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An Integrated Students Practical Report Submission System for Tertiary Institutions

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ABSTRACT :

The management of practical courses in tertiary institutions involves several activities, including course allocation, practical question distribution, submission of student reports, deadline monitoring, and management of academic records. When these activities are handled manually, lecturers may encounter difficulties in distributing practical assignments, receiving reports, tracking submissions, and maintaining organized records, while students may experience delays and uncertainty regarding submission deadlines. This paper presents an integrated web-based practical report submission and course management system designed to support the administration of practical coursework in tertiary institutions. The system provides three principal user roles: administrator, lecturer, and student. The administrator manages staff, students, courses, and course-to-lecturer allocations. Lecturers access their allocated courses, publish practical questions or project briefs, specify submission deadlines, and manage student submissions. Students access registered courses, view practical questions and deadlines, and submit their practical reports electronically within the specified submission period. A role-based access structure is employed to ensure that users access functions appropriate to their responsibilities. The developed system was implemented as a web-based application and evaluated through functional verification of its principal modules and user interfaces. The implementation demonstrates an integrated workflow linking course administration, lecturer assignment management, practical question publication, deadline specification, and student report submission. The system provides a centralized mechanism for managing practical coursework and establishes a foundation for reducing dependence on paper-based report submission and fragmented communication between lecturers and students. The work demonstrates how a focused academic web application can complement existing institutional learning technologies by addressing the specific workflow of practical report management.

Keywords: Practical report submission, tertiary education, web application, e-learning, course management, academic administration, online assessment, student portal.

Introduction

Practical courses constitute an important component of tertiary education, particularly in disciplines such as computer science, engineering, information technology, laboratory sciences, and other technology-oriented programmes. Practical activities enable students to apply theoretical knowledge to real-world or laboratory-based problems and provide opportunities for developing procedural, analytical, and problem-solving skills. Consequently, the management of practical activities requires effective coordination between academic administrators, lecturers, and students. The increasing adoption of digital technologies in higher education has resulted in the development of learning management systems, virtual learning environments, online assessment platforms, and other digital tools for supporting teaching and learning. A systematic review of online teaching and learning research found that higher education represents a substantial proportion of online learning research and identified learner, course, instructor, and organizational factors as important dimensions of online learning environments [1]. Similarly, research on learning management systems has examined technology acceptance, system usefulness, ease of use, and contextual factors influencing the adoption of digital learning platforms [2], [3].

Despite the availability of general-purpose learning management systems, practical coursework may involve institution-specific workflows that are not always directly addressed by conventional platforms. Practical courses require the distribution of practical questions, specification of submission deadlines, collection of reports, identification of students associated with particular courses, and appropriate association of submissions with lecturers responsible for the courses. A virtual laboratory management study, for example, describes systems in which instructors manage assessment questions and schedules while students view and submit assignments through an online platform [4]. These functions demonstrate the value of integrating practical learning activities with digital management mechanisms.

In many tertiary institutions, practical reports may still be submitted through paper documents, physical storage devices, email, messaging applications, or other fragmented mechanisms. Such approaches can make it difficult to maintain consistent records, determine whether a student has submitted a report, identify the lecturer responsible for a course, and enforce submission deadlines. They can also increase the administrative burden associated with organizing and retrieving reports. The system presented in this study addresses this problem through an integrated web-based practical report submission platform. The application was designed around three principal actors: administrator, lecturer, and student. The administrator controls the

institutional records maintained by the application, including staff, students, courses, and course allocations. Lecturers manage practical activities associated with courses allocated to them, while students access their courses and submit practical reports electronically. The implemented system is demonstrated through a home page and separate administrative, student, and lecturer interfaces. The submitted implementation contains an administrator dashboard for course and user management, a student dashboard for course access, and a lecturer workspace for publishing practical questions and defining submission deadlines.

The main contributions of this study are therefore the development of an integrated role-based platform for practical report management, the integration of course allocation with practical assignment management, the provision of deadline-controlled electronic report submission, and the implementation of separate interfaces for administrators, lecturers, and students.

