IMPLEMENTATION OF A WEB-BASED SYSTEM FOR GRADING AND COURSE MANAGEMENT

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Abstract

In today's world, digitalization has become increasingly important in all areas of life, including education. This paper presents the implementation of a web-based system for grading and course management that aims to help teachers and students in Kosovo manage courses and assessments more efficiently. The system features a test evaluation module that allows teachers to create and manage tests and enables students to take tests on their desktop or mobile devices, providing detailed feedback on their performance. Furthermore, schools need to adopt digital solutions to provide students with easy and convenient access to educational resources. One of the key features of our system is a module that allows students to access books with an easy-to-use interface for navigating between chapters. Overall, the system aims to simplify grading and course management for teachers, while improving efficiency and effectiveness, resulting in better learning outcomes for students.

Keywords: school, grade, book, assessment, system.

1. Introduction

In today's digital age, technology has become increasingly important in education. However, in many educational institutions in Kosovo, traditional grading methods that rely on physical, paper-based tests are still being used. This approach not only consumes a significant amount of time for teachers to grade the tests, but it also makes it difficult for students to manage their answers and keep track of their performance. We have created a web-based system for course and grade management that allows students to access educational materials, attend quizzes, take tests, and submit projects. The quizzes and tests will be created and compiled by the subject teacher, and the system will automatically calculate each student's grades based on their points in all the tests.

This system will improve the efficiency and effectiveness of grading and course management while providing students and teachers with easy and convenient access to electronic books as divided chapters or PDF files.

Our paper presents the implementation and features of this system, aiming to help teachers and students manage courses and assessments more efficiently, ultimately leading to improved learning outcomes for students. The adoption of this system represents a positive step towards modernizing the educational system in Kosovo and facilitating the transition towards a digital era of education.

2. Problem Definition

Our analysis of the educational system in the "Jeta e re" Gymnasium in Suhareka, Kosovo, suggests that relying solely on paper tests taken once to four times a year is not always reliable and may not provide an accurate assessment of students' knowledge. Furthermore, carrying physical books to class or libraries can be a challenge, particularly for primary school students. In recent years, the need for school materials to be accessible on desktop devices or smartphones has become important, as students require the flexibility to study anywhere, at any time.
We believe that implementing a web-based course management system with assessment and grading features can greatly improve students' academic performance.

3. State of the Art

According to [1] the evolution of modern teaching methods has brought improved access to resources. In the past, books were the primary source of valuable teaching materials. However, the advancement of educational technology has provided access to online educational resources and up-to-date web content that can supplement lessons and enhance learning. With the advancement of technology, teachers now have access to various tools that enable real-time interaction with their students. Traditional teaching methods, such as using a projector with paper to reveal answers, have been modernized with the help of educational software.
Some universities in Kosovo have adopted Moodle, a web-based application for course management. Moodle allows students to access their course materials and assignments from anywhere in the world, as long as they have an internet connection. Moodle also offers a default mobile-compatible interface, which means that students can access the platform from their mobile devices, making it easier for them to stay up-to-date with their coursework on-the-go. Furthermore, Moodle has cross-browser compatibility, ensuring that the platform's content is easily accessible and consistent across different web browsers and devices. [2] Taking into consideration the benefits of Moodle's mobile compatibility and cross-browser compatibility, our web-based grading and course management system will also prioritize responsive design, ensuring that students and teachers can easily access the platform and its features from any device, including smartphones and tablets.
One of Moodle's features is the powerful quiz tool, which enables educators to design and build quizzes with various question types such as multiple choice, true-false, short answer, and drag-and-drop images and text. [3]. In our system, we will focus on providing multiple-choice questions, which will simplify the quiz-creation process and make it easier for students to complete assessments.

4. System architecture and implementation

Combining programming languages together with Laravel Framework and different libraries, provided a solid foundation for the development of the course management and grading system. These technologies include:
   PHP: Laravel framework is built using PHP language, thus this is the main programming language used in the development of the system. Using version 9 of Laravel Framework made the process of development quick and efficient.

