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Design and Implementation of LearnLink: A School-Based Digital Learning Hub for Learning Continuity in Disaster-Prone Schools

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Abstract: Learning disruptions caused by environmental hazards pose serious challenges to educational continuity in disaster-prone regions. In the Negros Island Region, particularly in Talisay City, frequent weather disturbances such as heavy rainfall and flooding often result in class suspensions and the loss of instructional time. This study presents the design and implementation of LearnLink, a school-based digital learning hub developed to ensure continuous access to instructional materials during learning interruptions.

The system was developed using a web-based architecture composed of HTML, CSS, and JavaScript for the front end, PHP for the application layer, and MySQL for database management. LearnLink enables teachers to upload learning modules, activity sheets, and emergency learning kits, while students can remotely access and download these materials. The system was implemented among senior high school teachers and students in Talisay City during the School Year 2024-2025. Evaluation was conducted using the ISO/IEC 25010 software quality model to assess usability, reliability, efficiency, accessibility, and maintainability. Results showed an overall mean score of 4.49, interpreted as Very Satisfactory. System

usage data also revealed that approximately 91% of students maintained learning participation during class disruptions by accessing materials through the platform. The findings demonstrate that school-based digital learning platforms can significantly strengthen learning resilience and support disaster--responsive education systems. Future enhancements may include mobile integration, analytics dashboards, and expanded cloud storage capabilities.

Keywords: Digital Learning Hub, Learning Continuity, Disaster-Resilient Education, E-Learning System, Learning Management System

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I. INTRODUCTION

Educational continuity remains a major concern in disaster-prone countries such as the Philippines [4], [5]. Climate-related hazards including typhoons, floods, and extreme weather conditions frequently disrupt school operations and lead to class suspensions. These interruptions often result in significant losses in instructional time and negatively affect student engagement and academic progress. Previous reports have highlighted how flooding and extreme weather events in the Philippines have significantly affected schooling and access to education [1], [2].

In Talisay City, Negros Occidental, recurrent flooding and heavy rainfall have repeatedly affected school schedules and learning delivery. When schools suspend classes, many students are unable to access learning materials, particularly when these resources are distributed physically through printed modules. Such disruptions highlight the need for resilient learning systems that ensure students can continue their education despite environmental challenges. Studies indicate that disasters significantly impact learning quality, school facilities, and educational recovery [3].

Recent studies emphasize the importance of integrating digital technologies into education to ensure learning continuity during emergencies. Technology-assisted learning environments help sustain engagement and provide flexible access to educational resources [7], [10], [11].

Despite the availability of existing learning management systems such as Google Classroom and DepEd Learning Portal, many schools still face challenges in accessibility, system reliability during disasters, and localized content delivery. These limitations highlight the need for a school-based digital learning hub specifically designed for disaster-prone environments. This study addresses this gap by developing LearnLink.

The digital platform offers ongoing support for accessible learning that remains effective in both normal and disrupted school operations. This study aimed to:

1. Design and develop a school-based digital learning hub for instructional delivery.
2. Evaluate the system using the ISO/IEC 25010 software quality model.
3. Assess its effectiveness in supporting learning continuity during class disruptions.

II. METHODOLOGY

A. Research Design

This study utilized a developmental research design, focusing on the design, development, implementation, and evaluation of a digital learning system.

a. Participants

The participants of the study consisted of 17 senior high school teachers and 486 students, with a total sample size of 503 respondents from a senior high school in Talisay City during the School Year 20242025.

The study employed purposive sampling, where teachers and students who actively used the LearnLink platform during class disruptions were selected as respondents. This sampling technique ensured that only participants with direct experience using the system were included in the evaluation.

b. Data Collection

Data were collected through system usage logs and a structured questionnaire based on ISO/IEC 25010.

c. Instrument

A Likert-scale survey (1–5) was used to evaluate usability, reliability, efficiency, accessibility, and maintainability.

d. Data Analysis

Descriptive statistics such as mean and percentage were used.

B. System Development Approach

The LearnLink platform was developed using a web-based architecture with the following technologies:

Table 1. Technology Components

Component	Technology
Frontend	HTML, CSS, JavaScript
Backend	PHP
Database	MySQL
Platform Type	Web-based system

The development process followed Agile principles, allowing iterative improvements based on user feedback.

C. System Architecture

The LearnLink system follows a three-tier web architecture composed of the user interface layer, application layer, and database layer.

