



## Development of Website-Based Statistical Learning Media at Bina Sarana Informatika Pontianak University

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**Abstract:** This study aims to design and evaluate the effectiveness of website-based statistical learning media at Bina Sarana Informatika University, Pontianak. The media was developed using Lectora Inspire by following the ADDIE development model, which includes five stages: Analysis, Design, Development, Implementation, and Evaluation. The method applied in this study is research and development (R&D). The results of empirical tests conducted on students indicate that website-based statistical learning media is classified as adequate. The effectiveness measurement was carried out using the N-gain test, where the mean value obtained was 0.7679 or 76.79%. This means there was an increase of 76.79% in student understanding after using this media. Of the 100 students tested, 85 significantly increased understanding, with an average of 38.33 points between the pretest and posttest. These results place the effectiveness of learning media in the high category, indicating that this Media is efficacious in improving student learning outcomes. The results of this study indicate that website-based learning media designed with the ADDIE model can effectively improve students' understanding. This means that other educational institutions that want to improve the quality of their learning can adopt a similar approach, especially in subjects that require deep conceptual and analytical understanding, such as statistics.

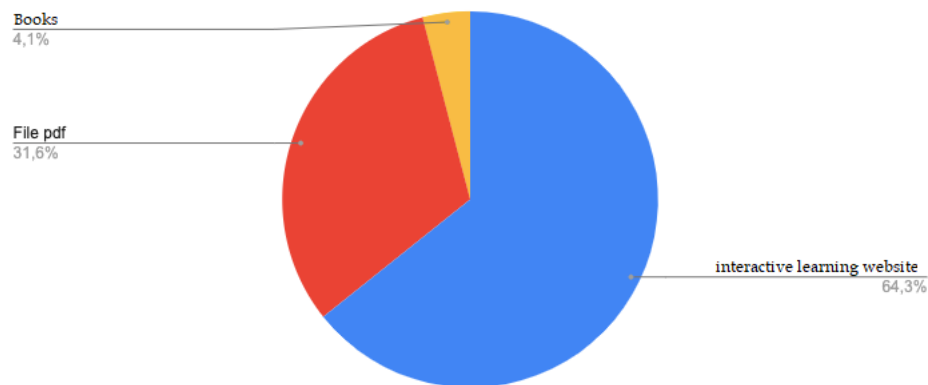
**Abstrak:** Penelitian ini bertujuan untuk merancang dan mengevaluasi efektivitas media pembelajaran statistik berbasis website di Universitas Bina Sarana Informatika Pontianak. Media tersebut dikembangkan menggunakan Lectora Inspire dengan mengikuti model pengembangan ADDIE, yang mencakup lima tahap: Analisis, Desain, Pengembangan, Implementasi, dan Evaluasi. Metode yang diterapkan dalam penelitian ini adalah penelitian dan pengembangan (R&D). Hasil uji empiris yang dilakukan pada mahasiswa menunjukkan bahwa media pembelajaran statistik berbasis website tersebut tergolong efektif. Pengukuran efektivitas dilakukan dengan menggunakan uji N-gain, di mana nilai mean yang diperoleh adalah 0,7679 atau 76,79%. Ini berarti bahwa terdapat peningkatan sebesar 76,79% dalam pemahaman mahasiswa setelah menggunakan media ini. Dari 100 mahasiswa yang diuji, 85 di antaranya menunjukkan peningkatan pemahaman yang signifikan, dengan rata-rata peningkatan nilai sebesar 38,33 poin antara pretest dan posttest. Hasil ini menempatkan efektivitas media pembelajaran dalam kategori tinggi, mengindikasikan bahwa media ini efektif dalam meningkatkan hasil belajar mahasiswa. Hasil penelitian ini menunjukkan bahwa media pembelajaran berbasis website yang dirancang dengan model ADDIE dapat secara efektif meningkatkan pemahaman mahasiswa. Ini berarti bahwa pendekatan serupa dapat diadopsi oleh institusi pendidikan lain yang ingin meningkatkan kualitas pembelajaran mereka, khususnya dalam mata pelajaran yang memerlukan pemahaman konseptual dan analitis yang mendalam seperti statistik.