JavaScript was used for front-end development, handling interactive elements of the system, such as dynamic page content.

HTML/CSS/SCSS were used to create the user interface, including the structure and style.

jQuery provided features such as event handling in the front-end development.

MySQL was used as a Database Management System to store the information for three types of users, courses, grading and different assessments.

Apache Web Server: To develop the system locally, we have used Apache Web Server.

The system is designed to perform three main modules:

The first module is the management of teachers, students and subjects. This task is managed by the system administrators who can perform the following operations:
- View and manage the list of students and teachers in the system.
- Add, update, and delete student and teacher profiles as needed.
- View and manage the list of academic subjects offered by the institution.
- Assign or remove a teacher for a particular subject.

The second module is the management of books content. This task is also handled by the system administrators. The option to manage books and their content provides a way for administrators to ensure that the content being offered to students and teachers is accurate and up-to-date with the physical books provided by the publishing companies. By maintaining an updated list of books and chapters, the system can provide a high-quality learning experience for students. The functions for this task include:
- View and manage the list of books and chapters.
- Update book details and add or update chapters for a book.

The third module of the system provides grading functionality based on student assessments, including quizzes, tests, exams, and projects. With this module, teachers can add and manage assessments, as well as monitor student performance and progress. The system then calculates the students' grades. With the implementation of this module, teachers can save valuable time and effort by automating the grading process, eliminating the need to manually check physical tests and store physical drafts. This allows teachers to focus more on providing personalized feedback and support to students, leading to improved learning outcomes. With the results available as soon as the test is completed, teachers can make informed decisions regarding student progress and success, as well as identify areas where students may need additional support or resources. The instant feedback provided by the system can also help students track their progress and identify areas where they need to focus their efforts. Additionally, students can take these assessments on desktop or mobile devices. This allows students to take assessments in their preferred environment, which can lead to a more comfortable and focused testing experience.

The system is developed using **Model-View-Controller (MVC)** framework architectural pattern. MVC separates the system into three main logical components **Model, View, and Controller**. This architectural pattern isolates the business logic and presentation layer from each other. [4]

In this section, we will provide the database schema and implementation of each module. To have a more understandable view, we have only shown the tables that are specific to each module. We used the "hide" option in phpMyAdmin Designer to hide any tables that are not relevant to the module being discussed. First, we will provide an overview of the schema for the teachers, students, and subject management module, shown in Fig. 2. This includes detailed information on the tables and relationships used in this module.
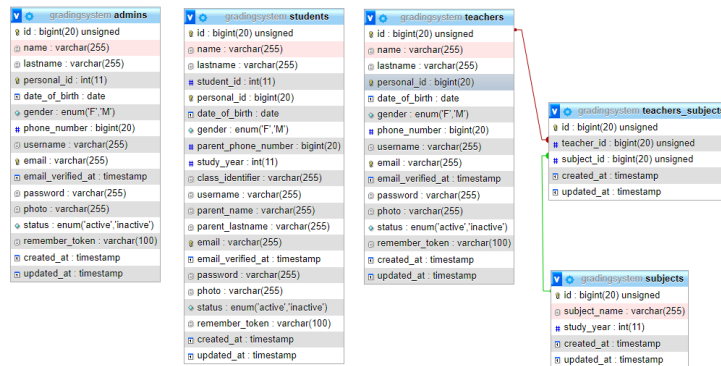
Figure 1. Database schema of the first module

Below, we have provided the implementation for the first module that handles the management of students, teachers and the subjects of each teacher.
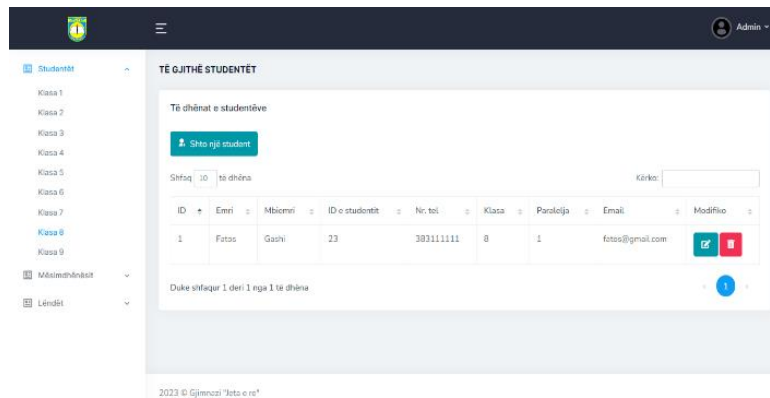