Literature Review

Digital Technologies in Higher Education

Digital technologies have become an important component of contemporary higher education. Online learning environments provide mechanisms through which learning resources, assignments, communication, assessment, and learner activities can be managed electronically. Martin et al. [1] reviewed 619 publications on online teaching and learning and identified learner engagement, presence, interaction, participation, course-related factors, and organizational issues among the major research themes.

Learning management systems have particularly contributed to the organization of online teaching and learning. Al-Nuaimi and Al-Emran [2] reviewed 732 studies and identified major theoretical approaches used to investigate LMS adoption, including the Technology Acceptance Model, DeLone and McLean information systems success model, UTAUT, TRA, DOI, and UTAUT2. Their findings indicate that individual, contextual, and psychological factors can influence the use of learning management technologies.

The adoption of learning technologies also depends on the perspectives and practices of academic staff. Liu et al. [3], in a systematic review of 131 studies, reported that academic adoption of learning technologies is influenced by the technology itself, academics, organizational context, and implementation strategies. This suggests that an educational platform should not merely provide technological functionality but should also align with the practical workflow of its intended users.

Learning Management Systems and Online Assignment Management

Learning management systems provide centralized environments for distributing learning materials, communicating with students, managing assessments, and collecting academic work. Moodle, for example, has been extensively investigated as an LMS in STEM and higher education. Gamage et al. [5] conducted a systematic review of 155 journal articles and found extensive use of Moodle in university and STEM education, including applications involving online assessment and collaborative learning.

Online homework and assignment submission have also been investigated. Magalhães et al. [6] conducted a systematic review of 31 studies comparing online and traditional homework. Their findings indicated that evidence concerning student performance varies across studies and contexts, demonstrating that moving an assignment online does not automatically guarantee improved learning outcomes. This distinction is important for the present study because the proposed system is primarily concerned with improving the **management and workflow of practical reports**, rather than claiming that electronic submission alone improves academic achievement.

Digital Management of Practical and Laboratory Activities

Practical and laboratory-based learning introduces requirements that differ from conventional content delivery. Students may need to perform experiments or practical tasks, record observations, prepare reports, and submit their work to instructors. Digital laboratory systems can provide additional mechanisms for managing these activities.

Achuthan et al. [4] investigated a remote laboratory platform and reported that online laboratory environments can support interaction, individual experimentation, assignment completion, and flexible access to practical activities. Their system incorporated instructor and student privileges and mechanisms for assignment management and submission.

More recently, Zhang et al. [7] presented a laboratory medicine teaching management system incorporating teaching-plan management, activity documentation, evaluation, feedback, workload aggregation, and visualization. Their work demonstrates the continuing development of specialized digital systems for managing teaching workflows that may not be completely addressed by generic educational platforms.

The present study follows this specialized-system approach. Instead of attempting to reproduce a complete LMS, the proposed application concentrates

on a particular institutional workflow: administrator-controlled course allocation, lecturer-controlled practical question publication, deadline specification, and student practical-report submission.

User Acceptance and Usability Considerations

The usefulness of an academic information system depends not only on the availability of functions but also on whether its intended users can understand and use those functions effectively. Davis et al. [8] established the Technology Acceptance Model and demonstrated the importance of perceived usefulness and perceived ease of use in technology acceptance.

This consideration influenced the design of the present system by separating functionality according to user roles. Rather than presenting administrators, lecturers, and students with the same interface, each user category is provided with functions associated with its responsibilities. Such separation can reduce unnecessary interface complexity and provide clearer workflows.

Research Gap

Existing learning management systems and digital learning platforms provide broad facilities for teaching, assessment, and communication. However, the literature also indicates that institutions frequently implement specialized tools to address local teaching and administrative workflows [2], [3], [7]. A specific gap addressed by this study is the integration of course administration, lecturer allocation, practical-question publication, deadline management, and student practical-report submission within a single focused application.

