Web-Based Online Learning Platform with RAD and laravel Methods

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Abstract— The rapid advancement of technology has significantly impacted the field of education, particularly in providing broader and more efficient access to learning. One of the main problems in conventional learning systems is the limited access to learning materials, along with rigid schedules and physical constraints. This research was conducted to address these issues by developing a web-based online learning system that offers greater flexibility and accessibility for students at Universitas Nahdlatul Ulama Indonesia (UNUSIA). The e-learning system was developed using the Laravel framework due to its stability and scalability. Key features include user authentication, class selection, access to learning materials, exams, payments, and certification. The system development followed the Rapid Application Development (RAD) methodology, which consists of requirement planning, system design using UML, iterative development with user feedback, and testing using black box and User Acceptance Testing (UAT) methods. The implementation resulted in a functioning system with main modules such as login, dashboard, class access, exams, and certificate pages. Based on the UAT results, the system achieved a user satisfaction score of 95.6%, indicating strong acceptance and effectiveness in enhancing students' learning experiences. This web-based learning system is expected to support a more interactive, adaptive, and effective learning process in today's digital era.

Index Terms— E-learning; User Acceptance Testing; Laravel; RAD; learning.

I. INTRODUCTION

Technological developments have brought significant changes to various fields, one of which is in the field of education [1][2]. The use of technology in education can be an important factor in improving student learning outcomes. Technology helps students understand subject matter more easily and also improve their skills [3][4]. Therefore, a learning system is needed that allows easy and flexible access from any location and at any time. In addition, this system should allow the selection of classes that suit the needs of each user[5]. In developing and building an e-learning system, it is important to adopt an effective and efficient approach to ensure the system functions optimally and according to the needs of its users.

E-learning aims to create an electronic classroom that is equivalent to classes in formal education. The goal is to distribute learning materials in real-time, allowing students to immediately access the materials as they are uploaded [6]. Universitas Nahdlatul Ulama Indonesia (UNUSIA) can utilize e-course-based e-learning to provide materials that are more specific and focused on the skills that students want to improve. By using e-course, students can choose materials that suit their own needs. Many universities have implemented various programs to assist students in acquiring their desired skills, including UNUSIA. As a lecturer and student at UNUSIA, the researcher is very enthusiastic in utilizing this technology and makes this university a case study in research. UNUSIA is a university located in Jakarta and currently continues to improve the quality of its educational services through an e-campus-based e-learning platform.

However, many students still face difficulties in accessing learning materials due to the limitations of traditional learning systems, which are often inflexible and constrained by time and location. The lack of integration between technology and students' learning needs presents a major challenge in delivering effective and accessible education. Therefore, there is a need for an online learning system that can overcome these barriers and provide a more adaptive, flexible, and efficient learning experience.

The e-learning system developed using the Laravel framework is expected to make an important contribution to education by improving their learning experience and helping students acquire the skills they need. Many students experience limited access to materials due to the existing curriculum, so they cannot achieve the desired abilities. Therefore, technology is needed that can provide a better learning experience for all students. Laravel framework is one of the reliable solutions to achieve this goal.

The utilization of Laravel technology in the development of e-learning sites with RAD (Rapid Application Development) approach can accelerate the process of e-course system design. The RAD method is a model of the system development life cycle (SDLC) that emphasizes software development through shorter cycles [7]. This method is very helpful in shortening the

possibility of errors at the beginning in the creation and development of an e-course website system that uses the Laravel framework.

Previous research on the creation of e-learning systems revealed a number of shortcomings. The first research conducted by Pamungkas & Raharja [8] showed that the method used was less flexible and time-consuming because it prioritized the interface and the limited technology used. The second study by Prianto & Septanto [9] used the waterfall method , but the results were ineffective because the technology chosen was old technology that was no longer relevant to the latest developments. The third study conducted by Widyawati, et al [10] also showed weaknesses, where the technology used was a less recent version and the method applied was the waterfall method, which is considered less efficient because it is an outdated software development method.

This research aims to design, implement, and evaluate a web-based e-learning system by applying the Rapid Application Development (RAD) method and the Laravel 10 framework, in order to enhance learning flexibility and accessibility for students at Universitas Nahdlatul Ulama Indonesia (UNUSIA). The system includes various features such as user authentication (login and registration), transaction processing, class access and management, user account management, online exams, certificate generation, and support for multiple payment methods.