## A. Introduction

Current technological advances have brought significant changes to the learning system. (Adesfiana et al., 2022) Information and Communication Technology (ICT) support is expected to be an educational innovation involving various technological components (Shalikhah et al., 2017; Latifah et al., 2020). Learning media is one of the main developments in the learning system in this digital era. Learning media includes various forms or types of tools used to help students in the learning process and convey information. This can be in the form of printed, audio, visual, or electronic materials applied in teaching. Media can generally be interpreted as humans, objects, or events that enable students to gain knowledge and skills (Mandasari et al., 2020). Learning media functions as a means to support smooth teaching (Apriani, 2023). In addition, this Media also includes online learning applications and platforms that allow students to learn anytime and anywhere with technological devices such as laptops or smartphones.

Learning media is essential in increasing the learning process's effectiveness and efficiency by offering students more engaging, interactive and personal methods (Ulimaz et al., 2023). Learning media can be adjusted to the desired goals and methods in its application. Appropriate media can also make it easier for students to understand concepts, improve cognitive and psychomotor skills, and encourage learning motivation (Tafonao, 2018). Therefore, learning media becomes crucial in the educational process at various levels, including in statistics learning. In the context of the Industrial Revolution 4.0, universities must adapt and organize competency-based education to produce graduates with skills per the fields in which they are engaged (Pitriani et al., 2021).

Learning media is not the only element determining success in the learning process. Using these media needs to be combined with appropriate learning methods, the selection of materials relevant to student's needs, and the influential role of lecturers in facilitating and motivating students to learn well. In this context, the development of learning media is significant because it can increase the effectiveness and efficiency of learning. Learning media includes various forms or types of tools used to help students learn or convey information during the educational process. Some innovations in learning media in the education system include digital media, animation and interactive graphics, educational games, augmented reality (AR), virtual reality (VR), and audio and video podcasts. These developments can increase learning effectiveness by offering students a more engaging, interactive, and personal approach (Said, 2023). However, the selection of learning media must be adjusted to the needs of students and learning objectives, and the technology and management capabilities of the lecturer must be considered. Based on an interview with the lecturer in charge of statistics, Mrs Latifah, it was found that the lecturer used PDF files to teach this material in teaching this material. On average, students experienced difficulties and got low grades. After the interview, the researcher conducted an initial needs analysis of students through a questionnaire distribution involving 98 respondents with the following results:



**Figure 1.** Initial Needs Analysis Questionnaire Results

From Figure 1, it can be concluded that the number of students who choose Website learning media is 64.3%, PDF files 31.6% and Books 4.1%. Interest in using media in learning cannot replace the role of lecturers in the learning process. Lecturers still have an essential role in facilitating and guiding students in learning and evaluating and providing feedback on student progress in the learning process. Therefore, using websites in learning must be balanced with the role of lecturers who are effective and responsive to student needs. A website is several pages with interrelated topics, sometimes accompanied by images, videos or other files (Sherley et al., 2021). The first research that supports website-based learning media is the first (Yunianta, 2018). The results reveal that this research produces website-based learning media for trigonometry material that is valid, practical, and effective.

The validation test results showed that the average score for material validity was 4.0, while the display validity reached 4.1. The practicality assessment test produced an average score of 4.2. This Media was tested and received a positive response, and it succeeded in increasing students' cognitive scores from 37.4 to 76.8. Thus, this website-based learning media is suitable for trigonometry learning – the second study from (Rahman, 2016) developing website learning media for PLC subjects. The media has gone through a validation process that has proven practical and effective. The trial results show that this Media is valid and has received positive responses from students and educators. Therefore, this web-based learning media is very suitable for use online in PLC teaching. The media has been validated, practical, and effective. The trial showed valid results. Students and educators gave positive responses. This learning web media is suitable for use online in learning PLC. The third study of (Wulandari et al., 2023a) focuses on developing website-based learning media for thematic learning literacy in grade V. Data analysis shows that website-based learning media effectively supports thematic learning literacy for grade V students.

