BOOK CHAPTER | Requirement Engineering & Learning Analytics
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Requirement Engineering in Learning Analytics (Machine Learning) in an Indigenously Designed Learning Platform: A Case Study

Michael Adelani Adewusi, Tokunbo Odekeye, Eniola Silas Egbowon, Rahman Alade & Olugbenga Gabriel Akindoju
Africa Centre of Excellence for Innovative and STEM Education
Lagos State University, Ojo
E-mail: mikeade3000@yahoo.com
0000-0002-8003-6761; 0000-0002-9973-6741 ; 0000-0002-7096-0352

ABSTRACT

Examination of data from a variety of sources could be a very effective tool for needs elicitation and management (Franch, 2020) and an indigenously developed platform for learning purposes should not be excluded or ignored (Adewusi, Egbowon & Akindoju, 2021). With the use of natural language processing or machine learning in analysing, data are tough to grasp since they necessitate high-quality data and specialised knowledge from several domains, and more importantly, their generalisation remains a difficult task (Franch, 2020). Although data-driven approaches are becoming more prevalent in practically every aspect of software development and or engineering, the issue of requirement engineering is still not being addressed to ensure that designed software, particularly indigenous applications, is appropriate to the end-users such as parents, government and stakeholders in all educational sector all over the world. However many countries shut down their schools in a bid to avoid the spread of COVID-19. This Chapter examines Requirement Engineering in Learning Analytics (Machine Learning) in an Indigenously Designed Learning Platform using a Case Study

Keywords: Requirement Engineering, Learning Analytics, Machine Learning

Introduction

During the COVID-19 Pandemic, the education sector saw a rapid uptake and deployment of several Learning Management Systems (LMS). Thousands of funds have been invested by higher education institutions to develop these systems in order to provide students with continuous access to high-quality education while also expanding enrolment through distance learning (Adewusi, 2021; Adewusi, Egbowon, Abodunrin, & Rahman, 2021). However, during and after the COVID-19 Pandemic, the influence of these learning management systems on improving learners' performance has been a prominent area of research (Adewusi, 2021). To establish the impact of LMS use on students' academic achievement, research studies have relied on data from learners' quantitative and qualitative opinions, as well as subjective interpretation via questionnaires or surveys (Zhang, Ghandour, & Shestak, 2020).

In this article, it is hypothesized that if these adoptions (learners' quantitative and qualitative opinions) had been able to accurately define the learning impacts on students, and if correct, had the process being implemented on the virtual learning platform replicated in other platforms for generalisation in order to understand all data retrieved from students' interactions with the virtual learning platform, the success or failure of their assessment would have been able to be determined.

Related Reviews from Learning Platforms

Zhang, Ghandour, and Shestak (2020) used learning analytic tools to examine the correlations between the number of logs submitted during the e-course and the final grades of 124 participants. The study used a correlation analysis to examine the impact of students' educational activities on the final assessment via the Moodle system, with the findings revealing that gender affiliation is connected to overall performance but has no bearing on training material selection. Additionally, students who achieved the highest grades in the course completed at least 210 logs. It is worth noting that the vast majority of students prefer to complete their assignments ahead of schedule.

Furthermore, Zhang, Ghandour, and Shestak (2020) built a machine-learning analytical technique to assess the causation between LMS usage and student performance in a study. Using a newly created Learning Analytics tool, data from the LMS logs of the two given courses were collected and subjected to a linear regression analysis with the students' outcomes. According to the study, discussion posts, peer engagement, and exercises were found to be key contributors to students' academic achievement in blended learning. Requirement engineering is the process of determining software requirements based on demands eliciting needs, modeling, analysing, verifying and validating, and managing requirements.

The requirement element in a learning environment or platform is the analytical tools which in most cases in not being implemented or activated by most virtual platform. It is important to note that data obtained through mediums such as questionnaires and surveys is frequently vulnerable to the possibility of low dependability and distortion.