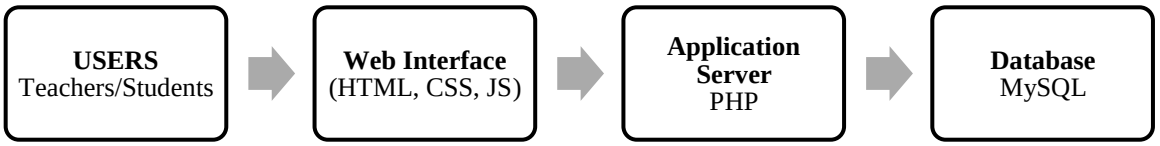

Figure 1. LearnLink System Architecture

This architecture enables teachers to upload learning materials while allowing students to securely access and download instructional resources through the platform.

a. System Features

The system provides two primary interfaces:

Table 2. Users Interfaces

Teacher Dashboard	Student Dashboard
Create class per Grade level	Log in using assigned credentials
Create Section per Grade	Access lessons (per Grade and Section)
Upload learning materials	Download learning materials
Edit or delete uploaded files	View previously downloaded materials
Track students' progress	Track own progress

b. System Interface and Implementation

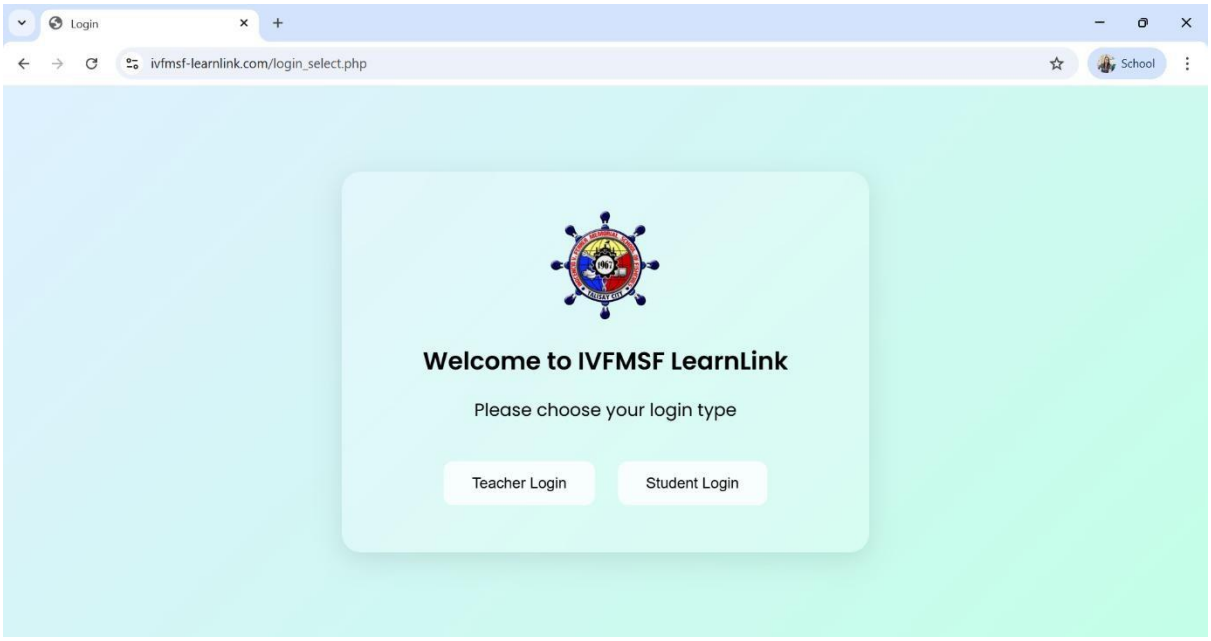

Figure 2. LearnLink Home Page Interface

Figure 2 shows the main interface of the LearnLink platform where users can access the system and navigate to the login portals.

