021).
- Zaini, H., Darmawan, D., & Hernawan, H. (2019). Penggunaan Bahan Ajar Berbasis Digital Book untuk Meningkatkan Hasil Belajar Siswa dalam Mata Pelajaran Matematika pada Materi Logika Matematika. *Teknologi Pembelajaran*, 4(2).