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Implementation of Integrated E-Learning System for Project Supervision Using Moodle Platform Nwuguru Ezekiel Chinwendu¹ & Edoghogho Olaye²

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ABSTRACT

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This research investigates the effectiveness of e-learning platforms for project supervision, focusing on the design and implementation of an online platform using Moodle, a widely used open-source e-learning platform. Employing the Design Science Research Methodology (DSRM), the study identifies relevant features for project supervision within e-learning. Additionally, existing tools within Moodle are explored to enhance the project supervision experience. The outcome is an integrated platform that consolidates diverse interfaces for efficient and effective project supervision. The developed platform is valuable for project supervisors, managers, and e-learning professionals aiming to enhance project supervision effectiveness through e-learning.

1.0 INTRODUCTION

Final-year projects in higher education serve as a vital application and integration of students' acquired knowledge. Effective project supervision is essential during this phase, yet traditional methods face time, space, and staff availability constraints. The challenges and the impact of the COVID-19 pandemic highlight the necessity for alternative supervision strategies. E-learning emerges as a viable approach, known for its flexibility and convenience in various fields like healthcare, engineering, and business management. In project management, particularly project supervision, e-learning offers advantages such as improved accessibility, flexibility, cost-effectiveness, and personalized learning experiences. This method equips project supervisors with essential skills like communication, risk management, and team management, ensuring they stay current with industry trends and best practices.

1.1 PROBLEM STATEMENT

- i. This work explores integrating project supervision features into Moodle, an open-source e-learning platform widely used for online learning.
- ii. The study focuses on designing and implementing e-learning for project supervision within Moodle, aiming to enhance accessibility, flexibility, and communication between students and supervisors and improve supervision efficiency and effectiveness. The research contributes valuable insights to the e-learning field, specifically regarding the design and effectiveness of such platforms in a specific educational context.

2.0 REVIEW OF RELATED WORKS

Technological approaches for project supervision have

gained momentum, notably due to shifts in research program delivery at the university level. The COVID-19 pandemic accelerated the exploration of alternative supervision strategies. Kanapathipillai (2022) conducted a design research study on alternative supervision practices during the pandemic, revealing that online supervision offers more advantages than onsite supervision.

Alqahtani et al. (2020) identified key variables for successful E-learning during COVID-19, emphasizing technology management, support, student awareness, and high IT expectations. E-learning's flexibility was highlighted as a solution to accommodate individuals' obligations.

Malik's research (2008) on social software for project supervision identified student categories, recommending tailored strategies. He explored social media like Twitter and wikis, fostering a sense of community and enhancing interaction.

In Technology Assisted Project Supervision (Malik et al., 2009), a blend of collaboration tools and traditional methods showed benefits in final year project supervision. Pedagogically chosen technology proved beneficial for both students and supervisors. E-mentoring's impact on project supervision was studied by Santos et al. (2022), revealing that e-mentoring enhances various skills for distant UX Education students. MireillaBikanga Ada (2021) compared online and on-campus final year project supervision perceptions, finding that students supervised online had a more positive experience.

Mesquida et al. (2015) emphasized the management, organization, and key elements of e-learning for project supervision, proposing a model to address the challenges of distance research project supervision. Khamaruddin et al.

(2017) investigated Moodle's role as an integrated final year project management tool, with positive findings on lecturers' perceptions of its use for submissions and assessments in chemical engineering undergraduate programs.

3.0 METHODOLOGY

This research employs the research design methodology, a systematic plan outlining the approach, structure, and techniques for data collection and analysis to address research questions or objectives. The method involves need assessment, platform design and implementation, testing and validation, as well as deployment and evaluation of the e-learning platform. Figure 1 below shows the methodology workflow

