

Development of Wetland Contextual Interactive Learning Media with Student Activity Monitoring

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Abstract

Received : July 27, 2023
Revised : August 21, 2023
Accepted : August 22, 2023

The rise of Covid-19 cases suppresses the activities of all industries. There are still many shortcomings encountered compared to the usual learning process done directly in the classroom. Both the government and private sector have presented many media to learn independently. One of the things that was developed was interactive media. The purpose of this study was to develop a web-based interactive learning multimedia for statistics material for 8th grade. The material was presented with a contextual approach so that students could connect material concepts with real-life problems to instill an understanding of the material. Nothing that excels in this learning media was monitoring student activities while studying, such as student progress in learning the material, activities that have been and have not been carried out in the learning series, and monitoring of keyboard and mouse activities. Learning media was developed using the Research and Development (R&D) method with the ADDIE model (Analysis, Design, Development, Evaluation). The learning media functionality was tested using the Black Box method. Data analysis technique used in this study, namely quantitative and qualitative data analysis. Based on the results of testing all features, it could be concluded that the developed learning media application can function well with very high validity. Where the results of media validation were 90.3% and material validation was 87.5%. Furthermore, the developed interactive learning media is suggested to be able to display monitoring of activities that have been done by students in their respective accounts.

Keywords: interactive learning media; contextual approach; student's activity monitoring

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How to Cite: Harja Santana Purba, Sari, D. P., Novan Alkaf Bahraini Saputra, Syahril Hanla Azis, & R. Ati Sukmawati. (2023). Development of Wetland Contextual Interactive Learning Media with Student Activity Monitoring. *JTP - Jurnal Teknologi Pendidikan*, 25(2), 234-245. <https://doi.org/10.21009/jtp.v25i2.37498>

INTRODUCTION

The rise of Covid-19 cases suppresses the activities of all industries. One of the biggest impacts has been on the world of education. Over time, the learning process becomes focused on online learning. During online learning, learning media such as electronic books and interactive media are given to students in order to learn independently. However, there are still many shortcomings encountered compared to the usual learning process done directly in the classroom (Arora & Srinivasan, 2020; Bahasoan et al., 2020; Jena, 2020). Media development has been done a lot. Among the most widely found are text such as e-books and audio-visuals such as video. Both the government and private sector have presented many media to learn independently. There is even a circular of the Minister of Education and

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Culture Letter No. 9/2018 on the use of Learning Houses as a learning medium during this pandemic for students (Atsani, 2020).

One of the things that was developed was interactive media. Interactive media is designed to serve to convey the subject matter and has an interactive element of two-way communication to its users (Li & Sundar, 2022; Siregar et al., 2020; Syahputra & Maksum, 2020). Interactive media can be used for a variety of purposes, one of which is as a learning medium. Multimedia is a combination of various media that give rise to two-way interactions, such as text, video, images, and sounds that use a computer in its presentation (Munir, 2012). Interactive multimedia is multimedia equipped with a controller that can be operated by the user, so that users can choose what is desired for the next process (Munir, 2012). One suitable subject to be taught using this contextual learning approach is mathematics, where students can connect material concepts with real-life problems. And in this research the material that will be discussed is junior level statistics class VIII, in which there are various kinds of problems in real life such as analyzing and processing data. The context presented regarding the environment of wetlands and local wisdom. So that students learn about mathematical concepts, also become more familiar about the treasures of South Kalimantan. In addition, as an effort to fulfill the vision of Universitas Lambung Mangkurat, it aims to become a center for Asian-level wetland studies (Jonata, 2018).

Based on some studies mentioned that learning is still centered on the teacher, so students are passive and lack understanding of the concept of the material conveyed (Fathir & Sabrun, 2015). Especially during online learning, there are 3 challenges for teachers, such as involving students independently in learning, exploring, and teaching them how to process the information obtained into something that is considered useful for them. The biggest problem experienced by students is that they haven't been able to connect between what they learn and how that knowledge is used (Dewi & Primayana, 2019). They have difficulty understanding academic concepts such as mathematics and physics, because the methods usually used during this time are done conventionally (Afriani, 2018). One solution to this problem is to use a contextual approach. According to the conclusion of a study mentioned the application of contextual approaches in improving the ability of mathematical representation is said to be significantly better than conventional learning (Hutagaol, 2013). Contextual approaches are more effective than conventional approaches to writing teaching (Indrilla, 2018) and can significantly improve student learning outcomes (Hutagaol, 2013). In another study, there was an 18.5% increase in critical thinking skills from the first cycle to the second cycle after applying contextual approaches to the Biology Teaching and Learning Strategies course (Hasrudin et al., 2015). Therefore, the study used contextual approaches as a method of learning that will be applied to interactive media created.