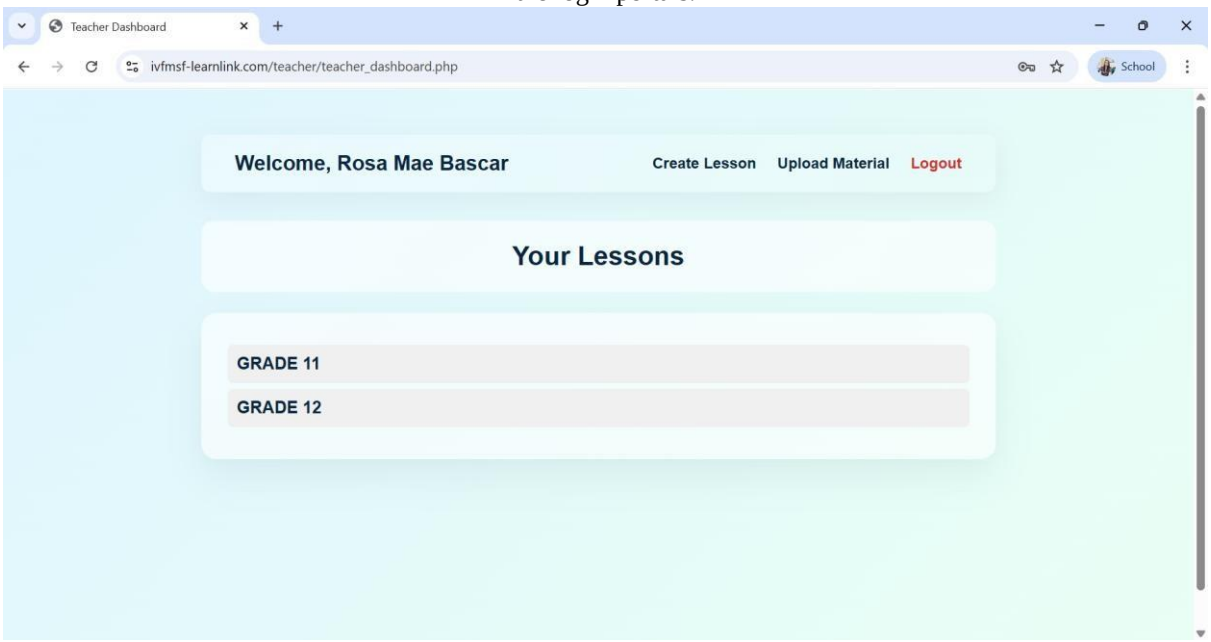

Figure 3. Teacher Dashboard

The teacher dashboard allows teachers to create lessons and upload learning materials such as modules, learning activity sheets, and emergency learning kits.

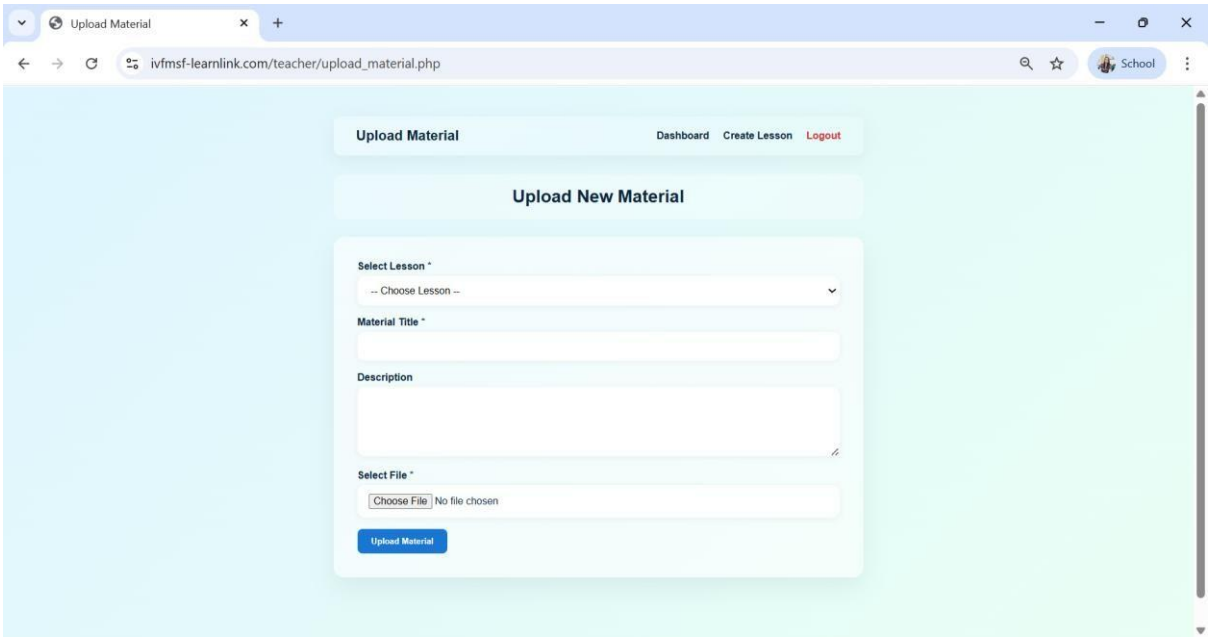

Figure 4. Upload Learning Material Interface

Teachers can upload one or more learning materials per lesson.