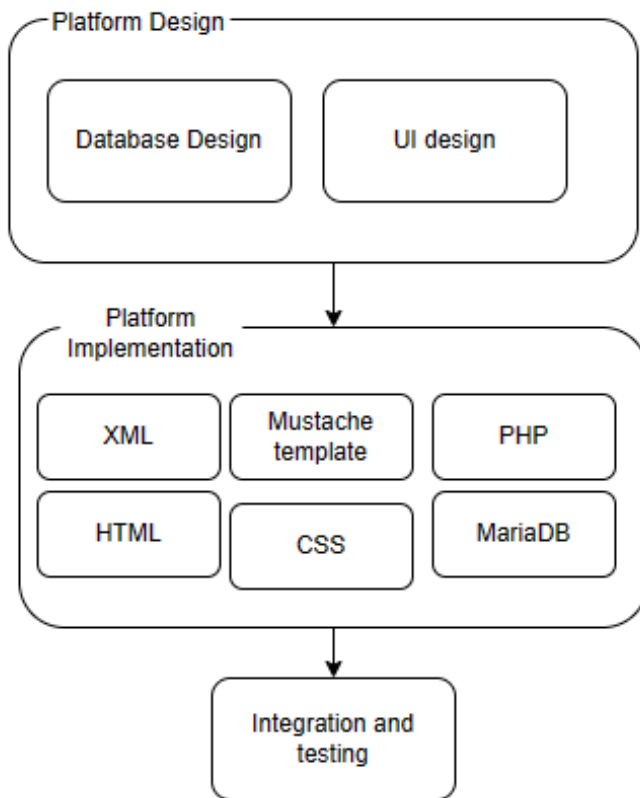


Figure 1: Workflow of Research Work

PLATFORM SELECTION AND DESIGN: After reviewing various e-learning platforms like Open edX, Canvas LMS, and others, Moodle was chosen for project supervision due to its customizable architecture through local plugins. Moodle's scalability ensures efficiency, and its active community provides support. Leveraging its open-source nature, developing local plugins is cost-effective, eliminating licensing fees and offering an economical alternative to custom platforms. The E-learning platform design includes User flow design, User Interface Design and Database design. The user flow design is as shown in figure 2 below.

3.2 User Interface (UI):

The project's plugin utilizes the Moodle USER API for user authentication and employs a manual registration process for project students. Users are added via CSV file uploads,

assigned default passwords, and prompted to change them upon login. The plugin provides a dashboard for users with links to project-related features, including topics, proposals, reports, and discussion forums. Additionally, it offers interfaces for Project Managers to create groups, assign

supervisors, and allocate students. Students can submit various project elements, receive feedback from supervisors, and utilize a grading interface for final project assessments.

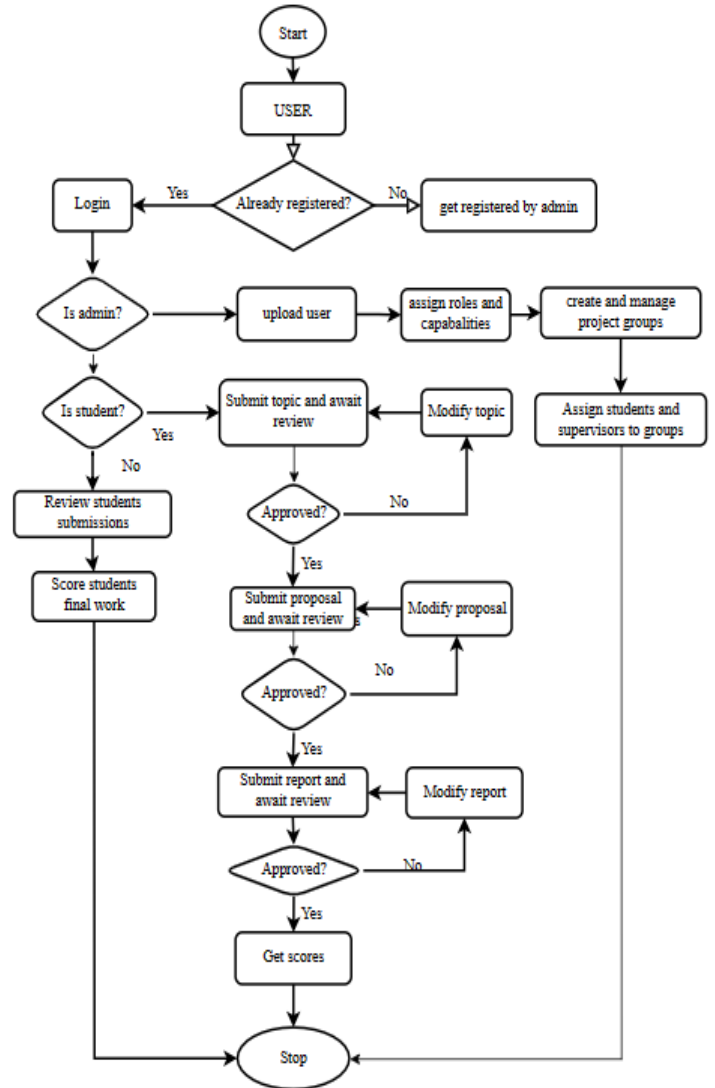


Figure 2: User Flow Diagram

Database Design: An entity relationship diagram was used to design the database for the project. Each entity represents a table in the database. A relationship symbol was used to indicate the relationship between each entity in the database. Figure 3 shows the complete database design.

