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Research Article

Easy2Distance Learning V2 (Easy2DL V2): A Web-Based Self-Learning Support System Using Database-Driven Architecture

Elisnorazmaliza Ab. Hamid[1,*], Hartati Maskur[2], and Roshila Abdul Mutalib[3]

[1] Politeknik Besut Terengganu; elis@polibesut.edu.my

[2] Politeknik Besut Terengganu; hartati@polibesut.edu.my

[3] Politeknik Besut Terengganu; roshila@polibesut.edu.my

* Correspondence: elis@polibesut.edu.my; 019-9396084.

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Abstract: *The post-pandemic education landscape requires flexible and sustainable self-directed learning support systems that go beyond static web platforms. However, many existing learning platforms still rely on static web technologies that lack user management, learning tracking, and system scalability. This study presents Easy2Distance Learning V2 (Easy2DL V2), a database-driven web-based learning support system developed to address the limitations of Google Sites. Using a Design Research and Development (DDR) approach, the system was designed and implemented using native PHP and MySQL. Functional testing and comparative analysis indicate improvements in content management, user interaction, and personalized learning plan support. Easy2DL V2 provides structured access to digital learning tools through centralized data management and a scalable architecture, supporting sustainable self-directed learning for both individuals and educational institutions.*

1. INTRODUCTION

The COVID-19 pandemic brought a significant shift to the education sector by accelerating the adoption of digital technologies across all levels of learning. During the crisis, emergency remote teaching became a practical solution to ensure the continuity of instruction. However, in the post-pandemic phase, education has gradually evolved beyond temporary online delivery toward more flexible, learner-centred, and self-directed learning approaches (Chomunorwa et al., 2023; Hebebci et al., 2020; Tavares et al., 2022).

In this new educational landscape, learners are no longer passive recipients of information. Instead, they are expected to actively manage their learning process, select appropriate digital tools, and continuously develop knowledge outside traditional classroom settings (Dabbagh & Castaneda,

2020). This shift places greater emphasis on learning autonomy and requires digital learning environments that can support sustained engagement and independent learning practices.

Despite these changing expectations, many educational institutions continue to rely on static web platforms, such as Google Sites, which were initially adopted for rapid deployment during the pandemic period (Chomunorwa et al., 2023; Hebebci et al., 2020). While these platforms are effective for basic information sharing, they are limited in supporting long-term self-directed learning. Features such as user authentication, learning activity tracking, personalization, and system scalability are generally absent in static platforms, reducing their suitability for structured and sustainable digital learning environments (Al-Fraihat et al., 2020).

In response to these limitations, Easy2Distance Learning V2 (Easy2DL V2) was developed as a database-driven, web-based system designed to support self-directed learning in a more structured manner. The system aims to provide organized access to digital learning tools, enable personalized learning plan management, and offer scalable system administration that aligns with the demands of post-pandemic education.

2. PROBLEM STATEMENT

Static web platforms are commonly used in educational settings due to their ease of use, accessibility, and low technical requirements. However, previous studies have shown that such platforms offer limited support for structured online and self-directed learning, particularly in terms of personalization, learner engagement, learning activity monitoring, and system scalability (Al-Fraihat et al., 2020; Chomunorwa et al., 2023). These limitations become increasingly critical in post-pandemic education, where learner autonomy and lifelong learning are central pedagogical goals (Dabbagh & Castaneda, 2020; Tavares et al., 2022).

The initial version of Easy2Distance Learning (Easy2DL), which was developed using Google Sites, functioned primarily as a static repository for learning materials. Although it served its purpose for basic content dissemination, the platform did not incorporate database integration, user authentication, role-based access control, or learning activity tracking. As a result, learners experienced difficulties in organizing and managing their learning tools systematically, while educators faced challenges in maintaining content, monitoring learner engagement, and ensuring long-term platform sustainability.

These challenges indicate a clear gap between the capabilities of static learning platforms and the requirements of contemporary self-directed learning environments. Therefore, there is a need for a dynamic, database-driven system that can support personalized learning experiences, enable effective monitoring, and ensure sustainable digital learning practices in the post-pandemic context.

3. LITERATURE REVIEW

3.1 Self-Directed Learning in Post-Pandemic Education

Self-directed learning has gained increased attention in post-pandemic education as learning environments continue to shift toward flexibility and learner autonomy. This approach emphasizes learners' ability to take responsibility for planning, monitoring, and evaluating their own learning processes (Dabbagh & Castaneda, 2020; Shemshack & Spector, 2020). In digital learning contexts, self-directed learning is closely associated with lifelong learning readiness and the ability to adapt to rapidly changing educational and professional demands (Chomunorwa et al., 2023).