Figure 2. Students 'list

On this page (Fig.3.), the administrator can select a class and view a list of all students registered in that class. With this list, the administrator can perform various actions, such as adding a new student, modifying existing student information, or deleting a selected student.

When the administrator clicks the button to add a new student, the below form will appear for inputting the necessary information:

Figure 3. Add student page

After filling in the required information, these data are handled by the validate () method to ensure that the data is in the correct format. When the administrator clicks the delete button for a specific student, a confirmation dialog will appear to ensure that the administrator wants to proceed with the deletion. (Fig. 5.)
If the administrator clicks "Yes" in the confirmation dialog, the selected student will be deleted and the administrator will be redirected to the student list. If the administrator clicks "No", the student will not be deleted and the administrator will remain on the same page without any changes to the student list.
The same procedures as adding and deleting the students are performed for adding, deleting, and updating teachers or subjects.
As mentioned in the section on modules, the second module of the system focuses on the management of books and their content by the system administrators. This module allows administrators to view and manage the books for a selected subject and their corresponding chapters. With this module, administrators can update book details such as the book's name and subject.
Additionally, administrators can add new chapters to a book or update existing chapters with new content. Below we have provided the database schema showing the table's variables and the relationship between the tables:
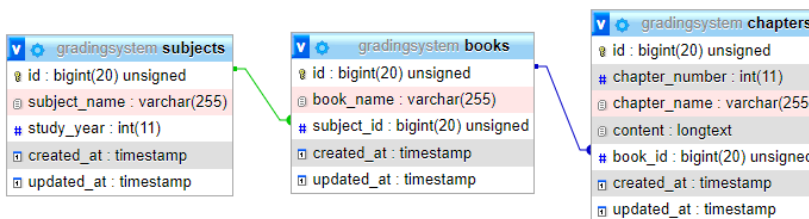

Figure 4. Database schema of the second module

The student panel displays a list of subjects based on the logged-in student's study year (for example, study year 8). Once a subject is selected, a list of chapters for that subject appears below the subject name (Fig.7.).

When a chapter is selected, it is displayed along with navigation options such as "previous" and "next" to allow easy navigation between chapters within the selected subject.

This user-friendly design provides students with a clear and organized way to access their course materials and facilitates their learning process. By enabling students to easily navigate between chapters and subjects, the system can help to provide a more engaging and effective learning experience.

Figure 5. Chapter content

The primary focus of the system is the third module, which involves managing grades using quizzes, tests, and other forms of evaluation, such as projects. As an implementation example of this module, we have chosen the quiz evaluation feature which in this paper will be referred to as "test". The database schema for the test feature is shown in Fig. 8. The database table and variables are displayed, along with their relationships. To avoid redundancy, we have not provided the variables for teachers, subjects, and students tables, as they have already been included in the previous database schemas.
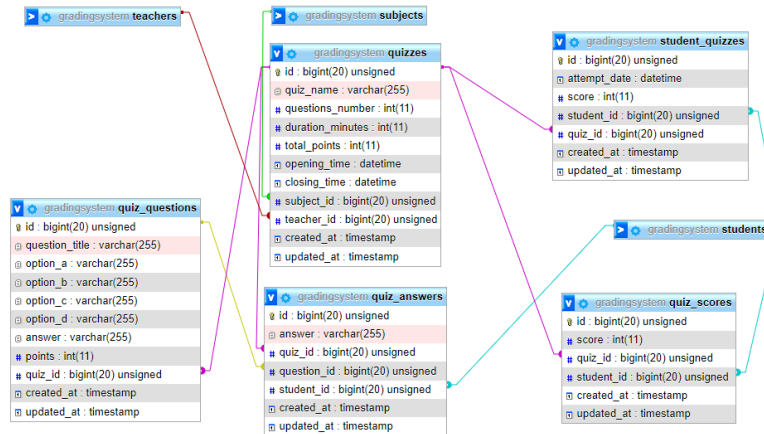