Implementation of the Platform:

The project implementation utilized PHP as the primary server-side scripting language for dynamic content generation and database integration. Mustache, a templating engine, facilitated the separation of presentation from logic

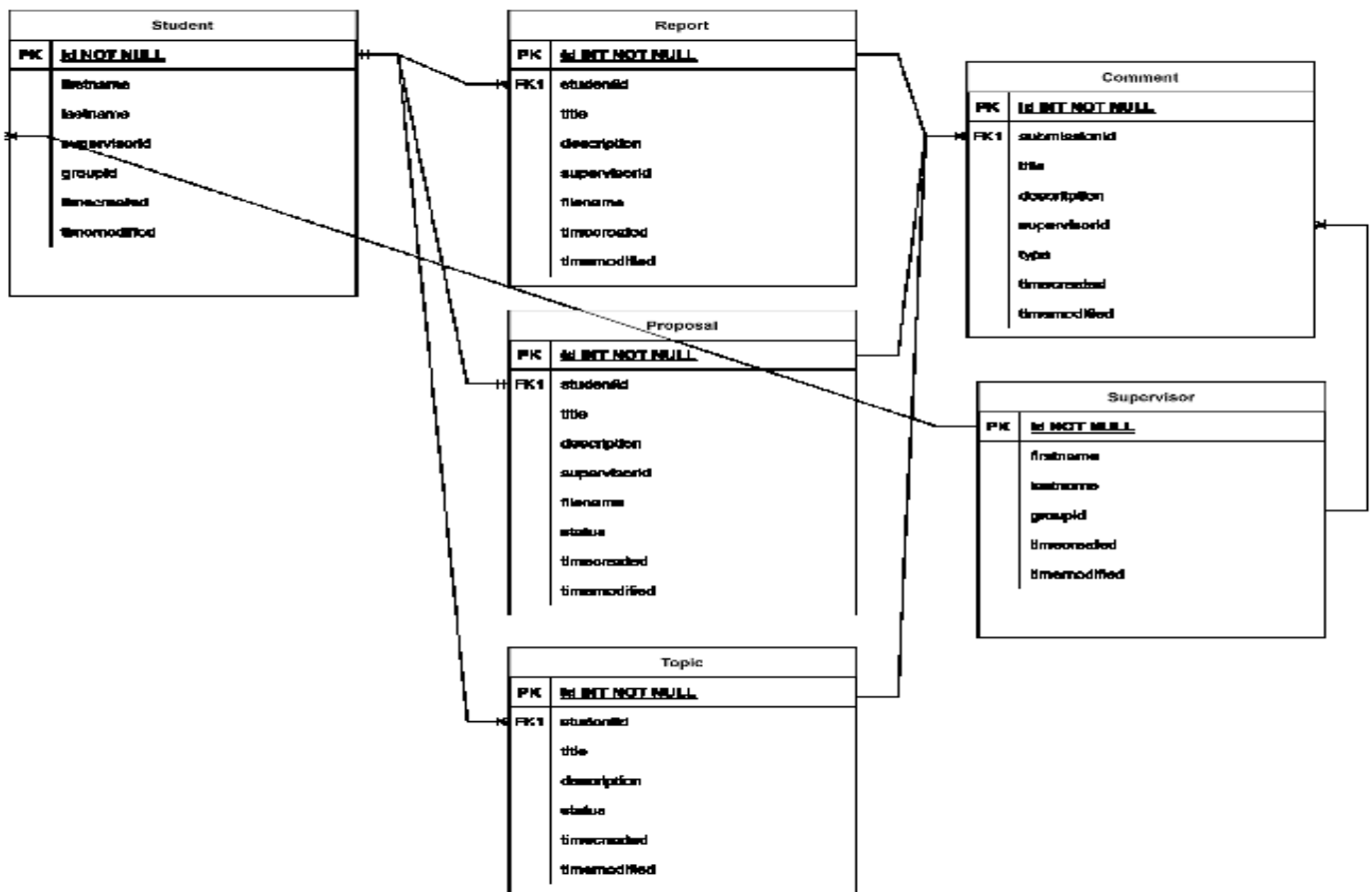


Figure 3: Diagram Illustrating Cross-Database Database Definition for Local Plugin

through dynamic rendering. XML was employed to structure database tables and fields, while MariaDB served as the chosen open-source relational database management system for its speed and scalability. XAMPP, a web server solution stack package, was used to locally run the plugin, incorporating components like Apache, MariaDB/MySQL, PHP, and Perl. Visual Studio Code (VS Code) was chosen as the code editor for its robust extensions and features.