The development of this e-learning platform is essential to improve educational accessibility through an online environment. With e-learning, students can study flexibly and independently, overcoming geographic and time-related constraints commonly encountered in traditional education. Furthermore, e-learning enables the delivery of diverse classes and programs tailored to students' individual needs, thereby significantly enhancing the inclusiveness and effectiveness of higher education.

II. METHODOLOGY

The methodology used in the design of a *web-based online* learning *platform* with the RAD method and Laravel 10 using the system development method is applied using the RAD *(Rapid Application Development)* approach. Model of several *System Development Life Cycle* (SDLC) models. RAD is an information system development method that has a short development time, so it is considered suitable to be applied in the development of this system [11] The design of this method involves several stages of system development.
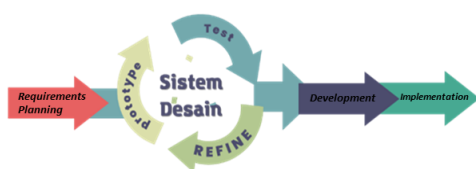

Fig. 1. RAD Development Cycle

A. Requirements Planning

This stage is the initial phase of system development, where problems are identified and data collection is conducted to define the system's goals[12]. In this study, data was collected through interviews and questionnaires involving 20 students and 2 academic staff members at Universitas Nahdlatul Ulama Indonesia (UNUSIA). The aim was to gather information regarding current obstacles in learning processes and understand the specific features users expect from an e-learning platform.

The results of this requirements analysis revealed several key needs, including easy login and registration processes, flexible course access, online payments, automated certificate generation, and a user-friendly interface. These identified needs became the foundation for the design and development of the system and were validated during subsequent phases of the RAD methodology.

B. System Design

This system design stage utilizes the Unified Modeling Language (UML) to create the proposed design and prototype. This design will later be implemented and used by the decision support team in the system. In this process, programmers and analysts work together to build and display visualizations of user designs and workflows [13]. Some of the diagrams used include case diagrams, activity diagrams, and class diagrams. The following is an explanation of each diagram designed for this system:

The use case diagram illustrates the three main actors in the system—Admin, Author, and User—and describes their interactions with the system. It presents the activities or functionalities that each actor can access, thereby helping to clarify user workflows and the system's primary features. The use case diagram for this system is shown in Figure 2.

Fig. 2. Use Case E-Learning

The activity diagram is used to model the workflow of activities within the system. It provides a visual representation of the process flow from start to finish, including decision points and branching conditions that may occur. This diagram helps in understanding the logical sequence of operations and the interactions that take place at each stage of the system. The activity diagram for this system is presented in Figure 3.
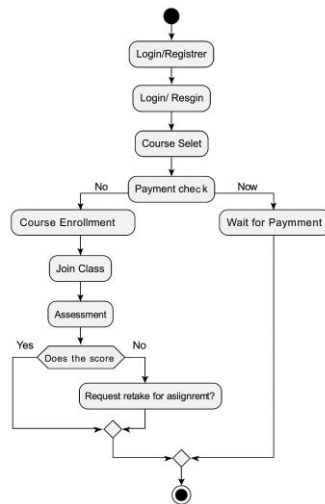
Fig. 3.   Activity Diagram E-Learning

The class diagram represents the static structure of the system, including classes along with their respective attributes, methods, and interrelationships. This diagram facilitates a better understanding of the system's data structure and the interactions between its components, serving as a foundation for the development of business logic and data models during the implementation phase. The class diagram for this system is presented in Figure 4.
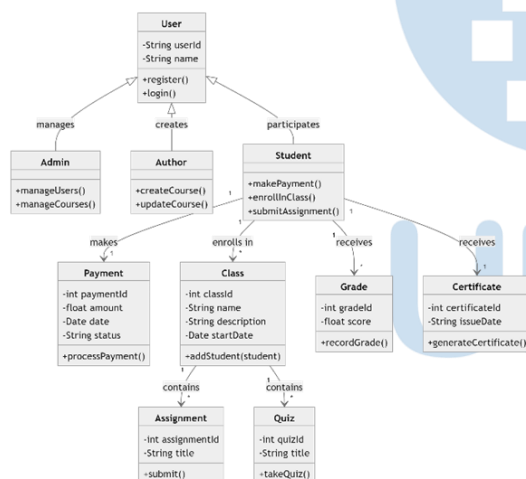