Despite its potential benefits, effective self-directed learning does not occur automatically. Learners require structured digital environments that support goal setting, resource organization, and learning continuity (Hebebci et al., 2020). Without appropriate system support, learners may struggle to manage learning activities independently, particularly when learning resources are dispersed across multiple digital platforms. This highlights the importance of learning systems that are designed to guide and support self-directed learning practices rather than merely providing access to content.

3.2 Limitations of Static Web Platforms in Online Learning

Static web platforms, such as Google Sites, are widely adopted in educational settings due to their simplicity, accessibility, and minimal technical requirements. During the pandemic, these platforms played an important role in enabling rapid content deployment and basic online learning support. However, previous studies indicate that static platforms are limited in their ability to support interactive and personalized learning experiences (Al-Fraihat et al., 2020; Chomunorwa et al., 2023).

Key limitations of static web platforms include the absence of user authentication, limited personalization options, lack of learning activity tracking, and restricted system scalability. These constraints reduce their effectiveness in supporting structured and sustainable digital learning environments, particularly in post-pandemic contexts where learners are expected to manage learning activities more independently. As educational practices increasingly emphasize learner-centered and self-directed approaches, the reliance on static platforms presents a significant challenge.

3.3 Database-Driven Learning Support Systems

In contrast to static platforms, database-driven learning support systems offer dynamic content management and personalized learning experiences. Such systems allow learning resources, user data, and learning activities to be organized systematically within a centralized database. Previous research has shown that system quality and personalization play a critical role in enhancing learner engagement and learning effectiveness (Du Plooy et al., 2024; Raj & Renumol, 2022).

Database-driven systems also support individualized learning plans by enabling user-specific access, progress tracking, and adaptive content organization. This aligns with learner-centered educational practices that emphasize flexibility and personalization (Essa et al., 2023; Gligorea et al., 2023). As a result, these systems are better suited to support sustainable self-directed learning compared to static web-based platforms, particularly in long-term digital learning implementations.

3.4 Design and Development Research (DDR) in Educational Technology

Design and Development Research (DDR) is commonly employed in educational technology studies that focus on the creation and evaluation of functional systems. This research approach emphasizes systematic design, development, and iterative evaluation rather than large-scale data collection (Richey & Klein, 2007; Richey et al., 2011). DDR is particularly suitable for studies that aim to address practical problems through technological solutions.

Previous studies highlight that DDR enables researchers to validate system functionality and design effectiveness within real-world educational contexts. For system-based studies, such as the development of Easy2Distance Learning V2 (Easy2DL V2), DDR provides a structured framework to guide the development process while ensuring that the system meets its intended objectives. Therefore, this approach is appropriate for developing lightweight, database-driven learning support systems that focus on usability, functionality, and sustainability.

4. OBJECTIVES

The main objective of this study is to develop a database-driven, web-based self-directed learning support system that addresses the limitations of static learning platforms in post-pandemic education. Specifically, this study aims to:

1. design a structured self-directed learning system that integrates user authentication and role management;
2. support personalized learning plan management through database integration; and
3. enhance the sustainability and scalability of digital learning platforms to support long-term self-directed learning practices.

5. METHODOLOGY

5.1 Research Design

This study adopts a design and development research approach, focusing on the development of a functional digital learning support system rather than theoretical model testing. The approach is suitable as the primary objective of the study is to address practical limitations of static learning platforms by designing and implementing a database-driven solution that supports self-directed learning. The research process involved system analysis, system design, development, and evaluation stages to ensure that the proposed solution aligns with the needs of post-pandemic digital learning environments.

5.2 System Development Approach

The development of Easy2Distance Learning V2 (Easy2DL V2) followed a structured system development process consisting of requirement analysis, system design, implementation, and testing phases. During the requirement analysis phase, key limitations of the existing Easy2DL platform were identified, particularly in relation to user authentication, content organization, personalization, and system scalability. These requirements were then translated into functional system components during the design phase, including database structure, user roles, and system workflows.

The implementation phase focused on developing a web-based system integrated with a relational database to enable dynamic content management and user-specific interactions. System testing was conducted iteratively to ensure that core functionalities such as user login, learning plan management, and administrative control operated as intended.

5.2.1 Phase 1: Analysis

The analysis phase involved a detailed examination of the original Easy2DL platform based on Google Sites. System and document analysis revealed several limitations, including static content presentation, absence of database integration, limited user interaction, and lack of personalized learning functionalities. These findings highlighted the need for a more dynamic and interactive system to support structured self-directed learning.

5.2.2 Phase 2: Design

During the design phase, the system architecture, database schema, and user interface were systematically planned. Easy2DL V2 was conceptualized as a web-based system supporting two

distinct user roles: User and Administrator. Learning tools were structured and categorized into four learning environments, namely Learner-Centered, Knowledge-Centered, Community-Centered, and Assessment-Centered, to ensure pedagogical alignment and ease of navigation.