As a result, application of a machine learning analytics tool to a live virtual learning environment is of more beneficial in order to assess students' performance on the platform. Moreover, the purpose of implementing a learning analytics tool is to assess students' learning optimization in virtual learning environment. Given the widespread usage of Learning Management Systems (LMS) by higher educational institutions it is critical to use it. Learning Analytics tool extracts data from LMS database files which can provide a plethora of information on students' activities in the system, which can be used to make informed judgments about potential problems and remedies in the system.

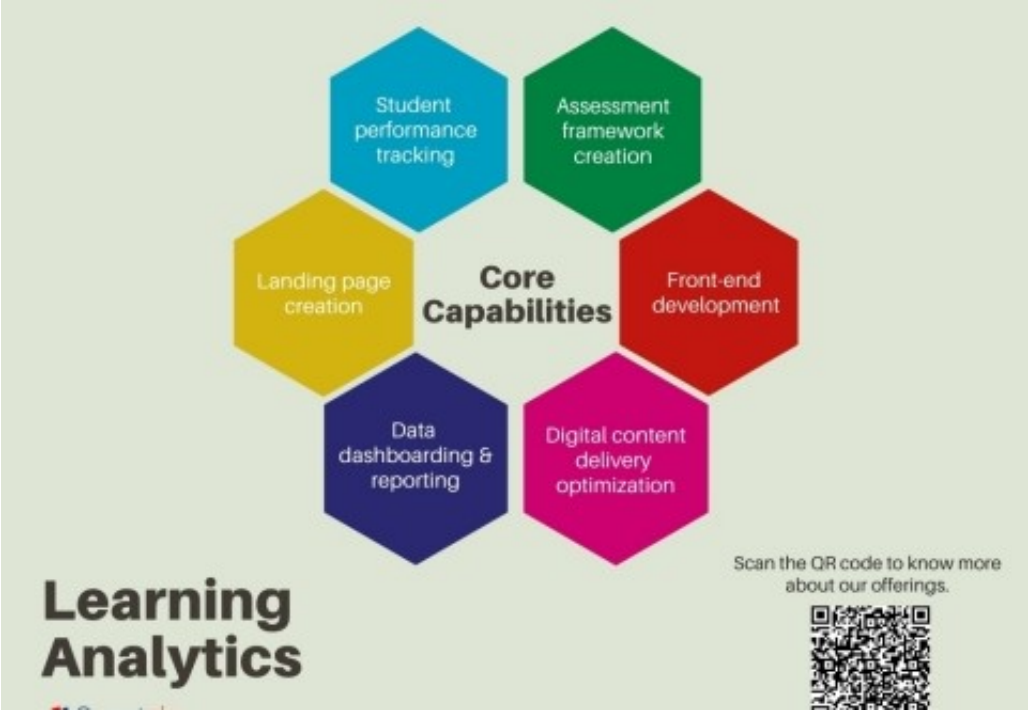

Fig 1: Component of Learning Analytics
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Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS) for structure and styling, Hypertext Preprocessor (PHP) as a server-side language, JavaScript as a client-side language, Chart.js as a JavaScript library for graph drawing, JQuery as a JavaScript library for cross-browser compatibility, and AJAX as an asynchronous method for data exchange between server and clients are among the web technologies used by the learning analytical tool to provide useful views of data in a Moodle site (Fenu, Marras, & Meles, 2017).

Learning Analytics software that extracts data from LMS database files can provide a plethora of information on students' activities in the system, which can be used to make informed judgments about potential problems and solutions. The Learning Analytics tool in the indigenously constructed adelanivle.ng was built and developed using variables acquired from the literature. The built tool was used to retrieve data from the site's course during the academic year 2019/2020. The Learning Analytics tool was used to gather data from e-learning system usage to determine the impact on students' academic performance.

However, the analytical tool was used as requirement engineering to check the deployed achievement test of the students that were registered for cyber security course on the site during the COVID-19 pandemic. The resultants showed that some questions that were thought to be easy were actually very difficult for the students to attempt.