The study's main objective is to develop and evaluate the effectiveness of website-based learning media designed explicitly for statistics courses at Bina Sarana Informatika University (BSI) Pontianak. Information and communication technology (ICT)-based learning is urgently needed in the increasingly advanced digital era, especially in higher

education (Divayana et al., 2016). Through the development of this website-based learning media, students are expected to understand complex and abstract statistical concepts more quickly. In addition, this Media is also expected to increase student involvement in the learning process and improve their learning outcomes. The specific objectives of this study were to identify the needs of students and lecturers related to statistics learning media. Through surveys, interviews, and observations, researchers attempted to understand the difficulties faced by students in learning statistics and what methods and tools were most effective according to lecturers in teaching this course. The data obtained will be the basis for designing features in website-based learning media. After identifying user needs, the objective is to design and develop learning media that suits those needs. This learning media will include various features, such as interactive learning modules, quizzes, statistical simulations, and discussion forums. The website design will be user-friendly, with an attractive appearance and easy navigation so users can quickly access the needed materials.

Furthermore, this website-based learning media was implemented for BSI Pontianak students. At this stage, the website that has been developed will be tested in a natural environment involving students who take statistics courses. This trial is essential to evaluate how the media is used by students, as well as to identify weaknesses or areas that need to be improved. Finally, the effectiveness of the learning media in improving student understanding and learning outcomes will be evaluated. The evaluation will be carried out through student learning outcome data analysis before and after using the website and through feedback from students and lecturers. In addition, researchers will also measure the extent to which this learning media can improve student learning motivation.

Based on the research above, valid, practical, and effective website-based learning media for each subject (trigonometry, PLC, and thematic) have been successfully developed. The media received a positive response from students and educators and is suitable for online learning. Therefore, developing website-based statistical learning media at Bina Sarana Informatika University Pontianak can increase learning effectiveness and improve the quality of education at Bina Sarana Informatika University. Given the background above, it is necessary to develop website-based learning media. Through this study, it is expected that the development of website-based learning media can be an effective solution in improving the quality of statistical learning at Bina Sarana Informatika University Pontianak. This study's results are beneficial not only for students but also for lecturers at the university. However, they can also be a reference for other educational institutions that want to develop similar technology-based learning media.

## B. Method

The research method used in this study is R&D (Research and Development). This method is used to create specific products and test the effectiveness of the product. (Sugiyono, 2013; Rohma et al., 2022). Researchers use R&D to develop website-based statistical learning media. This study uses a research and development model oriented towards the learning system ADDIE (Analyze, Design, Develop, Implement, Evaluation).

This study develops learning media by following the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation, through research and development procedures. The ADDIE model was chosen because it is flexible and can be adjusted to the problem's needs (Rasvani & Wulandari, 2021). The advantages of the ADDIE model, according to (Siregar, 2019), are 1) simple, 2) easy, and 3) systematic structure. This model was chosen because it was developed in a structured manner and based on fundamental theories in learning design. The product development procedure with the Addie model can be seen in the picture.

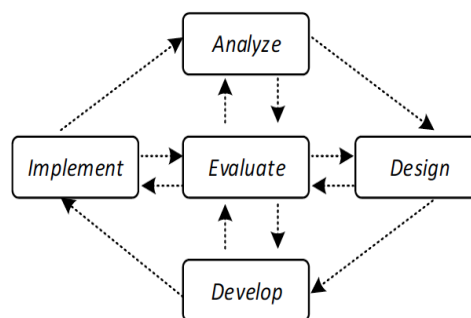


Figure 2. Stages of the ADDIE model (Sugihartini & Yudiana, 2018)

## C. Result and Discussion

### Result

Website-based statistical learning media was developed using the ADDIE model. The results of the researcher's findings in the field are as follows: (1) Analyze. The purpose of the analysis step in the design is to collect the necessary information before developing website-based statistical learning media. Researchers collect document analysis, instructional objective analysis, student characteristic analysis, campus facility and infrastructure availability, and relevant research analysis. Based on the document analysis, data on student learning outcomes in 2023/2024 were obtained, which showed that some students still needed to complete the survey and needed help understanding the slope and sharpness of index numbers. The results of the survey the researcher conducted showed that students prefer the media used in learning. Of 98 respondents with the results of 64.3% of students chose the website, 31.6% chose pdf files, and 4.1% chose books. The information obtained at the student characteristic analysis stage is the reason for choosing the development of website-based statistical learning media to facilitate the student learning process. (2) Design: This step begins with the media used. These media are the syllabus, RPS, and question-answer collection links. In addition to the media, a container has been determined to accommodate the media, namely Lectora Inspire. Then, the initial concept of the website-based statistical learning media design was created. (3) Developing The profile of website-based statistical learning media was developed using the Lectora Inspire application; the researcher carried out the development stages according to the sequence in