In a conventional workflow, an administrator may maintain course and staff records separately, lecturers may distribute practical questions through different communication channels, and students may submit reports through paper, email, messaging platforms, or removable storage. Such fragmentation makes it difficult to maintain a unified relationship between a course, its lecturer, its students, the practical question, the deadline, and the submitted report.

The proposed system therefore focuses on the following research problem:

How can a role-based web application integrate institutional course management with lecturer-controlled practical-question publication and deadline-based electronic submission of student practical reports?

The novelty of the work should be stated carefully. The contribution is not the invention of online assignment submission itself, since this functionality exists in established LMS platforms. Rather, the contribution lies in the design and implementation of an integrated workflow specifically centered on practical report management and linked directly to institutional course allocation and role-based administration.

Objectives of the Study

The general objective of this study is to develop an integrated web-based practical report submission system for tertiary institutions.

The specific objectives are to:

- develop an administrator module for managing students, lecturers/staff, and courses;
- provide functionality for allocating courses to lecturers;
- provide lecturers with access to courses assigned to them;
- enable lecturers to publish practical questions or project briefs;
- enable lecturers to specify submission deadlines;
- provide students with access to their registered courses and practical activities;
- enable students to upload and submit practical reports electronically;
- associate submitted reports with the appropriate course and lecturer;
- provide role-based access to administrative, lecturer, and student functions; and
- provide a centralized platform for managing practical report submission records.

Proposed System

System Overview

The proposed system is a role-based web application designed to manage practical coursework from course allocation through report submission. The application consists of three principal user categories: administrator, lecturer, and student.

The administrator represents the institutional management layer of the system. The administrator registers and manages courses, students, and lecturers and performs course allocation to lecturers. This ensures that lecturers only manage practical activities associated with courses assigned to them.

The lecturer represents the academic management layer. After authentication, the lecturer accesses allocated courses and can configure practical activities for those courses. A practical activity consists primarily of a practical question or project brief and a specified submission deadline. The lecturer can subsequently access reports submitted by students for the relevant practical activity.

The student represents the submission layer. Students authenticate into the system and access courses available to them. They can view practical questions and associated deadlines and submit their practical reports electronically through the platform.

This role structure establishes a relationship among the three major entities:

Administrator → Course Allocation → Lecturer → Practical Question/Deadline → Student → Practical Report

System Architecture

The architecture consists of a presentation layer, web application layer, business-logic layer, data/file-storage layer, and security/access-control mechanisms.