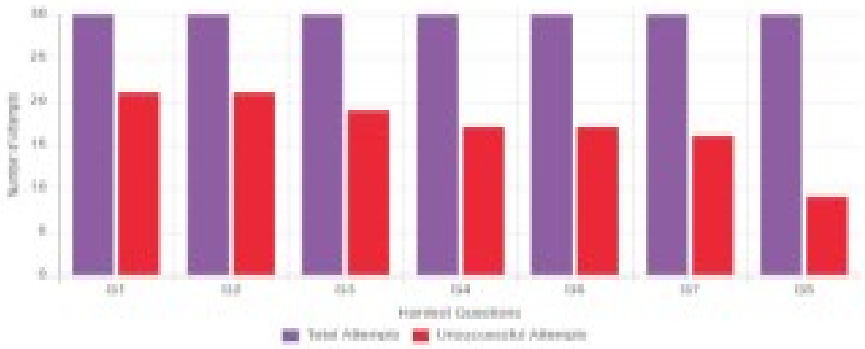

Fig 1: Toughness of Questions

The total number of quiz tries is indicated by Total Attempts. Unsuccessful Attempts is the sum of all incorrect attempts plus the number of cases that were not answered. Figure 1 depicts the difficulty of questions, which is determined by the number of times the quiz has been attempted as well as the number of times a question has been left un-attempted or erroneously attempted.

Using the learning analytics tool, it is clear that question number one is the most difficult or difficult question in the course's evaluation. The findings were presented using an analytical tool that compared the number of times the quiz was attempted with the number of times the specific question was left un-attempted or improperly attempted before moving to the next question. While question number five, as shown in Figure 1, is the most straightforward for students to attempt.

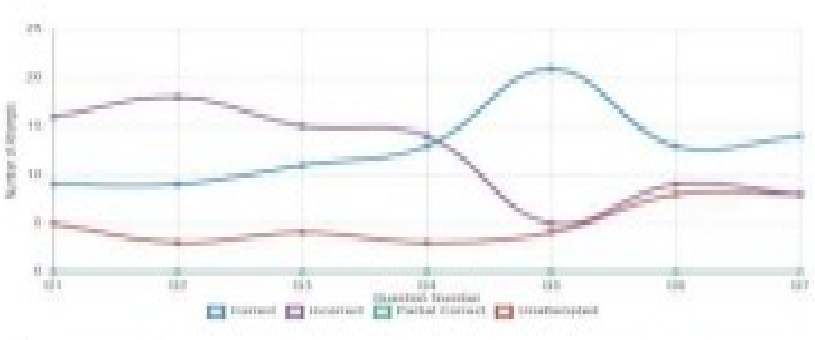

Fig 2: Attempts Pattern

Figure 2 depicts the curves that indicate the students' performance on each question. The circles next to each question indicate and display how the students did on the question, along with an explanation and the correct answer.

Conclusion

Learning analytical tools are software algorithms that combine previously interacting data and current activity in a learning management system to detect unknown areas of a learning process. This is the requirement engineering in this study. Despite its sample size constraints, the study has added to the literature on the use of analytical techniques in LMS as requirement engineering. It also adds to academic attempts to achieve equity in science learning by using constructing models that incorporate mutual understanding. There is an on-going study to implement requirement engineering as an analytical tool involving over 5000 students.

The findings highlights the academic's goal of assisting all learners in achieving science literacy equality by demonstrating how students performed in their interactions with the questions and why the assessor may not have realized that some questions are more challenging than others. This is beneficial in that such a difficult question can be removed from the system's list of questions.

The results of the findings also revealed the patterns in which students engage with the system. Making it possible to observe their responses to the questions. This is useful because future questions may be like this, and students should be free when answering them. However, limited indigenously designed learning platform had reported students interaction with the learning platform to be sure that knowledge acquired by the students are truly lasting and that the learning platform had been able to satisfy the needs of the students. This call for a need to activate the requirement engineering element in the virtual learning environment in form of the learning analytics.

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