ARCHITECTURE: The architecture of the project includes the following features:

3.2.1 Front-end/Client and backend:

The front-end refers to the user interface and client-side functionalities, managing user interactions and making

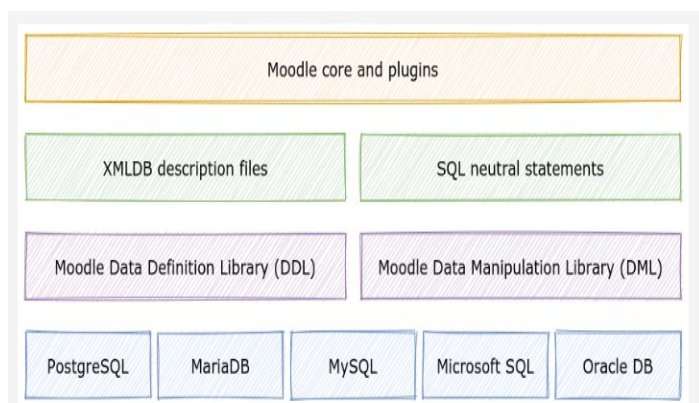
requests to the backend. In contrast, the back-end, serving as the server-side of the e-learning platform, handles data processing, storage, and business logics. It processes client requests from the front-end, interacts with the database, and returns the required data to the front-end.

Database: The e-learning platform utilized MariaDB as its relational database management system, storing student details, project information, supervisor data, and communication records. Database design involved creating tables efficiently, with schema definitions in XML files for cross-database compatibility. The XML files, located in db/install.xml, described tables, columns, types, indexes, and keys. Data Manipulation API functions were employed for operations like select, insert, update, and delete, with custom SQL queries written in a database-neutral manner.

3.2.1 Moodle Framework:

Since the project is being developed on Moodle plugin, it was integrated with the Moodle framework. The E-learning for project supervision was designed to extend and customize Moodle’s functionalities to cater specifically for project supervision.

Security layer: Appropriate security was applied to protect user data and prevent unauthorized access. Moodle Access API was utilized to ensure that only users with correct access rights can access a given resource.



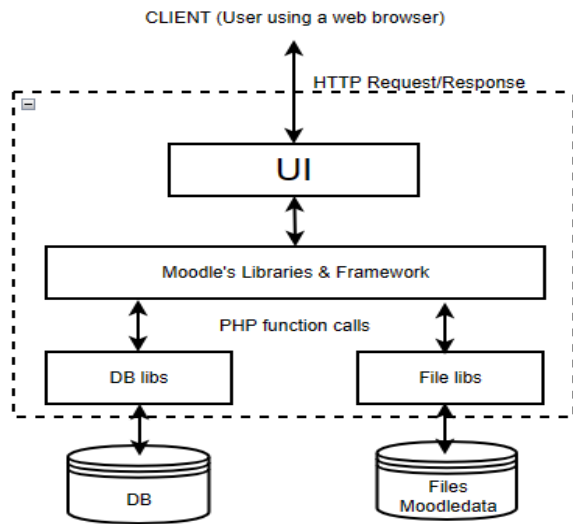


Figure 4 Architecture of Moodle plugin

necessary database setup involved linking the server to MariaDB, creating an empty **moodle** database, and ensuring proper directory permissions.

The creation of the plugin folder structure within Moodle's local directories was a crucial step. The **esupervision** folder, along with subfolders like **db** (this contains the database definition files as well as the roles and capability definition file), **classes** (This directory was used for class definitions form forms and other essential class for better abstractions and Object Oriented Programming (OOP)), **lib** (This file contains most of the business logics necessary for the functionalities of the platform, and **templates** (this directory was used for creating templates to manage dynamic views using Moodle mustache templates, was established to accommodate different aspects of the project, such as