the ADDIE model: initial product development, which started by creating the specified media. The learning media design is an HTML website using Lectora. Learning materials, learning outcomes and Quizzes are taken from research results on statistics courses at BSI Pontianak University, then entered into Lectora and designed in such a way that it is website-based in the form of menus to display pages based on the selected menu. 2) results of initial product validation and revision. Initial product validation of website-based statistical learning media consists of six validators. The validators comprised two design experts, two media experts, and two material experts. At the validation stage by the design experts, each validator evaluated the initial product that had been developed by providing an assessment on the validation sheet that had been prepared. The components assessed in the validation sheet included aspects of appearance, content feasibility, language feasibility, and presentation feasibility. Table 1 below shows a recapitulation of the design expert validation using Aiken's V calculation:

**Table 1.** Recapitulation of Design Expert Validation

Aspect	Item	V Value	Category
Appearance	1,2,3,4,5,6	0.833	Valid
Content suitability	7,8,9,10,11	0.75	Valid
Language Eligibility	12,13,14,15,16,17	0.875	Valid
Presentation eligibility	18,19,20	0.75	Valid

From the recapitulation in Table 1, data was obtained that all aspects validated regarding the design of this website-based statistical learning media are feasible to use. This feasibility can be seen in appearance, content, language, and presentation feasibility, which are all valid categories. Although declared feasible, experts have submitted suggestions for further revision to improve the product. The next step is validating the material, which is carried out by two validators. The following Table 2 shows the recapitulation of the validation of material experts using the Aiken's V calculation:

**Table 2.** Recapitulation of Material Expert Validation

Aspect	Item	V Value	Category
Material	1,2,3,4	0.875	Valid
Construction and Language	5,6,7,8	0.937	Valid

Table 2 shows the overall results of each validated question item that has been declared valid and suitable for use in research. However, there are some suggestions from the validator and revisions. Next, media validation is carried out. This validation calculation is carried out to obtain data and media quality. Table 3 below summarises media expert validation using Aiken's V calculation.

**Table 3.** Recapitulation of Media Expert Validation

Aspect	Item	V Value	Category
Software engineering	1,2,3,4,5,6,7	0.785	Valid
Aspects of Learning Design	8,9,10,11	0.781	Valid
Visual Communication	12,13,14	0.75	Valid
Language	15,16	0.75	Valid
Evaluation	17,18	0.75	Valid

Table 3 shows the overall results of each validated statement item that has been declared valid, which means it can be used in research. However, experts have made suggestions. This improvement is a consideration for perfecting the product being developed.

The next stage, the product trial, is a one-to-one trial consisting of three people with diverse abilities. The findings from the one-to-one trial revealed that the quiz result storage was not functioning. From these suggestions, a revision was made to the place of access to collect the quiz. Furthermore, a small group trial was conducted with nine people. The response questionnaire that was previously given has been validated by (Wulandari et al., 2023b). The results of the small group trial phase response questionnaire are shown in Table 4 as follows:

**Table 4.** Recapitulation of small group trial results

Aspect	Item	Percentage	Information
Display and Presentation	1,2,3,4,5	92.89	Very good
Language	6,7	88.89	Very good
Benefits and Evaluation	8,9,10	90.37	Very good

The data in Table 4 shows that website-based statistical learning media is very good. The next is the field trial. The group in this field trial consists of twenty-one people, and students in this field trial consist of various levels of ability. This field trial directs students to fill out the provided response questionnaire. The recapitulation of the results of the field trial can be seen in Table 5 as follows:

**Table 5.** Recapitulation of Field Trial Results

Aspect	Item	Percentage	Information
Display and Presentation	1,2,3,4,5	95.24	Very good
Language	6,7	91.90	Very good
Benefits and Evaluation	8,9,10	95.56	Very good