Fig. 4.   Class Diagram E-Learning

Figure 4 illustrates the class diagram of the e-learning system, which shows the static structure of the system, including its main classes, attributes, methods, and relationships. At the top of the hierarchy is the User class, which contains general attributes such as userId and name, along with basic methods like register() and login(). This class is inherited by three subclasses: Admin, Author, and Student. These subclasses do not define their own attributes explicitly in the diagram, as they inherit the common attributes from the User superclass. Instead, each subclass introduces specific methods relevant to their respective roles.

The Admin class includes methods to manage users and courses, the Author class contains methods to create and update courses, and the Student class is responsible for handling payments, enrolling in classes, and submitting assignments. The diagram also displays associations between other entities such as Class, Payment, Assignment, Quiz, Grade, and Certificate, each with relevant attributes and functions. Relationships like makes, enrolls in, receives, and contains help illustrate how the classes interact with one another throughout the learning process.

C. Development

The third stage in RAD is evaluating user feedback. This evaluation includes features, functions, visuals, and interfaces of the program being developed by the development team [14]. At this stage the programmer has done the coding for the system that has been designed.

D. Implementation

The last stage is system implementation, including system evaluation to ensure that the system can function properly and meet needs [15]. At this stage, various testing methods are applied, such as black box testing to verify functionality without examining internal structures, and User Acceptance Testing (UAT) to confirm the system's usability and alignment with user expectations. Additionally, this phase may involve deploying the system in a real-world environment, providing user training, and gathering feedback for any necessary refinements.

III.   RESULT

At this stage, researchers display the results of the system design in the form of a web page display that includes login, dashboard, main page, course, payment, exam, and certificate features. System testing is carried out using the black box method and User Acceptance Testing to ensure the functionality of each feature. The following is a more detailed explanation of each display.

A. Login Page

The login page is the user's initial access point to the system, where they enter their email and password. This page validates the credentials to ensure they match the stored data in the database. If the login is successful, the user is redirected to the main dashboard, where they can access system features based on their role and permissions. In cases where the credentials are invalid, the system displays an error message, prompting the user to re-enter their details or reset their password. Additional security measures can also be implemented to enhance protection against unauthorized access.
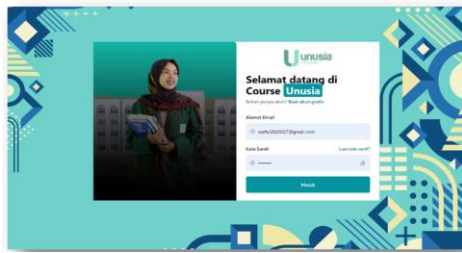
Fig. 5.   Login Page Display

B. *Dashboard Page*

The dashboard is the page after login that is designed to provide a summary of important information and quick access to key features. The dashboard displays statistics, notifications, and navigation to various parts of the system such as courses, payments, and exams, making it easy for me to get an overview and quickly access the features I need.
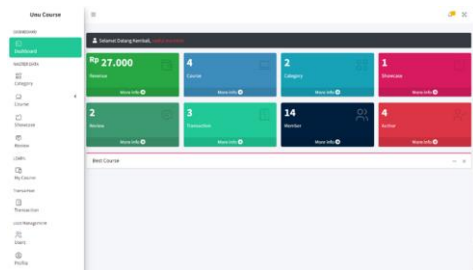

Fig. 6.   Dashboard Page Display

C. *Home Page*

The *home* page is a *landing page* that I designed as a starting point for system introduction. This page presents the main information about the system, key features, and easy navigation to other important sections. The goal is to give a good first impression and make it easier for users to explore the various features available.