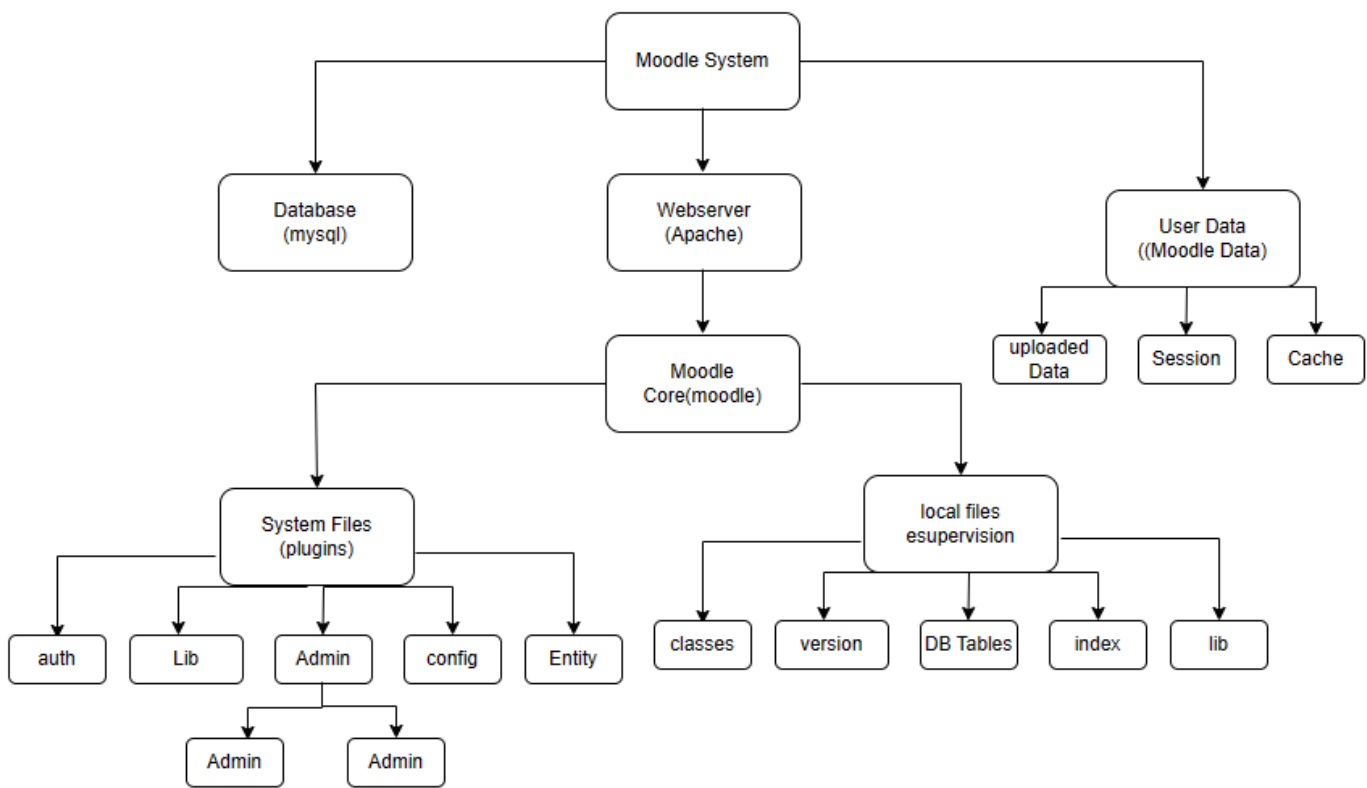


Figure 5: Moodle System Architecture Diagram with Esupervision Plugin

The project implementation encompassed various essential steps. It commenced with a comprehensive understanding of Moodle Plugin Development through the completion of a Moodle Developers Academy course. This ensured familiarity with the platform, prevention of service duplication, adherence to best practices, and maintenance of consistent styles. The Moodle API documentation served as a valuable guide throughout this phase. Next, a local development environment for Moodle was established by configuring a PHP-supported web server (Apache) using XAMPP. Various configurations, including port numbers and server home directory adjustments, were made. Moodle was installed by cloning the GitHub repository, and the

managing databases, classes, core functions, and templates. Core functionalities related to project supervision were defined within the **lib.php** file, covering tasks such as data storage, retrieval, and other essential functions. Moodle's APIs, including Form API, Messaging API, Notification API, Access API, and File API, were leveraged to interact with the platform's core features during plugin development. To ensure adherence to Moodle plugin development styles and standards, testing and debugging were conducted using additional plugins like Moodle Code-Checker and Moodle **PHPdoc** check. Throughout the development process, proper documentation practices, in line with Moodle's documentation best practices, were followed to maintain

clarity and transparency.

4.0 RESULTS

The result of this work was an integrated platform with enhanced features necessary for carrying out project supervision in higher institutions.