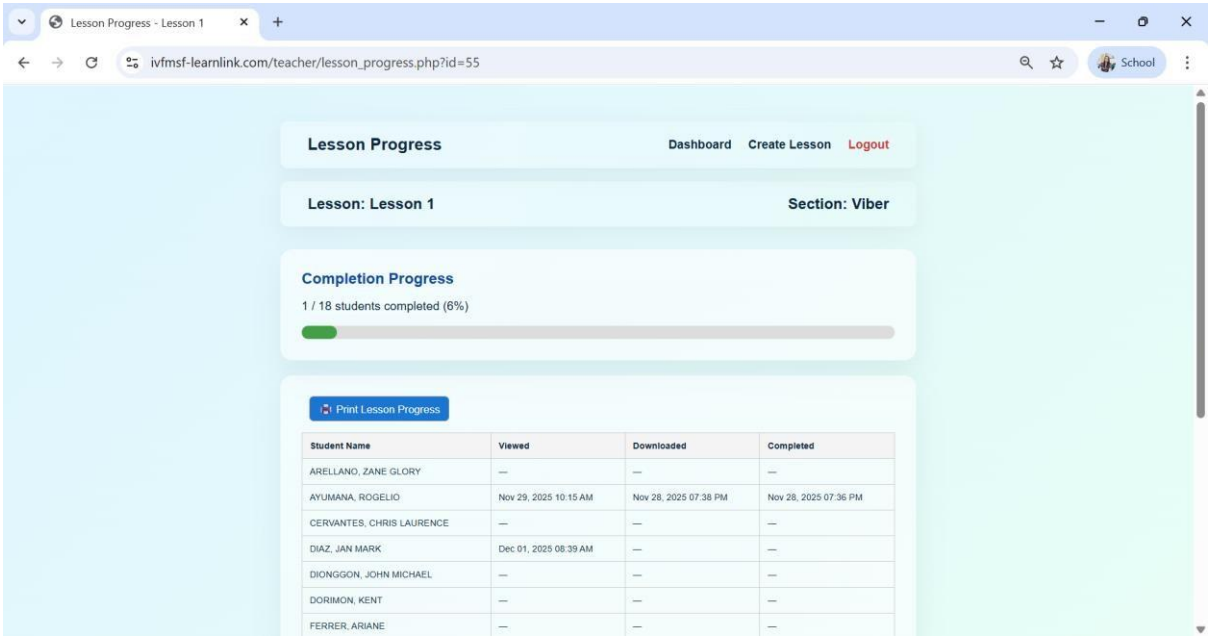

Figure 5. Check Progress Function

Teachers can track students' progress when the lesson is viewed, when the learning material was downloaded and when the student completed the activity. It also provides a hard copy of the lesson progress of the entire class.