Learning with a contextual approach or called CTL (Contextual Teaching and Learning) is a learning strategy that emphasizes the process of student engagement to find the material they learn and connect it to real-life situations (Afriani, 2018; Dewi & Primayana, 2019). The student-centered contextual approach fosters students' independence in online learning, making it allegedly suitable for application to web-based interactive learning media. Self-study is certainly a good

thing to do, but without the supervision of a party such as educators or parents can make students become less directed in learning. It cannot be denied that supervision in the teaching and learning process is still very necessary, especially for the level of school students. This problem still exists in most interactive learning media today, although it is interactive but without supervision of student activities equal to no guarantee that he is indeed learning thoroughly or doing it correctly, it is also necessary to serve as a "supervisor" in charge of monitoring the activities of student self-learning. Therefore, in this research will be developed a web-based interactive learning media with a contextual approach to statistical material to monitor student learning activities.

METHODS

This research is a development research with R&D (Research and Development) methods (Purba, Rosal, et al., 2022; Purba, Sari, et al., 2022; Sari & Mahendra, 2017). The main focus of this research is developing a web-based interactive learning medium. The development model used is the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. There are two kinds of theoretical validity validated by experts, namely content validity and construct validity. The validators of this interactive learning media are two Information Technology experts, one mathematician, and one mathematics teacher. Assessment aspects of media validation are feedback and adaptation, presentation design, and interaction usability.

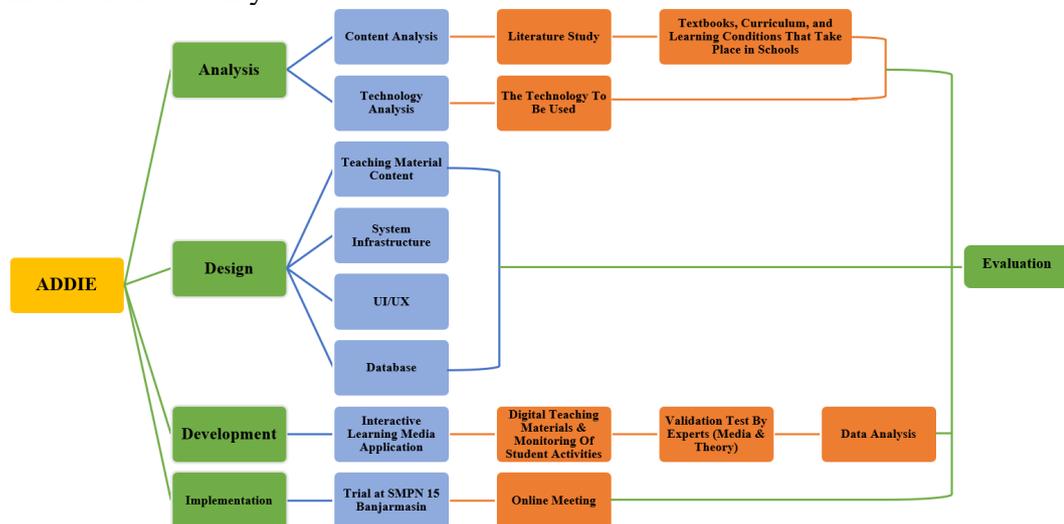


Figure 1. R&D Research Method with the ADDIE Development Model

The assessment aspects of material validation are content, presentation, and language. In this study, the testing phase was carried out at the end of development using the Black Box testing method focuses on testing functional applications and errors in the following categories: (1) incorrect or missing functions, (2) interface errors, (3) errors in data structures or external database access, (4) behavioral or performance errors, and (5) initialization and termination (Pressman, 2005). Data analysis technique used in this study, namely quantitative and qualitative data

analysis. Quantitative data analysis to analyze the results of media validation and teaching modules with percentages. Qualitative data analysis aims to examine the functionality of interactive media from experts. Figure 1 below shows the R&D research method with the ADDIE development model in this study.