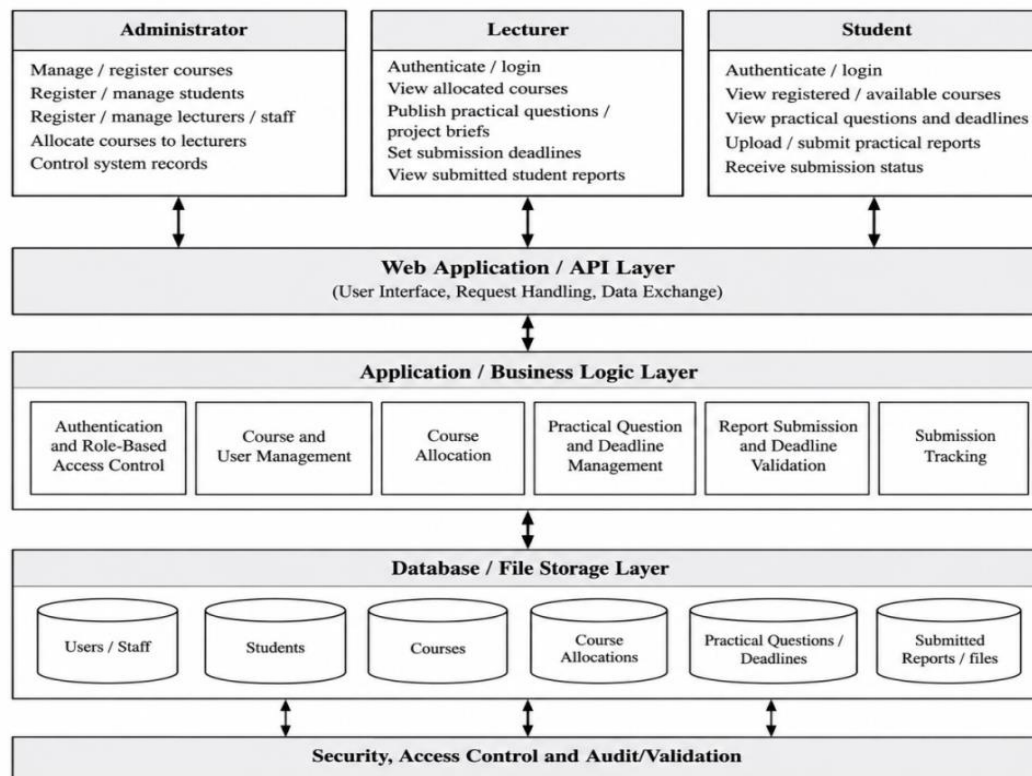


Figure 1. Architecture of the Integrated Practical Report Submission System

The architecture is organized around three user groups. Administrators interact with the system to manage institutional records and course allocation. Lecturers interact with their allocated courses to publish practical questions and deadlines and manage submitted reports. Students interact with the system to access their courses, view practical activities, and submit reports.

All three user groups communicate with the web application/API layer. This layer provides the user interface, handles requests, manages communication between clients and the application logic, and returns appropriate responses.

The application/business-logic layer contains the principal functional modules. These include authentication and role-based access control, user and course management, course allocation, practical-question and deadline management, report submission and deadline validation, and submission tracking.

The database/file-storage layer stores the information required to operate the application. Conceptually, the data include staff accounts, student records, course records, course allocations, practical questions and deadlines, and submitted reports/files. A separate file-storage mechanism may be used for uploaded report documents while their associated metadata are maintained in the database.

The security layer provides authentication, authorization, validation, and auditing mechanisms. Role-based access control is particularly important because administrative operations should not be available to students, while course and practical-question management should be restricted to lecturers assigned to the relevant courses.

System Modules

A. Administrator Module

The administrator module provides centralized control over the academic records required by the system. The administrator can register and manage courses, students, and lecturers. The administrator also controls course allocation, thereby establishing the relationship between a course and its responsible lecturer.

The implemented administrative interface demonstrates dashboard information including the number of courses, students, lecturers, and course allocations. The course management interface also provides fields for course code, course title, credit unit, semester, academic level, and course status. These features demonstrate that the system incorporates an institutional course-management component rather than treating practical submissions as isolated files.

B. Lecturer Module

The lecturer module provides academic staff with access to courses allocated by the administrator. The lecturer can configure practical activities

associated with an allocated course, publish practical questions or project briefs, and define the target submission deadline.

The lecturer interface in the implementation contains a “Publish Practical Question & Deadline” section and an “My Allocated Courses Summary” section.

The module establishes a direct relationship between a lecturer, an allocated course, a practical assignment, and its deadline. This reduces the need for lecturers to distribute practical questions through independent communication channels.

C. Student Module

The student module allows students to access their academic information and available courses. The student dashboard identifies the authenticated student and academic level and provides course-related information.

The implemented student interface contains an “Available Courses for Registration” area and informs the student that displayed courses correspond to the student's academic level.

After a practical activity has been published for a course, the same role-based workflow can be used to present the practical question and deadline to eligible students and receive their reports.

D. Authentication and Role Management

Authentication provides controlled entry into the system, while authorization determines the operations available to each user. The administrator is given management privileges, lecturers are given course/practical-management privileges, and students are given course-access and report-submission privileges.

This separation follows the principle of least privilege and reduces the possibility of unauthorized access to administrative or academic records.

E. Practical Question and Deadline Management

A central feature of the proposed system is the ability of a lecturer to create a practical activity by specifying the practical question or project brief and the submission deadline. The deadline establishes the temporal constraint for the student submission process.