Figure 6. Database schema of the third module

The system provides teachers the functionality of creating tests, which include the name, number of questions, duration of the test, total points for all the questions, and opening and closing time of the test. Once a test is created, teachers can add questions with titles, options, correct answers, and points. These tests are then made available to students using the sidebar panel, where they can access them from the test list under the relevant subject, as in the below picture:
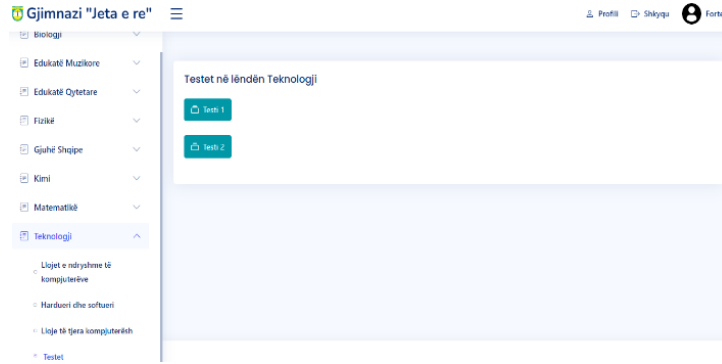
Figure 7. Tests list for the selected subject

After selecting a test, the student will be able to view important test information such as the name of the test, number of questions, duration, points and starting and ending time of the test as below:
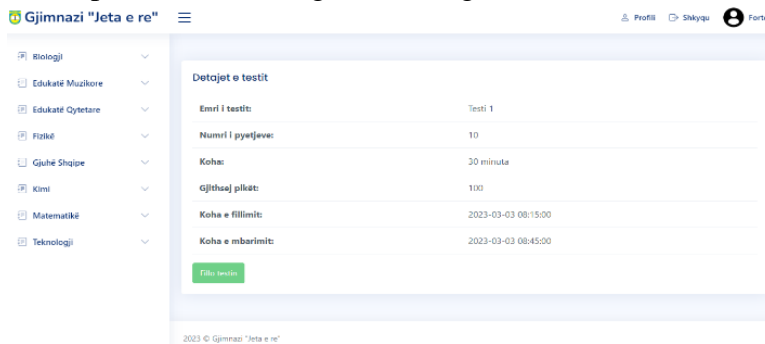

Figure 8. Test details

If the test has already started and has not yet finished, the system will display the "Take test" button, otherwise, if the student has not made it on time or is early, the "Test not available" button will be displayed. Once the student takes the test, the questions will be displayed with their corresponding options, and a timer indicating the remaining time will be displayed at the top of the page (Fig.11). If the time duration set for the test runs out, the student's answered questions will be automatically saved to the database, and any unanswered questions will be saved as blank.
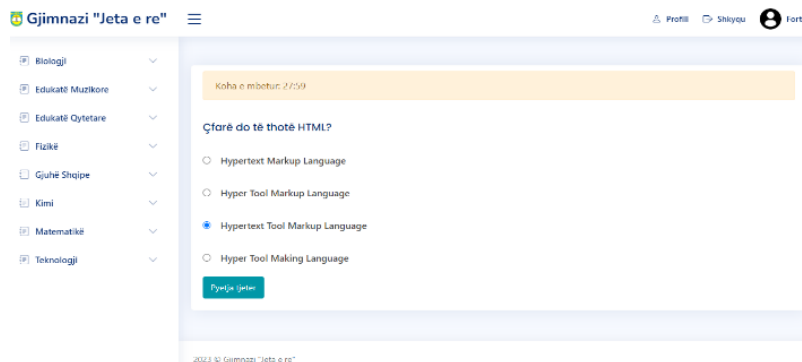