RESULTS & DISCUSSION

Analysis

Literature study is obtained based on textbooks, curriculum, and learning conditions that take place in schools. The material contained in this interactive learning media is Statistics for class VIII SMP. Statistical material is very closely related to everyday life so it is easier and more precise to present it with a contextual approach. The context presented is the wetland environment and local wisdom, such as fish and cakes which are familiar in South Kalimantan. So, students not only learn about statistics, but also get to know the local wisdom where they live.

Then, technology analysis to determine the technology to be used to meet the usage and functional needs of interactive learning media. Users of this interactive learning media consist of students and teachers (admin). Users are required to log in to access the features specified for each user. Features provided for teachers or admins are accessing student personal progress details, progress details per class, creating classes, managing classes, opening and closing evaluation features, and admin management. While the features for students are accessing learning materials, quizzes, dashboard pages (user profiles), and participating in evaluations. This interactive learning media was developed into a web application. The advantage of using this technology is that it is easier to distribute media for use without the need to install on devices, is cross-platform, and is light on all systems, such as laptops and low-spec smartphones. The need for technology in learning media is React.js, Next.js, Cloud Firestore, Firebase Authentication, React Katex, Chart.js, Vercel. Evaluation at the analysis stage is carried out to determine the feasibility of the analysis results. The results of the evaluation at the analysis stage are the addition of features to record and monitor student learning progress and achievements.

Design

The design activities carried out to develop this learning media are in the form of designing digital teaching material content, system infrastructure, interface design and databases. Teaching materials are included and adapted to the characteristics of web learning. Development of system infrastructure in the form of functional and non-functional features. The system interface consists of material design and media interactivity. And finally the database is built based on NoSQL where data is stored as collections and documents so as to make the structure more scalable. The response data obtained is formatted in JSON so that it is more easily accessible during the learning media development process. Evaluation at the design stage is carried out to determine whether the design is ready to be used as a reference in the process of developing teaching materials and learning media. The evaluation carried out at this stage is (1) revision of teaching material content, such as pictures

and sentences adapted to suggestions from supervisors and validation results and (2) add features to support student learning activities.

Development

The development stage is carried out after the design has been carried out, everything that has been analyzed and designed is converted into a form of source code so that it becomes the planned learning media application. The development process uses HTML, CSS, and Javascript (React and Next.js). The results of the development are products that are made based on the stages of analysis and design. Digital teaching materials, the concept of monitoring student activities, and planned features are contained in interactive learning media. So that they are divided into three sections based on account access, namely the general page (homepage or homepage), subject page, and instruction page. Then for the admin account, namely admin management, class management, and viewing details of student development. As for students, they access materials and quizzes, a dashboard profile, and an evaluation page. Using React and Next.js, this learning media can run offline or without an internet connection as long as the application is loaded perfectly during initial use (when it is first opened in a tab). Thus, users can still study smoothly even though they are constrained by an unstable internet network.



Mengapa App Ini Bagus Untuk Kamu:

 Belajar Mandiri Belajar dengan kecepatanmu sendiri	 Latihan Kamu akan diberikan latihan untuk menguji dan mengasah pemahamanmu	 Progress Tracking Proses belajarmu akan dipantau sehingga kamu mengetahui seberapa pesat perkembangannya
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Figure 2. Homepage

These pages can be accessed without logging in first. Figure 2 is the result of the homepage development. On this page users can enter, view basic material information, and navigate to other public pages. On the about application page, users can see a brief description of the interactive learning media created, the main technologies used, the urgency of development, and others that are informative about the learning media created. The student page displays the student dashboard or profile page. Developed based on features, sitemaps and usecases created based on analysis and design. Then, the percentage page for student learning progress as a whole and per sub-material is displayed. Students who first enter and use learning media will start all progress from the beginning, and are required to take part in classes that have been created by the class admin to use the evaluation feature.