The implementation of the platform involved the following features:

4.1 Project management dashboard:

This provides a dashboard for both the supervisors and students to gain access to all the features of the platform such as project topic, project proposal, project report, discussion forum and project scores. Figure 4.1 shows the project supervision dashboard

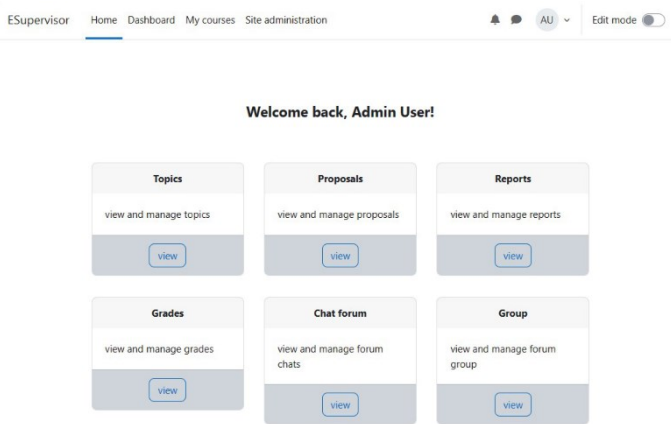


Figure 6: E-supervision dashboard with cards showing links to topics, proposals, reports and grades and chat forum.

4.2 Project topic submission:

This provides interface for the student to submit their project topic and await feedback from their supervisor. The student's interface provides options for submitting, editing and deleting a topic and awaiting feedback from the supervisor.

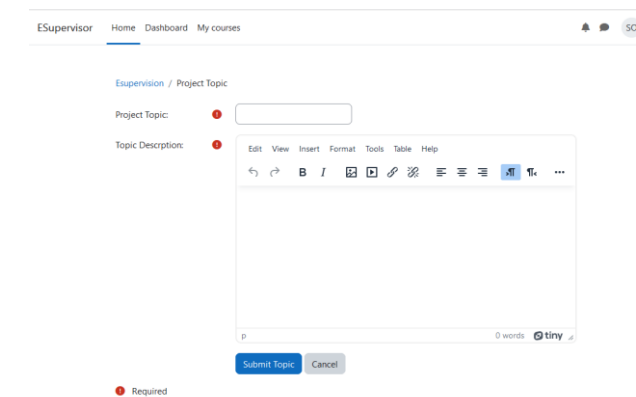


Figure 7: Student Project topic submission page

4.3 Student proposal submission:

The student interface facilitates project proposal submission, editing, and deletion, along with awaiting supervisor

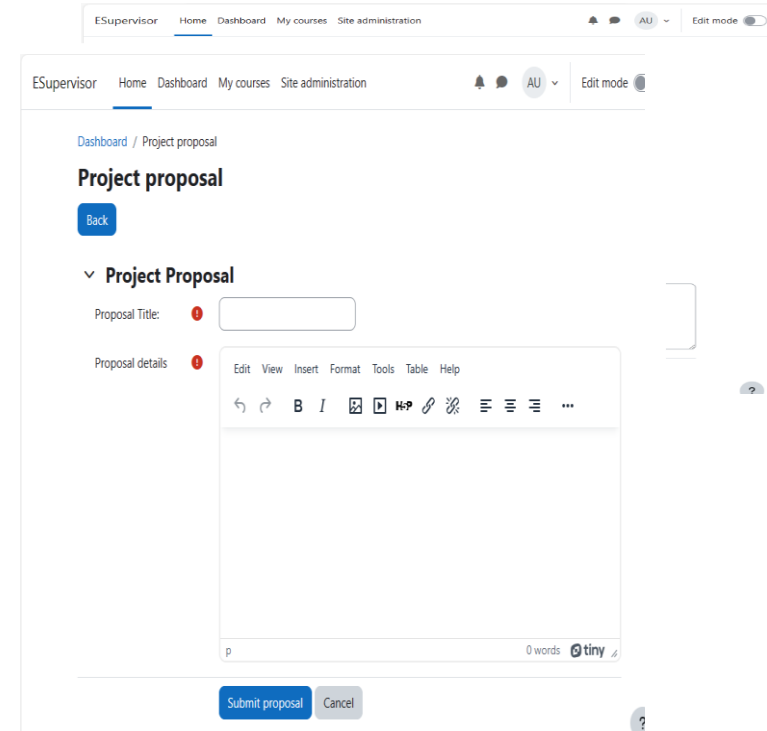


Figure 8: Proposal page

4.3 Student project report submission:

As shown in figure 9, this provides interface for the student to submit their project report and await feedback from their supervisor.