From Table 5, website-based statistical learning media with the category very good and no revisions means it is suitable for use by students in learning activities. With the implementation of field trials and follow-ups that have been carried out based on good suggestions from validators and students, a website-based statistical learning media was

formed as the final product of this study. (4) Implement: The final product that has undergone several stages of expert validation and empirical testing can be applied in learning. Only students use the product at this implementation stage because statistics lecturers are very limited. Student preparation is one of the essential steps in the ADDIE model. The preparation carried out by the researcher is to prepare a learning implementation schedule. Students are trained to use website-based statistical learning media while implementing it in learning activities – implementation activities are carried out well and according to the predetermined schedule. (5) Evaluate: Each stage in the ADDIE model always has an evaluation stage. The evaluation results are intended to improve and enhance the development quality at each stage. In this study, in addition to evaluating each stage, the researcher also looks at student learning outcomes by measuring them using pretests and posttests. Before the questions are used in pretest and posttest activities, the instrument is prepared and tested to get good questions. The trial of the questions in this study was conducted on thirty students. The students who participated were fourth-semester students. After obtaining the value data, the data was processed using SPSS. Then, the output of the processed data was categorized. See the attachment for a recapitulation of the trial question value data processing results. The pretest and posttest activities were conducted on thirty students. From the pretest and posttest results, the average pretest and posttest scores were 49.68 and 88, which means there was a difference of 38.33. Furthermore, a normality test was carried out. In calculating the normality test in this study, SPSS 26.0 was used. The test results were to look at the output of SPSS 26.0 on the Shapiro-Wilk test as a guideline for decision-making. The following are the normality results of this study.

**Table 6.** Normality Test

	Kolmogorov-Smirnova			Shapiro Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
pretest	.187	30	.009	.919	30	.026
posttest	.189	30	.008	.866	30	.001

a. Lilliefors Significance Correction

Based on the normality test data above, it is known that the pretest sig value is 0.026, and the posttest sig value is 0.001. Based on the decision-making criteria that the significance value is  $<0.05$ , both the pretest and posttest values are not normally distributed. This study conducted the Wilcoxon test to determine the effectiveness of using website-based statistical learning media. The data used are pretest and posttest value data. The Wilcoxon test calculation was carried out with the help of SPSS 26.0. The guidelines for decision-making used in the Wilcoxon test are to see the difference in significance levels. The following are the results of the analysis using SPSS 26.0.

**Table 7.** Wilcoxon test

	<b>posttest - pretest</b>
<b>Z</b>	-4.817b
<b>Asymp. Sig. (2-tailed)</b>	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Based on the results of the analysis above, it is known that the significance value obtained is 0.000, which means this value is  $<0.05$ . There is a difference between before and after using website-based statistical learning media.

The N gain test was conducted to determine the magnitude of the influence of website-based statistical learning media on student learning outcomes. The calculation of N gain using SPSS, namely:

**Table 8.** Ngain Test

	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
<b>Ngain_skor</b>					
<b>Ngain_persen</b>	30	.40	1.00	.7679	.19390
<b>Valid N (listwise)</b>	30	40.00	100.00	76.7937	19.39006

Based on the analysis above, it is known that the mean value for the Ngain score is 0.7679, and the Ngain per cent value is 76.79%. The Ngain score distribution shows a mean of 0.7679 in the high category and the Ngain per cent effectiveness category with a value of 76.79% in the Effective category. The effectiveness category is in the practical category, meaning that website-based statistical learning media is effective.

## Discussion

In this section, the researcher will explain the research results obtained and relate them to relevant theories, concepts or research. The researcher explains based on the stages of the ADDIE model:

(1) Analyze: This research has presented several findings obtained at the analysis stage in developing website-based statistical learning media at Bina Sarana Informatika University, Pontianak. Based on document analysis, analysis of instructional objectives, analysis of student characteristics, analysis of the availability of campus facilities and infrastructure and analysis of relevant research, it was concluded that it is necessary to apply engaging learning media for learning statistical material so that it can create more effective, exciting learning and by current technological developments. This is included in the Educational Technology Area according to (Astuti, 2022). Statistics courses with the material of slope and sharpness of index numbers are materials that require practice. Website-based statistical learning media are designed with features such as materials, sample questions, exercises, and student feedback when working on questions on the website. The development of website-based learning media has been carried out by other studies, such

as research conducted by (Wulandari et al., 2023b), which developed an interactive multimedia website for learning at SMAN 1 Salatiga, Sambas Regency. The study showed that the website can help with teaching and learning activities. The development of website-based statistical learning media is also in line with cybernetic theory, which emphasizes the importance of feedback in the learning process.