The statistics material page display is presented using the Chart library.js to

display charts and graphs. React Katex is used to display the mathematical formula notation contained in the material. On the material page there are activities that students must do as defense activities. When the activity has been carried out correctly, the student learning activity progress bar at the bottom of the image will be filled, this progress will be stored locally behind the screen of the user's device and in the cloud in the database. On the material page monitoring of student learning activities is also implemented. If students are not active in using the media, such as not interacting with the mouse and keyboard on the media for more than 2 minutes or opening an application other than the learning media, the system will display a warning message to direct students to focus more on learning. Thus, the application of student activity modeling to this learning media can help them learn independently in a more directed manner (Kabi et al., 2013). This can be seen in Figure 3 below.

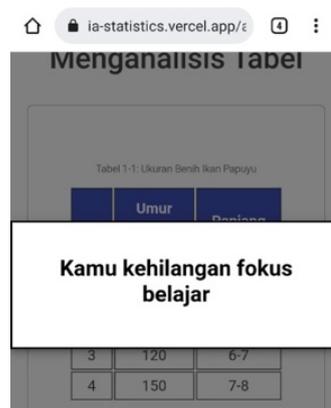


Figure 3. Warning message if students are inactive on display on smartphone

Teacher can act as admin who manage the learning process using this interactive media. Registration as an admin can be done using the user's Google account. If the account is registered as an admin then the user will be redirected to the admin page. The admin page shows the contents of the selected class participants. Admin can open the details of the activities that have been done by students, so that it can be known the level of activeness of students in learning whether they have completed all the activities given or just to get grades. Details of individual activities can be seen by selecting and clicking on the name of the desired student, and Figure 4 shows progress per class as a whole.

No	Nama	Skor	Bab 1: Analisis Data														
			Kegiatan Hal. 1			Kegiatan Hal. 2			Kegiatan Hal. 3			Kegiatan Hal. 4			Kegiatan Hal. 5		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1	Dimas Muhammad	70	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	SYAHRIL HANLA AZIS	85	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Figure 4. Activity details per class

Implementation

Testing of learning media applications is done using the Black-box method. Black-box testing is a test that focuses on the functionality of an application that has been built (Anwar et al., 2020). Testing of learning media applications is carried out using the Black-box method. Black-box testing is testing that focuses on the functionality of the applications that have been built (Anwar et al., 2020). Based on the results of tests conducted by experts, it can be concluded that each assessment category received a successful category. The implementation was carried out at SMPN15 Banjarmasin. The implementation was carried out in 4 online meetings, which were divided into three meetings for learning teaching materials and one meeting for the final evaluation to take the value of learning outcomes. Student learning progress can be monitored on the admin page, so that it can be seen which part of the material is an obstacle for students in independent learning activities. Then, as data triangulation, response questionnaire data were collected from teachers and students regarding the interactive learning media that had been used.

Evaluation

At this stage of development, this interactive learning media has been validated by four experts. Media validity test results can be seen in Table 1.

Table 1. Media validity test results

Assessment aspects	Expected Score	Achievement Score		Achievement Percentage (%)	Validity
		Validator 1	Validator 2		
Feedback and Adaptation	8	3	4	87.5	Very High
Presentation Design	40	17	19	90	Very High
Interaction Usability	24	11	11	91.6	Very High
Total Achievement	72	31	34	90.3	Very High

In Table 1, the validation results show that the feedback and adaptation of the developed media is very high with an achievement of 87.5%. Presentation design of the media is 90%, meaning very high validity. The interaction usability of the developed interactive learning media reached 91.6%, with very high validity. All of the assessed aspects show very high validity, with an Achievement of 90.3%. Then, Table 2 shows very high validity for all aspects assessed, including content (89.3%), presentation (87.5%), and language (85%), with a total achievement of 87.5%. Evaluation stages are carried out at each stage of this research, such as content analysis, UI and database design, and the learning media development stage. Evaluation is done based on the feedback provided, so revisions are carried out as feedback to users.