The system can therefore associate the following information:

Course → Lecturer → Practical Question → Deadline → Student → Submitted Report

This relationship is important for maintaining organized academic records.

F. Report Submission Management

Students submit their completed practical reports electronically through the system. A submission should be associated with the student, course, practical activity, lecturer, submission date/time, and uploaded file.

A complete implementation can use the submission timestamp to determine whether a report was received before the configured deadline. The system can also retain submission metadata to support later retrieval and academic record management.

System Workflow

The overall workflow begins with the administrator creating the institutional records. Students and lecturers are registered, courses are created, and courses are allocated to lecturers.

After course allocation, the lecturer logs into the lecturer workspace and accesses the courses assigned by the administrator. The lecturer publishes a practical question or project brief and specifies the submission deadline.

The student subsequently logs into the student portal and accesses the relevant course. The student views the practical activity and deadline, completes the practical work, and uploads the resulting report.

The submitted report is stored and associated with the relevant student and practical activity. The lecturer can subsequently access the reports submitted for the course.

The complete workflow can be represented as:

Administrator registration → Course creation → Lecturer allocation → Lecturer publishes practical question → Deadline specification → Student accesses activity → Student prepares report → Electronic upload → Submission validation → Lecturer accesses report

Implementation Method

A. Development Approach

The system was developed as a web-based information system using a modular approach in which functionality was divided according to user roles and academic workflow. The design began with identification of the main actors and their responsibilities, followed by definition of the principal data entities and system functions.

The implementation was organized around three user-facing areas: the administrator portal, lecturer portal, and student portal. The submitted implementation also includes a public home page that provides access to the different portals.

B. Database Design

The database design should maintain relationships between users, courses, lecturers, students, allocations, practical questions, deadlines, and reports. A conceptual relational structure can contain the following entities:

Table 1 Database Entities

Entity	Main purpose
Users/Staff	Stores lecturer and administrative accounts
Students	Stores student academic/account information
Courses	Stores course codes, titles, levels, semesters and related information
Course Allocation	Associates lecturers with courses

Entity	Main purpose
Practical Questions	Stores questions/project briefs
Deadlines	Stores submission target dates/times
Submissions	Stores report metadata and submission information
Files	Stores or references uploaded practical-report documents

The database structure allows the system to retrieve information according to the authenticated user's role.

Security and Access Control

Security is an important consideration because the system stores student information, staff information, course records, and submitted academic work. Access to the system should therefore be authenticated and authorization should be based on user roles.

Administrative functions should be accessible only to authorized administrators. Lecturer functions should be restricted to authenticated lecturers and, where applicable, to courses allocated to the lecturer. Student functions should be restricted to authenticated students and to courses available to those students.

Input validation should be applied to forms to reduce invalid database entries. Uploaded reports should also be subjected to file-type and file-size validation. Session management should be implemented to prevent unauthorized access to authenticated pages after logout.

Where the system is deployed in a production environment, communication should be protected using HTTPS, passwords should be securely hashed rather than stored as plaintext, uploaded files should be stored outside directly executable web locations where appropriate, and server-side authorization should be enforced independently of interface controls.

Experiment and System Evaluation

A. Experimental Objective

The objective of the experimental evaluation was to verify that the implemented system provides the principal functionality required for managing practical report submission. The evaluation focused on functional availability and workflow integration rather than attempting to measure learning outcomes.

The evaluation considered the following functional areas: home-page access; administrator authentication and dashboard; course management; student management; lecturer management; course allocation; lecturer access to allocated courses; publication of practical questions; deadline specification; student course access; practical-report submission; and lecturer access to submitted reports.