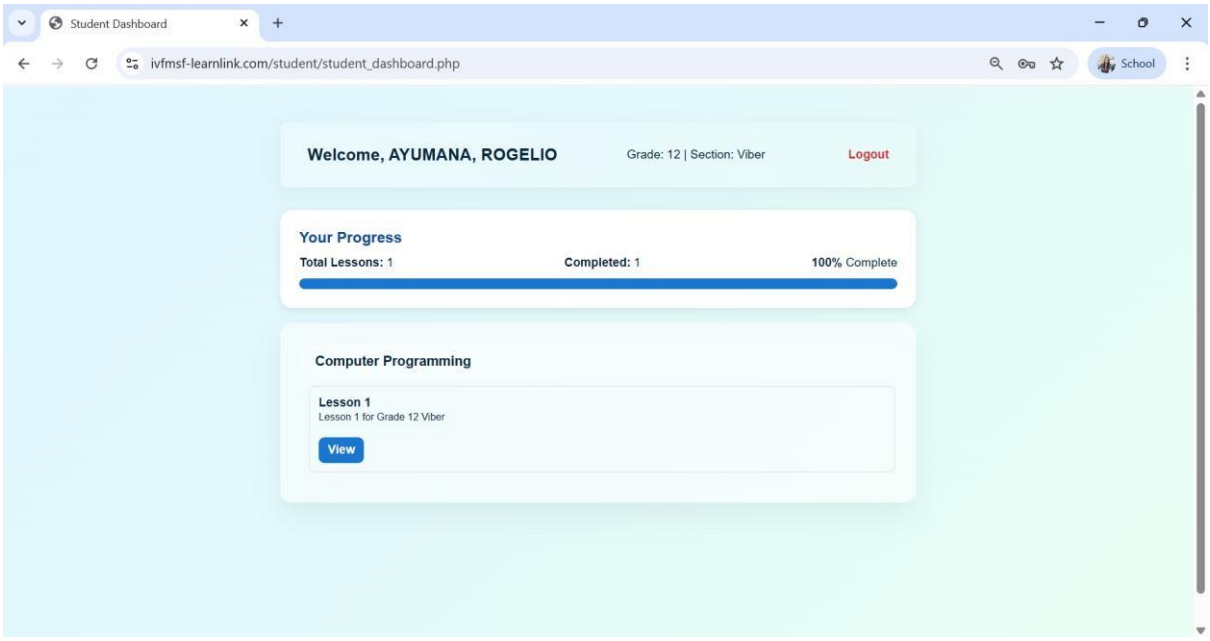

Figure 6. Student Dashboard

Students can view available lessons and track own progress.

III. RESULTS

The implementation of LearnLink demonstrated positive outcomes in terms of accessibility, participation, and efficiency in instructional delivery.

1. Increased Learning Continuity

   Tracking data revealed that approximately 91% of students maintained participation during class disruptions by accessing learning materials through the platform.

2. Improved Access to Learning Materials

   Students were able to download learning activity sheets, modules, and emergency learning kits anytime, reducing delays caused by physical distribution of materials.

3. Enhanced Teacher Efficiency

   Teachers reported that the platform improved their ability to organize and distribute instructional materials. The system allowed teachers to easily upload, edit, and manage lesson resources.

4. Positive User Feedback

   Students and parents expressed satisfaction with the system due to its accessibility and ease of use. Users reported that the platform enabled them to continue learning despite class suspensions caused by adverse weather conditions.

A. Learning Participation

Table 3. Respondents Profile

Respondents	Number
Teachers	17
Students	486
Total	503

System tracking data showed that:

Table 4. Learning Participation Indicators

Indicator	Result
Student participation during disruptions	91%
Access to learning materials	Improved
Teacher efficiency in distributing materials	Increased

The high participation rate of 91% indicates that the LearnLink platform effectively supported learning continuity during class disruptions. This suggests that students were able to access instructional materials despite environmental challenges, reducing learning loss and improving engagement.

B. System Evaluation (ISO/IEC 25010 Model)

The system was evaluated using ISO/IEC 25010 Software Quality Standards.

Table 5. ISO 25010 System Evaluation Results

Quality Attribute	Description	Mean Score	Result
Usability	Ease of system use	4.52	Very Satisfactory
Reliability	System stability	4.48	Very Satisfactory
Efficiency	Speed of accessing materials	4.55	Very Satisfactory
Accessibility	Access via mobile devices	4.40	Satisfactory
Maintainability	Ability to update materials	4.50	Very Satisfactory

Overall Mean: 4.49 – Very Satisfactory

The results indicate that users perceived the system as efficient and easy to use, supporting continuous access to instructional materials during learning disruptions.

IV. DISCUSSION

The findings of this study indicate that LearnLink effectively addressed the challenges of interrupted learning during disasters. The high participation rate and positive system evaluation suggest that digital learning platforms can significantly enhance accessibility and continuity of education. These results support the study of Crompton et al. [7], which emphasized the role of technology-assisted learning in maintaining educational engagement during emergencies.

The high participation rate suggests that learners were able to continue their studies despite class suspensions. Teachers also benefited from the system through improved organization of instructional resources and simplified distribution of materials.

However, challenges related to internet connectivity and digital literacy were observed among some users. Providing additional training and improving infrastructure support may further enhance the effectiveness of the system.

V. LIMITATIONS AND FUTURE WORK

This study was conducted within a single school environment, which may limit the generalizability of the findings. Future research may involve implementing the system across multiple schools and integrating additional features such as mobile application support, real-time analytics dashboards, and offline access capabilities to further enhance system usability and accessibility.

VI. CONCLUSION

This study developed and implemented LearnLink, a school-based digital learning hub designed to support learning continuity in disaster-prone environments. The platform improved access to learning materials, increased student participation, and enhanced teachers' efficiency in managing instructional resources.

This study contributes to the growing body of research on disaster-resilient education by demonstrating the effectiveness of a localized digital learning platform in maintaining instructional continuity. The findings highlight the importance of integrating technology into educational systems to support flexible and accessible learning environments.

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