Fig. 7.   Home Page Display

D. *Payment Page*

The payment page is the section where users can make transactions and payments for the courses they choose. This page uses Midtrans as a payment tool to facilitate secure and easy transactions. Users can select available payment methods, enter payment details, and

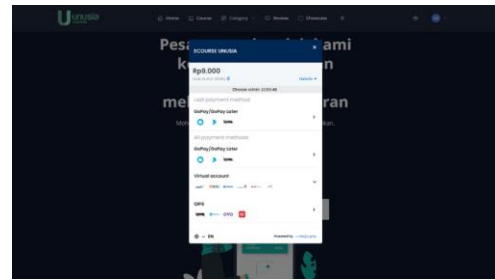complete the transaction with an integrated and secured process.

Fig. 8.   Payment Page Display Using Midtrans

E. *Learning page*

The learning page allows users to access the course materials and modules they have purchased. Here, I provide navigation to various sessions or course topics, complete with learning materials and interactive tools. This page is designed to make it easier for users to follow and complete the course efficiently.

Fig. 9.   Course Learning Page Display

F. *Exam Page*

The exam page is for multiple-choice tests accessible only after all class material is completed. It ensures participants finish all sessions before attempting the exam, reinforcing mastery of the material.
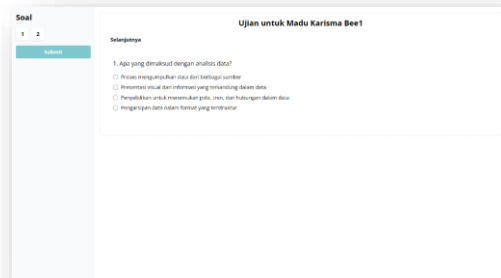

Fig. 10. Exam Page Display

G. *Certificate Page*

The certificate page is where users can view and download certificates after completing the exam with a score of 60 or above. After passing the exam, a

certificate will be generated and displayed on this page as proof of user achievement. This page is designed to make it easy for users to quickly access their certificate and ensure that they can save or print the certificate as official documentation.
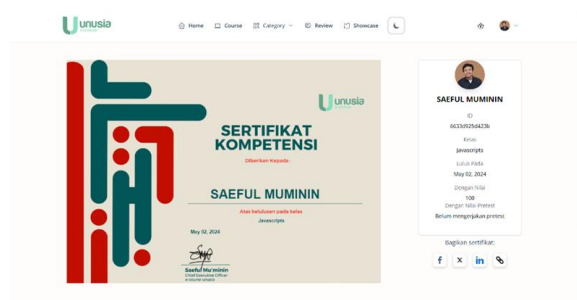

Fig. 11. Certificate Page Display After Exam Completion

H. Black box testing and user Acceptance Testing

This software testing focuses on evaluating the functionality of the system by checking whether the

system features work as expected. This process is performed based on various predefined input and output scenarios. This approach is known as black box testing, where the test only looks at the result without examining or accessing the source code.

The main goal of this testing is to ensure that every function in the system works according to predefined specifications. It also seeks to identify any bugs or discrepancies that may occur in the system's performance. The validation includes the input process, workflow, and results provided by the system, to ensure compliance with user needs and expectations.

The final stage of testing involves User Acceptance Testing (UAT), where end users test the system to ensure that the software meets their needs and expectations. UAT aims to ensure the system is ready to be used in real conditions, according to the user's desired specifications.

TABLE I Black Box Testing Website E-Learning

No	Testing	Test Case	Expected Results	Test Results	Conclusion
1.	Login Page	Enter email and password	Successfully logs into the system	Matches	Valid
2.	Dashboard View	Verify dashboard display	The dashboard is displayed with all elements	Matches	Valid
3.	Main Page View	Access the main page	The main page displays text and a list of classes	Matches	Valid
4.	Payment Page View	Display payment page	The payment page displays payment method	Matches	Valid
5.	Class Access Page	View purchased classes and gain access	The page shows purchased classes and confirms successful payment	Matches	Valid
6.	Class Exam Page	Display class exams	Shows exams input by admin or authors	Matches	Valid
7.	Certificate Page	Display certificates based on classes	Shows certificates corresponding to classes and user grades	Matches	Valid

Table 1 displays the results of black box testing conducted on the e-course system to verify whether each core feature functions according to its intended specifications. The testing involved simulating typical user actions and observing system responses without examining the internal code. Seven test cases were evaluated, covering the login process, dashboard display, main page access, payment processing, class access, exam functionality, and certificate generation. All features produced the expected results and matched the defined output scenarios, resulting in a conclusion of "Valid" for each case. These results indicate that the main components of the system function correctly and are ready for real-world use.