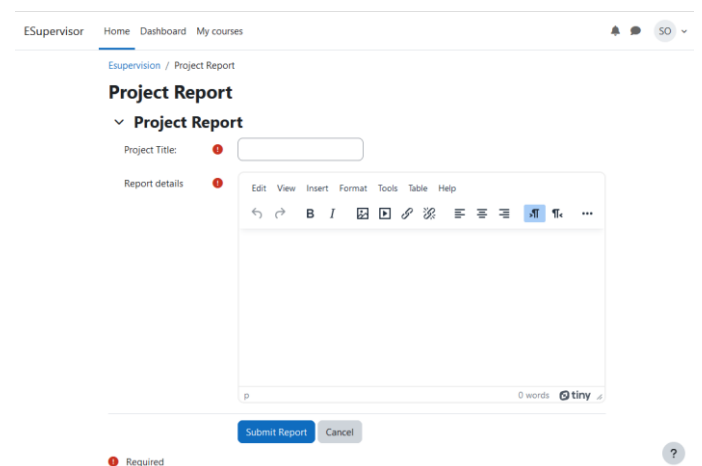


Figure 9: Project report page

4.4 Grading of students using a scoring system:

This feature enables the project supervisor to assign grades to his project students based on some key criteria such as attendance, punctuality, attention to instruction, turn-over of work, attitude to work and resourcefulness. It also

includes a comment section for feedback. Fig 10 shows the project scoring page.

ID	Student Name	Attendance	Punctuality	Attention to instruction	Turnover of work	Attitude to work	Resourcesfulness	Total Score
12	Student One	3	5	0	5	4	5	17

Attendance	Punctuality	Attention to instruction	Turnover of work	Attitude to work	Resourcesfulness	Total Score	Grade	Comment
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Figure 10: Project score page

4.5 Discussion forum:

Figure 11 shows the discussion forum which was implemented for collaboration between all project students and their supervisors. The **tinyMC** editor was integrated to accommodate different post formats.

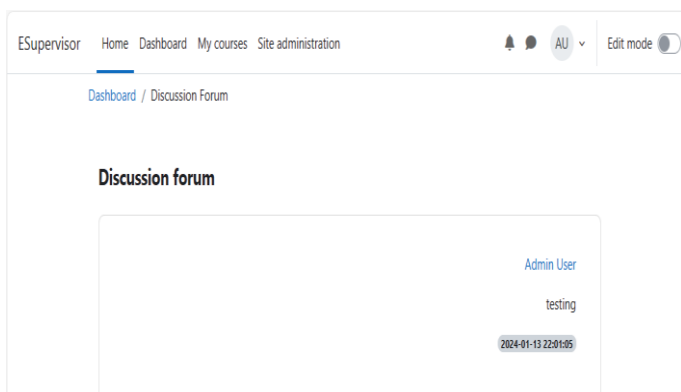


Figure 11: Discussion forum

5.0 DISCUSSION

The successful integration of this plugin into the Moodle platform demonstrates its adaptability and compatibility with existing educational technology infrastructures. By seamlessly incorporating project supervision features into Moodle, its utility has been enhanced for supervisors and students alike. The plugin's functionality, including project topic management, project proposal management, project report management, and communication tools, offers a comprehensive solution for project-supervision activities.

An important consideration in the design and implementation of the plugin was prioritizing user experience and accessibility. Through user testing and feedback iterations, the interfaces were continuously refined to ensure intuitive navigation and ease of use for both supervisors and students. The accessibility features

incorporated into the plugin comply with best practices, making it inclusive for users with diverse needs.

The platform interfaces were built in such a way that setting it up is very easy and most of the features that makes project supervision very effective was added. The steps below are required to set up the platform.

5.1 Upload of the user lists:

This involves using the Moodle user interface under the site administration tab as shown in figure 12 below to upload the list of users for the plugin. The user list can be in an excel or csv format.