B. Functional Test Cases

Table 2 Functional test cases

Test ID	Function	Expected Behaviour	Evaluation Basis
T01	Home page	System displays portal entry points	Implemented interface
T02	Administrator dashboard	Administrator accesses management functions	Implemented interface
T03	Course management	Administrator can create/manage course records	Implemented interface
T04	Student management	Student records can be managed	System module
T05	Lecturer management	Lecturer/staff records can be managed	System module
T06	Course allocation	Courses can be associated with lecturers	System workflow
T07	Lecturer dashboard	Lecturer accesses allocated-course functions	Implemented interface
T08	Practical question	Lecturer can configure a practical activity	Implemented interface
T09	Deadline	Lecturer can specify submission target	Implemented interface
T10	Student dashboard	Student accesses relevant academic functions	Implemented interface
T11	Report submission	Student uploads/submits practical report	System workflow
T12	Submission tracking	Submitted report is associated with relevant activity	System workflow

Results

The implemented home page provides a common entry point to the system and presents navigation options for the Home, Admin Portal, Student Portal, Lecturer Portal, and Contact Us sections. The page identifies the application as an online practical report submission system and describes its purpose as supporting the electronic submission of laboratory/practical reports. The implementation therefore provides a centralized access point for the different system users.

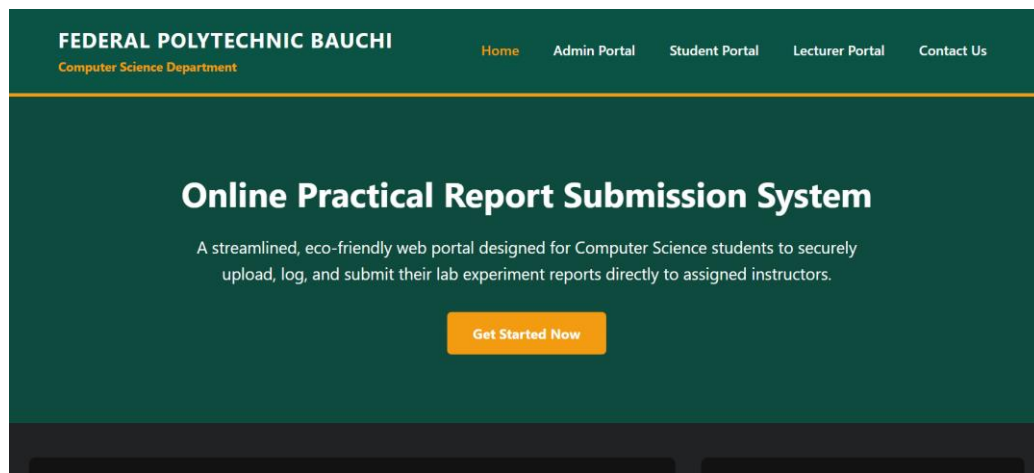


Figure 1 Home Page

The administrator dashboard provides centralized management facilities. The supplied implementation shows dashboard counters for courses, students, lecturers, and course allocations. The course management interface contains fields for course code, course title, credit unit, semester, academic level, and course status. This interface demonstrates the integration of course management into the practical-report workflow. Rather than requiring lecturers to independently create course records, courses are established at the administrative level and subsequently made available for allocation.

