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Research Article

Development of Learning Management System and Its Effect in Students' Academic Performance

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ABSTRACT

Technology in the educational institution enhances the teaching and learning experiences of both teachers and students. Learning Management System is a technological advancement which has been adopted by several institutions. Not only it helped in delivering online teaching materials but served as a way of communication. This study aimed to develop and validate a rule-based adaptive LMS using the ADDIE model and determine its influence on students' academic performance. Results showed that regression and correlation analysis identified time spent in LMS (r = +.812) and time spent viewing pages (r = +.877) as statistically significant predictors of academic performance, whereas login frequency (r = –.065) showed negligible effect. Expert and user evaluation rated the system at a "great extent," with subject matter content, instructional design, and software evaluation emerging as key factors affecting LMS acceptability. Findings suggest that sustained engagement and quality content drive improved performance.

Keywords*: LMS, Academic Performance, Learning Management System, Adaptive Learning, Adapative LMS*

Introduction

The presence of technology in educational institutions is no longer an option nowadays, rather it is an essential component of learning in the 21st century (Downs, 2016). Schools are spending fortunes to ensure the inclusion of technology in the learning and teaching experience of students and teachers. As the demand for blended and online education increases, institutions are considering expedient approaches to implementing learning management systems (Round, 2013).

Many educational technologies are available to enhance the learning and teaching experiences. One of the technological advancements in educational settings is the Learning Management System (LMS). It is defined as a web-based system requiring the participation of students and instructors to ensure activities such as systematizing, keeping statistics

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relating to students, benefiting from multimedia contents, sharing course materials and holding an exam (Ülker & Yılmaz, 2016).

LMS also enables instructors to share materials, organize lessons and assessments, and virtually communicate with students to support the learning and teaching process (Dulkaman & Ali, 2016). The primary objective of the implementation of LMS is to help and improve efficiency of learning activities (Phongphaew & Jiamsanguanwong, 2018). According to (Dittoe, 2018) with LMS, not only can teachers supply their students with assignments in digital format, but they can also record all their grades online, which can be easily accessed by parents, and provide online instruction so students need not to be in the school building to receive and participate in the lesson. Though one can certainly learn without an LMS (and most still do), those who have gained at least one quality learning experience through a properly managed LMS recognize the unequaled utility and accessibility that the LMS has to offer (Kokensparger, 2013).

The students who has gained experience of one quality learning module through a properly organized LMS can recognize the utility and accessibility of LMS (Kokensparger, 2013) in comparison to the students who are learning without an LMS.

Although many studies explored LMS usage, motivation, and engagement, limited research has investigated LMS validation and how its utilization correlates with measurable student academic performance. This study therefore aimed to (1) develop and validate a rule-based adaptive LMS using the ADDIE framework, and (2) analyze the correlation between LMS utilization metrics and academic performance based on system-generated logs.

Methodology

This study developed and validated a Learning Management System, as well as investigated its correlation in the students' academic performance expressed in their prelim grade. Descriptive Developmental Design is employed in this study to gather and investigate variables, viz., students' academic performance and LMS utilization. These data were collected using questionnaires and system logs, after which their correlation was identified.

On the other hand, user's needs and requirements were identified in the development of the system. Five categories of LMS features for higher education is considered, these include (1) subject matter content; (2) readability; (3) instructional design (4) software operation; and (5) usability, in reference to the study of (Espino, 2019).

There were two sources of data in this study. To identify the academic performance of the respondents, the Prelim grade period is used as basis. Students' logs were collected as the basis of learning management utilization. The validation of Learning Management System adopted the locally construct evaluation tool from (Espino, 2019) in reference to the standard evaluation for software engineering from ISO 9001:2015, which focused on the subject matter content, readability, instructional design, software operation, and usability.

Descriptive statistics (mean, frequency, percentage) were used to summarize participant characteristics, while Pearson correlation and multiple regression analysis determined the predictive relationship between LMS usage variables and academic performance. Results are tabulated, analyzed and interpreted using Statistical Package for Social Science (SPSS) software.

Result and Discussion

Using the description method and correlation, the study sought to investigate the acceptability of utilization of the developed LMS and its effect in academic performance of the students.