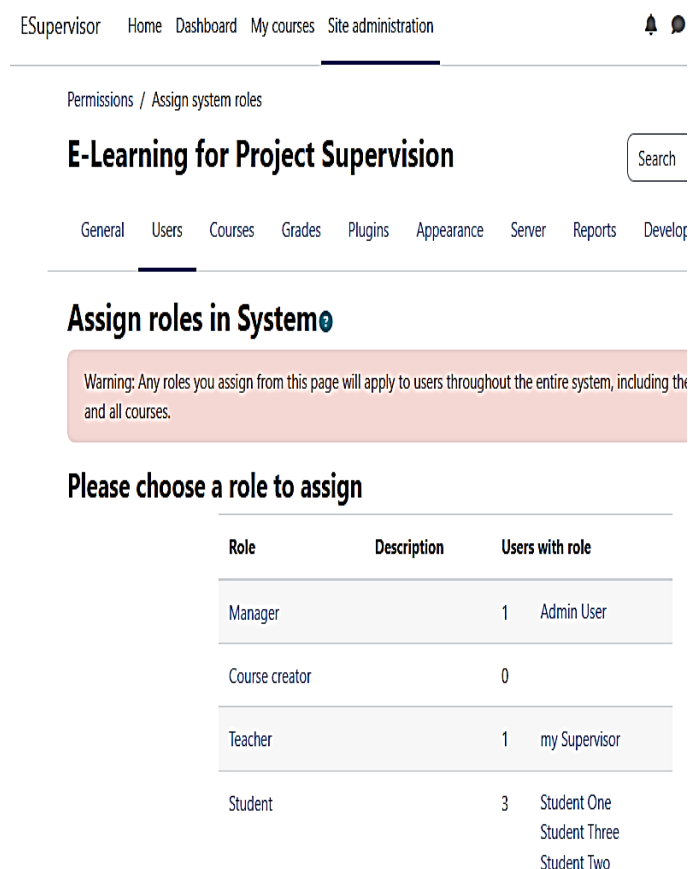


Figure 12: User interface for uploading of user list

The list should contain at least username, first name, last name and a default password. Sample csv file can also be downloaded to aid in preparing the user list. Users should be forced to change their password at login with the default password.

5.2 Assignment of roles:

This can be done using the assign system role link under the user tab inside the site administration table. Figure 13 shows a sample of the user roles assignment page. The major roles required for the project supervision platform are manager, teacher and student.

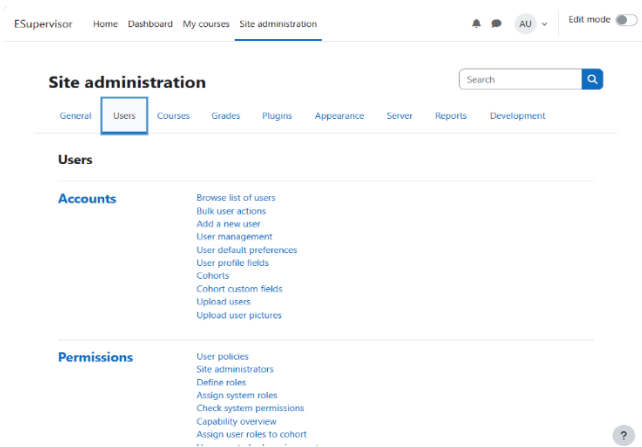


Figure 13 Sample user role assignment page

5.3 eation and assignment of students and supervisors to groups:

After defining roles and capabilities of each user, the next task is to create project groups and assign students and supervisors to each group. This task is dedicated to the manager for project. Once this is completed, the project work can begin. The project supervision dashboards provide all the links to the various interfaces needed in the project.

5.4 Management of other project supervision features:

After the above set up is done, students can proceed to submit their project topic suggestions. This is followed up by the project supervisor's feedback. The student can then utilize the feedback to effect correction on the topic if any and proceed to prepare and submit their project proposal. The same step is repeated for both proposal as well as project reports. The discussion forum can also be utilized for collaboration and communications.

6.0 CONCLUSION

The implementation of E-learning for project supervision using Moodle focused on providing an integrated platform tailored to project supervision requirements and needs such as assigning students to their respective supervisors, management of project topics, proposal and reports and communication using a discussion forum.

Several approaches were followed in implementing this platform such as platform design, database design, user interface implementation, integration with Moodle API and testing. The implementation followed the required Moodle code styles and documentations.

At the early stage of the development some challenges were encountered much of which has to do with the use of Moodle APIs. This was overcome by leveraging on Moodle Developer's Academy course as well as the Moodle API documentations.

The major contribution of this work to the body of knowledge is in providing an integrated platform on Moodle

dedicated to towards project supervision needs and requirements (a feature was lacking on the Moodle site), thus facilitating project supervision in higher education and complementing the traditional face-to-face project supervision approach.

The platform is still open for improvement as some features such as plagiarism checker and other advanced features are yet to be completed.

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Appendix

The full code for the implementation of this platform can be found on the git repository link

<https://github.com/EAZYLINK/moodle.git>.