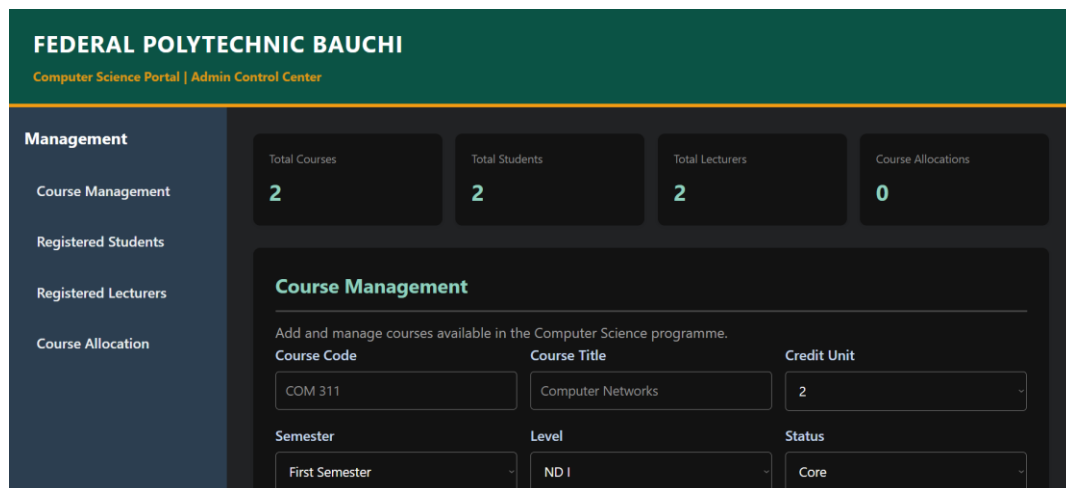


Figure 2 Admin Dashboard

The student dashboard provides a personalized interface through which an authenticated student can access course-related functions. The supplied interface displays the student's name, matriculation number, academic level, account status, and available courses for registration. This role-specific interface provides the foundation for linking practical activities to the students who offer the relevant courses.

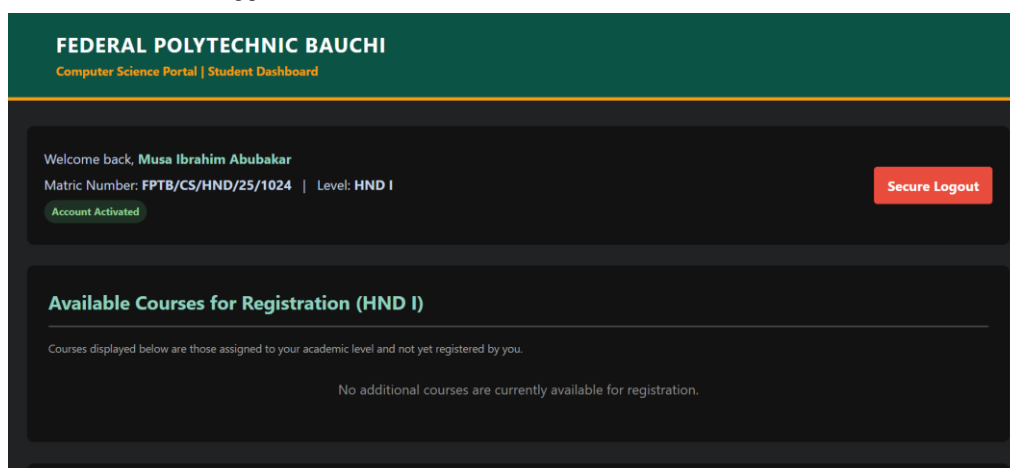


Figure 3 Student Dashboard and course access interface.

The lecturer workspace provides lecturers with access to their assigned courses and practical-activity management functions. The supplied implementation includes the “*Publish Practical Question & Deadline*” interface and an “*My Allocated Courses Summary*” area.

The lecturer interface demonstrates the central academic workflow of the system: the lecturer receives course allocation from the administrator and uses the allocated course to configure the practical question and submission deadline.