(2) Design: Based on the conceptual framework, storyboard concept and flowchart created, the researcher determines the specifications and content of website-based statistical learning media by the RPS. This study aims to develop website-based statistical learning media for the slope and sharpness of index numbers that are easier to understand to achieve learning objectives more effectively. Lectora Inspire was chosen as the development software, an application for developing website-based statistical learning media. In (Rubiantica et al., 2021) research, he stated that Lectora Inspire is easy to use for beginners. Lectora can also be used offline and online, suitable for student flexibility regarding internet use.

(3) Develop. At this stage, the concept design of website-based statistical learning media is realized and transformed into a website that is useful and suitable for use by students of Bina Sarana Informatika University, Pontianak. The researcher uses the Lectora Inspire version 18 development software to combine multimedia and features used according to the specifications. Website-based statistical learning media has relatively low interaction by utilizing navigation and hyperlink features. The website-based statistical learning media profile on the opening display consists of a header, menu, body content containing welcome text, creator's name and footer. The second display is in the form of achievements with body content containing learning objective text. The material display consists of a discussion of the material, the following button for the following material page, the case study material page, the SPSS usage material page, the conclusion page, the Quiz page, the Quiz question page and the quiz result page. The learning media profile can be seen in Attachment 5. 1.

The website-based statistical learning media has been developed and tested by design, material, and media experts to ensure suitability for learning objectives. This process also includes an analysis of content diversity and the learning media's appeal. Assessment and evaluation are carried out to improve the media and meet the needs during the learning process. The validity test results conducted by the three experts indicate that this website-based statistical learning media is feasible to use, with several suggestions and improvements needed to optimize the user experience and improve the media quality before being tested on students. Users can access the website-based statistical learning media trial via a link: <https://zenynovia.github.io/>. Participants in the individual trial were three people; small groups were nine people, and in field trials, twenty-one people were present, which shows that the developed website-based statistical learning media is very feasible to use as a learning medium.

(4) implement and evaluate. This process is obtained through student preparation after several validations and trials, which show that the website-based statistical learning

media is feasible. The next stage is to prepare for implementation in authentic learning. Preparation for this implementation is supported by the head of the Bina Sarana Informatika University campus, which helps provide the facilities needed during the study, such as classrooms and internet connections. Internet connections are prepared to allow online access to website-based statistical learning media. Preparation involves 30 students who are given an explanation of the media to be used. Before learning begins, students are asked to access the internet first. The learning process can run smoothly and effectively with thorough preparation.

Students conducted a pretest and training using the product at the first meeting. After they understood how to use it, they studied the procedures for using SPSS accompanied by researchers. At the second meeting, namely, learning, students conducted a posttest. Generally, the pretest, product usage training, and posttest went smoothly.

Based on the results of calculating the pretest and posttest values, namely 49.68 and 88, there is a difference of 38.33. Then, several further tests were carried out, namely the normality test, which showed that the data was not normally distributed with a pretest significance value of 0.026 and a posttest significance value of 0.001. Furthermore, the Wilcoxon test showed that the significance value obtained was 0.000, indicating that there was a difference before and after the use of website-based statistical learning media, and the test of the effect of using website-based statistical learning media showed a mean value for Ngain score of 0.7679 and a Ngain per cent value of 76.79%. The Ngain score distribution category has a mean of 0.7679 in the high category, and the Ngain per cent effectiveness category has a value of 76.79% in the Effective category. The effectiveness category is in the practical category, meaning that website-based statistical learning media is effective.

#### **D. Conclusion**

This study successfully designed and developed website-based statistical learning media at Bina Sarana Informatika University Pontianak using the research and development method with the ADDIE model. Based on the results of the analysis, a significant difference was found between the pretest and posttest scores of 38.33, indicating increased student understanding after using this media. The Wilcoxon test also confirmed a significant difference before and after using learning media, with an N-gain effectiveness category of 76.79%, categorized as effective. The implications of this study indicate that website-based learning media can significantly increase the effectiveness of statistical learning among students. The success in developing this media with the ADDIE model also shows that this approach is suitable for developing other learning media, providing clear and structured guidance from the analysis to the evaluation stages.

For further research, it is recommended that this website-based learning media be tested on a broader scale and in various subjects to measure its effectiveness in general. In addition, further research can explore integrating more complex interactive features and analyze the long-term impact of using this media on student learning outcomes.

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