Table 2. Theory Validity Test Results

Assessment aspects	Expected Score	Achievement Score		Achievement Percentage (%)	Validity
		Validator 1	Validator 2		
Content	56	22	28	89.3	Very High
Presentation	40	15	20	87.5	Very High
Language	40	15	19	85	Very High
Total	72	31	34	87.5	Very High

Discussion

Interactive learning media can make students interact with the system (Dewi et al., 2018; Priyanto, 2009). The system acts as a tutor who can provide responses, such as providing input and direction for students according to their activities. In this study, the media was developed by modeling and monitoring student activities in its use. This learning media contains statistical material. Where statistics is the study of how to collect data, summarize the data that has been obtained, present it, analyze it, and make decisions based on the results of the data analysis (Metstat, 2022). By connecting the contextual approach and statistical material, students can practice the lessons they have learned by collecting and analyzing data from various activities using statistics on rules (Fathir & Sabrun, 2015; Maryati, 2018). In daily life, there are many things that can be applied to learning Statistics material. One example that will be included in this interactive learning media uses the context of a wetland. Like finding out the average size of a typical Banjarmasin fish, namely the Papuyu fish. From this example, students can find out how to process data from the research process such as presenting the data obtained, processing, and analyzing it from the context of the wetlands contained in the lesson. Such as presenting data from a collection of Papuyu fish, then processing it by calculating all the data obtained, starting from the average, largest and smallest sizes.

In this study, the main difference from previous research (Augustin et al., 2021) is the use of a different learning method, namely the tutorial method, while this study uses a contextual approach. So there are differences in the presentation of the material, where the tutorial method provides more practice and limits access to learning according to the speed of students' personal learning progress. While the contextual approach, which presents material according to the components of the contextual approach, provides more information and illustrations in the context of a wetland with real data in accordance with field facts. The learning media that has been developed (Augustin et al., 2021) uses vanilla web development technology such as HTML, CSS and JavaScript. Meanwhile, the technology used to develop this learning media is based on a framework that helps improve development results, so that applications can be made more complex with more features. This is to help the independent learning process and supervision of student learning activities. In addition, the developed learning media has additional features that were not found in previously developed media.

This learning media has a progress tracking feature to record the overall learning progress in the form of a percentage of completeness. This is different in functionality from previous studies using similar features (Scott-Hill et al., 2020; Taruli et al., 2021; Turkan et al., 2013). The parameters of the progress tracking feature developed are every activity available in the learning media, such as reading the material thoroughly, answering essay questions, and answering multiple choice questions. Learning media developed to model student activities and activities, examples of activities that use modeling student learning activities in class are reading and listening to explanations, paying attention to material explanations, answering questions, and so on. For example, listening to material is represented by reading progress such as implementing the Terms of Service and asking questions that are automatically corrected by the system. Student activities are also

monitored by monitoring the use of the keyboard and mouse. If there is no activity within 2 minutes or open another application, the system will respond by giving a warning in the form of a warning display and a buzzer sound that steals the students' attention again.

Intended to give interpretation and meaning to the results of the study in accordance with the theories and references that are used. It is not merely used to present findings. Interpretation should be enriched with referencing, comparing, or contrasting with findings of previous research published in reputable, not predatory, journal. It is advisable to integrate findings into collection of theories or established knowledge, development of a new theory, or modification of existing theories. Implications of the research findings are given. Every activity carried out by students on the developed learning media is recorded and can be monitored by the teacher. So that the assessment in learning is not only based on the value of learning outcomes, but also in terms of the learning process (Anugraheni, 2017). Learning progress data can also identify whether students experience bottlenecks in learning so that teachers can immediately take appropriate action to help the learning flow.

CONCLUSION

The interactive learning media Statistics grad VIII junior high school developed in this study has several forms that are tested in terms of functionality, namely login and logout, class join form, material pages, short questions, and evaluation quizzes. The test results obtained by almost all items in accordance with expectations. The discrepancy is found in the description of the E3 test, which is when the user submitted an evaluation answer that is still empty but the answer and value can still be submitted to an external database. Such discrepancies have little effect on media functionality and are a point of improvement for the development of this learning medium. Furthermore, the results of the media and material validity results show very high validity. Where the results of media validation were 90.3% and material validation was 87.5%. Furthermore, the developed interactive learning media is suggested to be able to display monitoring of activities that have been done by students in their respective accounts.

ACKNOWLEDGEMENT

Thank you to media and theory expert and Lambung Mangkurat University for funding this research.

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