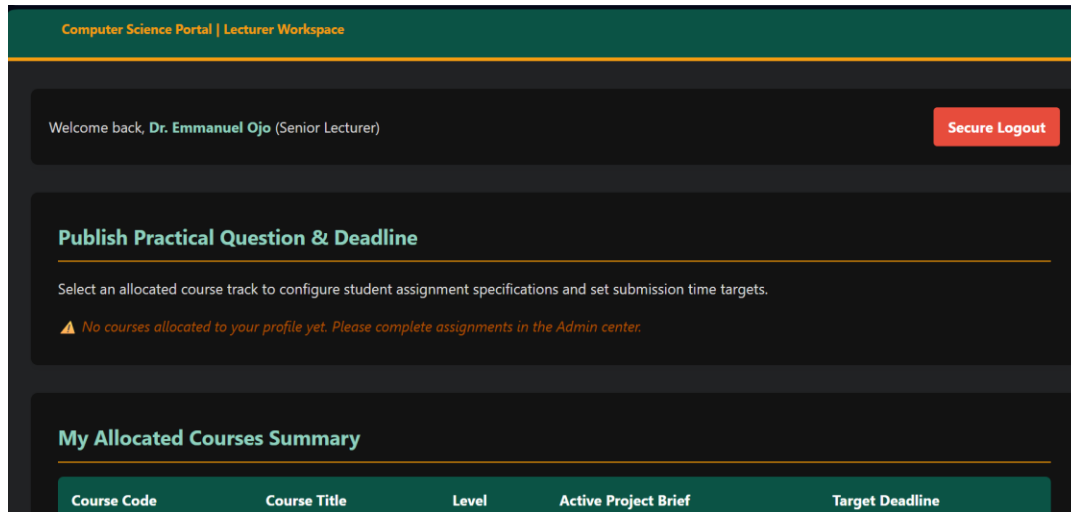


Figure 4 Lecturer workspace for practical question and deadline management

The principal result of the implementation is the integration of functions that are frequently handled independently in practical-course administration. The system establishes a logical workflow beginning with administrator-controlled course registration and allocation and continuing through lecturer-controlled practical-question publication and student report submission. The implemented interfaces confirm the existence of the three principal role-based environments. The administrator dashboard addresses institutional management, the student dashboard addresses student access, and the lecturer dashboard addresses practical activity management.

Discussion

The developed system addresses a specific administrative and academic workflow rather than attempting to replace a complete learning management system. This distinction is important because established LMS platforms already provide broad facilities for course delivery and online assessment [2], [5]. The contribution of the proposed system is its concentration on practical-report administration and the explicit relationship between course allocation, lecturer responsibility, practical activities, deadlines, and student submissions.

The role-based architecture provides a clear separation of responsibilities. The administrator controls institutional records and course allocation, lecturers manage practical activities associated with their allocated courses, and students access and submit work through their own interfaces. This structure reduces the possibility of presenting all users with unnecessary functionality and follows established considerations concerning system usefulness and ease of use [8].

The system is also consistent with research showing that digital platforms can support assignment management and practical learning workflows. Existing virtual laboratory systems have demonstrated the usefulness of online mechanisms for managing instructor activities, assignments, student access, and submissions [4]. However, the proposed system does not attempt to provide remote experimentation or virtual laboratory equipment. Instead, it addresses the *report-management stage* of practical education.

Another important consideration is that the system should be viewed as complementary to existing institutional LMS platforms. Gamage et al. [5] showed that Moodle has extensive application in STEM and university education, while Al-Nuaimi and Al-Emran [2] demonstrated the breadth of LMS adoption research. Therefore, the proposed application may be deployed independently in institutions requiring a focused solution or potentially integrated with a larger institutional learning environment.

The present implementation also has implications for academic record organization. Electronic reports can be associated with students, courses, lecturers, practical questions, and submission dates. This relationship provides a structured alternative to fragmented storage mechanisms and can make later retrieval easier.

However, the present evaluation does not establish that the system improves student academic performance. Such a claim would require a controlled educational study involving appropriate learning-outcome measures. Similarly, the current implementation evidence does not establish a quantified

reduction in administrative workload because no before-and-after time measurements were provided.

Conclusion

This paper presented an integrated web-based practical report submission and course management system designed for tertiary institutions. The system addresses the workflow linking institutional course management, lecturer allocation, practical-question publication, deadline specification, and student report submission. The developed application provides separate role-based interfaces for administrators, lecturers, and students. Administrators manage courses, students, lecturers, and course allocations. Lecturers access allocated courses and manage practical questions and submission deadlines, while students access their courses and submit practical reports electronically. The implementation demonstrates that a focused web application can integrate these activities within a single workflow rather than requiring separate mechanisms for course administration, assignment distribution, and report collection. The system therefore provides a structured technological foundation for managing practical coursework and academic report submissions. The findings should, however, be interpreted within the scope of the available evaluation evidence. The present study demonstrates functional implementation but does not provide sufficient quantitative evidence to claim specific improvements in student achievement, user satisfaction, administrative processing time, or system performance. Future work should therefore conduct a larger empirical evaluation involving real users and measurable performance and usability indicators.

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