5.2.3 Phase 3: Development

The development phase involved the implementation of Easy2DL V2 using native PHP as the server-side scripting language and MySQL as the database management system. Key system modules developed included user authentication, a dynamic learning tools directory, standardized tool detail pages, a personalized learning plan module, and an administrative dashboard for content and user management.

5.2.4 Phase 4: Implementation and Evaluation

System evaluation was conducted through **functional testing and usability observation** to assess whether the developed system met its intended objectives. Functional testing focused on verifying the accuracy of system features, including login authentication, learning plan management, and administrative operations. Usability observation was carried out by reviewing system interaction flows to ensure that the system supports intuitive navigation and practical use in a learning context. Feedback from the evaluation process was used to refine system features and improve overall system reliability.

6. SYSTEM ARCHITECTURE

Easy2DL V2 was developed using a web-based architecture integrated with a database backend. The system architecture consists of three main components: the user interface, application logic, and database layer. The user interface allows learners and administrators to interact with the system through role-based access. The application logic manages system functions such as authentication, learning activity organization, and data processing, while the database layer stores user information, learning resources, and activity records. This architecture enables scalability and supports long-term system maintenance.

Table 1. Description of Main System Components

Component	Description
Presentation Layer	Web interfaces for users and administrators
Application Layer	PHP-based logic for authentication, tool management, and learning plans
Data Layer	MySQL database for storing users, tools, categories, and learning plans

The system database consists of tables for users, categories, learning tools, learning plans, and system content. This structure enables centralized data management and supports personalized learning experiences.

7. FINDINGS

The development of Easy2DL V2 resulted in a fully functional self-directed learning support system that demonstrates clear improvements over the original static platform (Du Plooy et al., 2024; Essa et al., 2023). Comparative analysis indicates enhanced content management efficiency, improved user interaction, personalized learning plan functionality, and greater system scalability. These findings confirm that transitioning from a static web platform to a database-driven system significantly improves support for structured and sustainable self-directed learning.

Table 2. Comparison between Google Sites and Easy2DL V2

Feature	Google Sites	Easy2DL V2
Database support	No	Yes
User login	No	Yes
Learning plan	No	Yes
Admin dashboard	No	Yes
Scalability	Limited	High

A comparative analysis between the original platform and Easy2DL V2 reveals significant functional enhancements, including database integration, user authentication, learning plan management, administrative dashboards, and improved system scalability. These findings confirm that transitioning from a static web platform to a dynamic, database-driven system substantially improves the system's capability to support structured, scalable, and sustainable self-directed learning environments.

8. DISCUSSION

The development of Easy2Distance Learning V2 (Easy2DL V2) demonstrates how a database-driven learning support system can address the limitations of static web platforms in post-pandemic education. Unlike the original Easy2DL platform, which functioned mainly as a content repository, Easy2DL V2 introduces structured user management, personalized learning organization, and scalable system administration. These features directly support the growing need for learner autonomy and sustained self-directed learning highlighted in previous studies (Dabbagh & Castaneda, 2020; Tavares et al., 2022).

The findings from the system development and evaluation indicate that integrating database functionality enhances the organization and accessibility of learning resources. Learners can manage learning tools more systematically, while administrators can monitor and update content more efficiently. This supports Al-Fraihat et al. (2020), who emphasize that personalization and system management are critical factors influencing the effectiveness of digital learning platforms.

Furthermore, the role-based system architecture implemented in Easy2DL V2 allows different user groups to interact with the platform according to their needs. This feature contributes to system scalability and long-term sustainability, which are often lacking in static learning environments. In the context of post-pandemic education, where digital platforms are expected to support continuous learning beyond emergency use, such system capabilities are essential.

However, this study also recognizes that system development alone does not guarantee effective self-directed learning. Learner motivation, digital literacy, and institutional support remain

important factors that influence how digital platforms are utilized. Therefore, Easy2DL V2 should be viewed as a supporting tool that complements pedagogical strategies rather than a standalone solution.

9. CONCLUSION & FUTURE WORK

This study presented the development of Easy2Distance Learning V2 (Easy2DL V2), a database-driven, web-based system designed to support self-directed learning in post-pandemic educational contexts. The system was developed to overcome the limitations of static learning platforms by incorporating user authentication, personalized learning organization, and scalable system management. The findings suggest that Easy2DL V2 provides a more structured and sustainable digital learning environment that aligns with contemporary educational needs.

By transitioning from a static platform to a dynamic, database-driven system, this study contributes to practical solutions for supporting learner autonomy and long-term digital learning practices. The development approach adopted in this study highlights the importance of aligning system design with pedagogical goals, particularly in self-directed learning environments.

For future work, further evaluation involving a larger group of users could be conducted to assess user experience, learning engagement, and learning outcomes. Additional features such as learning analytics, adaptive learning recommendations, and mobile platform integration may also be explored to enhance system effectiveness. These improvements could further strengthen the role of Easy2DL V2 as a sustainable learning support system in evolving digital education landscapes.

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