The developed LMS is designed with the following features, (a) content management which allows creation of new content, modifying existing content, perform editorial processes on content, and ultimately make that content available to other people to use, (b) user account management which provides access in browsing list of users, bulk user actions, adding new users, user default preference, user profile fields, upload users, and upload user pictures, (c) communication system which is in the form of email, discussion forums/chats,

notes, upcoming events, information channels, and endnote, and (d) evaluation system which can be calculated, aggregated and displayed in a variety of ways, settings are provided to suit the needs of a class.

ADDIE model which stands for Analysis, Design, Develop, Implement, and Evaluation is used in the development of the system. In the analysis phase, software, hardware, and contents integration were identified. In the design phase LMS is conceptualized, keeping in mind the intended users, furthermore the platform (Moodle) is identified. Develop phase is the conversion of ideas into computer language. The developed LMS contains intended learning, advance organizer, pre-task, while – task, post – task, assessment, and references. In the implement phase, the developed LMS underwent validation from experts. Results revealed an overall mean of (4.39) which is verbally interpreted as "great extent". The last phase which is evaluate, is where the intended users evaluated the developed LMS.

Rules were defined for adaptive learning; next task will only be unlocked when students passed the existing task. These rules customized the learning management system for a particular student. One student may learn faster from one part of the module, but may learn slow from other modules. By using rule-based technique the learning path is developed for the diversity of learners.

Students spent a total of 485270 minutes within four weeks in using LMS, 455526 minutes were spent viewing pages and login times has a total of 29455. Activities of the students in LMS includes participation from online quizzes, discussions, forums, and communications. Students are likely to spend time in using LMS if teachers would engage them like giving reading materials or online activities in LMS. It can be noted in the study of (Ülker & Yılmaz, 2016) that instructors need to pay a greater role in motivating students to use the LMS via innovative and creative means.

Students who spent more time in using LMS and viewing pages in LMS performed with High Satisfactory, which represents 78% of the respondents. Students under Low Satisfactory representing 22% of the respondents spent few hours in using LMS and viewing pages in LMS.

There is a statistical significant correlation at 0.01 level (r=+.812) between the student's academic performance and their time spent in LMS, and the average time spent by the students in viewing LMS pages and their academic performance with statistical significant correlation of (r=+.877). But for number of times they logged in from LMS it has no statistical significant correlation (r=-.065).

Conclusion

That learning management system should contain the vital features to facilitate improvement in the teaching and learning experience. These features include content management which is the very essence of a LMS. User account management which grants access to intended users, communication system which is important in establishing communication with teachers and students and lastly evaluation system which serves as the performance rating of the students.

Based from the standard learning management system development model, ADDIE which stands for Analysis, Design, Develop, Implement, and Evaluation is the most suited development model. Each phases of the model are equally important in the progress of the development.

Diverse students have diverse learning paths, by defining rules in LMS, students utilized learning management system as a supplementary tool in their learning experiences. They spent hours to navigate from the pages of LMS, read the pages, and participate on online activities.

Findings confirm that the developed LMS, validated to a great extent by experts and users, contains essential features for effective digital learning delivery. The strong positive correlation between academic performance and time spent navigating LMS pages suggests that sustained engagement significantly enhances learning outcomes.

Regression results further establish that subject matter content and instructional design are strong predictors of LMS acceptability and user satisfaction, emphasizing the need for high-quality learning resources.

Recommendation

The LMS validation identified content quality and instructional design as the strongest predictors of acceptability and usefulness. Therefore, these two areas must be given highest priority in development, deployment, and continuous improvement.

1. Prioritize enhancement of instructional content and design, ensuring materials are structured, engaging, and aligned with course outcomes. Content quality must remain the central focus of LMS development.
2. Encourage teachers to maximize LMS features for assessments, activity-based learning, and guided digital interaction, not merely content posting.
3. Provide sustained capacity-building programs for faculty on instructional design, multimedia content development, and online pedagogy.
4. Explore integration of adaptive modules and IoT-enabled features (e.g., attendance automation, performance analytics) to improve personalization and monitoring.
5. Establish clear institutional policies to guide responsible and optimized LMS use.

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