Figure 9. Test questions

The student will not be given the option to go back to the previous question, therefore the button "next question" will be displayed until the second last question. When the last question appears, the button changes to "submit". (Fig. 12)
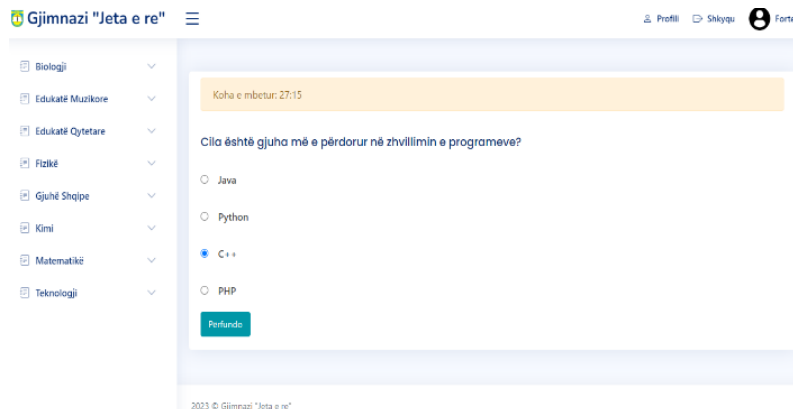

Figure 10. Last question of the test

After the student submits the test or if the time runs out, the system will display the test results with the total points, percentage, and the number of all questions of the test, all answered questions, and incorrect answers (Fig. 13). In addition to this, the system will provide students with a detailed review of their answers. The review will include all answered questions with the correct answers in a table format, with incorrect answers highlighted in red and correct answers in green. This feature provides students with a better understanding of their performance.
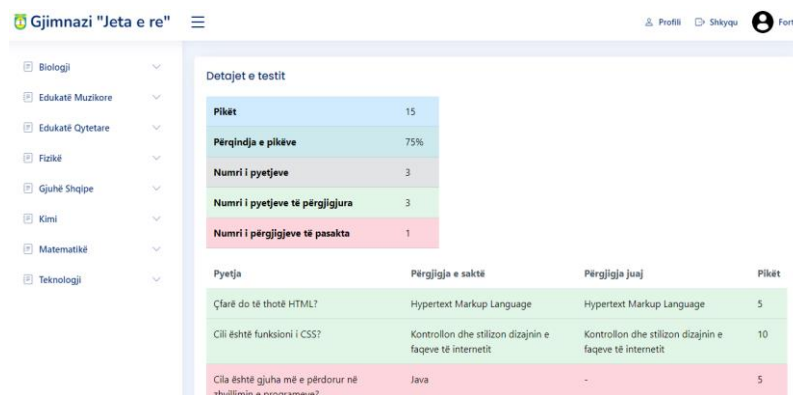

Figure 11. Test results

The results of each student for each class and every taken test will be displayed on the teacher's dashboard just like on the student's dashboard, and then calculated.

5. Conclusions

In conclusion, the implementation of a web-based grading and course management system is an important step towards improving the level of education in primary schools and high schools in Kosovo.

We concluded that by providing teachers with the option to easily create and manage tests and access immediate results, the system saves time and improves the accuracy of grading. Similarly, by allowing students to take tests and submit projects electronically, the system eliminates the need for paper-based assessments and provides detailed feedback on performance, improving the learning outcomes for students.

Moreover, providing easy and convenient access to electronic books, divided into chapters or PDF files, offers students a more engaging and interactive learning experience. By facilitating effective course and grade management, the system streamlines administrative tasks for teachers, allowing them to focus on teaching and guiding students toward success.

Overall, based on the literature reviewed in the State of the Art chapter, the web-based grading and course management system presented in this paper offers an innovative solution that is well-suited to the demands of today's digital age. By implementing this system, educational institutions can improve their efficiency, accuracy, and quality of education, benefitting students, teachers, and administrators alike.

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