TABLE II UAT Question Items for Assessing E-Course Usability

No	Question Code	Statement
1	Q1	I find the e-course website easy to use.
2	Q2	I find the interaction system on the e-course website to be simple.
3	Q3	I find that many features on the e-course website are easy to remember.
4	Q4	I find that the e-course website requires a reasonable amount of time to complete tasks.

5	Q5	I find it easy to understand how to use the e-course website.
6	Q6	I find that errors frequently occur while using the e-course website.
7	Q7	I am satisfied with the e-course website's ability to meet my needs.
8	Q8	I find it easy to learn how to use the e-course website.
9	Q9	I find it difficult to use the e-course website.
10	Q10	I am confident that I can use the e-course website effectively.

Table 2 presents the list of statements used in the User Acceptance Testing (UAT) to evaluate the

usability and user satisfaction of the e-course website. Each item is designed to measure different aspects of user experience, such as ease of use (Q1, Q5), interface simplicity (Q2), memorability of features (Q3), task efficiency (Q4), and system reliability (Q6). Additionally, the questionnaire assesses user satisfaction (Q7), learnability (Q8), perceived difficulty (Q9), and user confidence (Q10). The combination of positive and negatively worded statements ensures a more balanced evaluation, helping to identify both strengths and potential usability issues in the system from the end-user perspective.

TABLE III E-Learning UAT Calculation Results

No.	Answer Scores from UAT Results					Total Score	Average	| Percentage%
	SS	S	N	TS	STS			
Q1	15	5	0	0	0	95	4.75	95%
Q2	15	5	0	0	0	95	4.75	95%
Q3	16	3	1	0	0	95	4.75	95%
Q4	17	2	1	0	0	96	4.8	96%
Q5	16	4	0	0	0	96	4.8	96%
Q6	17	3	0	0	0	97	4.85	97%
Q7	18	1	1	0	0	97	4.85	97%
Q8	17	2	1	0	0	96	4.8	96%
Q9	16	2	2	0	0	94	4.7	94%
Q10	16	3	1	0	0	95	4.75	95%
Average = (Total Percentage / Total Questions)						95.6%		

The results of the User Acceptance Testing (UAT), as presented in Table 3, indicate a high level of user satisfaction with the e-course system. A total of 20 respondents were involved in the testing process, selected purposively from active students at Universitas Nahdlatul Ulama Indonesia (UNUSIA) who were directly involved in using the system during the trial phase. This number was determined based on time constraints, resource availability, and access to representative end users during development. The UAT consisted of ten statements evaluated on a 5-point Likert scale, ranging from Strongly Disagree (STS) to Strongly Agree (SS). The responses showed consistently high ratings, with most questions receiving scores of 95% or higher. The highest scores were observed in Q6 and Q7 (97%), indicating strong user agreement on system reliability and satisfaction. The lowest, Q9 (94%), still reflects a high acceptance level despite minor difficulties. The overall average satisfaction score reached 95.6%, confirming that the system is user-friendly, functional, and ready to be deployed in a real educational environment

IV. CONCLUSIONS

This study concludes that the implementation of a web-based online learning platform using the Rapid Application Development (RAD) method and the Laravel framework has successfully achieved the research objectives. The system has been implemented with core features such as user authentication, class access, payment, assessment, and certificate generation. Through black box testing and User Acceptance Testing (UAT) with 20 student respondents, the system demonstrated high functional reliability and user satisfaction, with a satisfaction rate of 95.6%. These results indicate that the system is capable of supporting a self-directed, flexible, and accessible learning experience for students at the Nahdlatul Ulama University of Indonesia (UNUSIA). Despite its effectiveness, the current version of the system has some limitations. The system lacks real-time communication features such as discussion forums or video conferencing, and user testing was limited to a relatively small sample. Future work may involve expanding the system with interactive features, broader user testing, integration with mobile platforms,

and the use of AI to provide adaptive learning pathways. These improvements will further enhance the platform's usability, scalability, and relevance in meeting evolving educational needs.

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