LEARNING ANALYTICS FOR SMART CLASSROOM IN HIGHER EDUCATION

Vikas Rao Naidu[1*], Baldev Singh[2], Raza Hasan[3], Ghaniya Al Hadrami[4]

[1*]Mr., Middle East College, Oman, vikas@mec.edu.om
[2]Dr., Vivekananda Institute of Technology, India, baldev.vit@gmail.com
[3]Mr., Middle East College, Oman, raza@mec.edu.om
[4]Ms., Middle East College, Oman, ghaniya@mec.edu.om
*Corresponding author

Abstract

Higher education sector is always incorporating changes pertaining to the technology to provide better teaching and learning environment to the stakeholders, which includes students and faculty members. A smart classroom is the one, which is equipped with latest tools and technologies that are based on the internet. Various web-based tools are also being used to enhance teaching and learning experience. To provide appropriate content to the students, based on their level of understanding, learning analytics could be helpful. Students would be provided with the content, based on assessments and tests, the result of which could analyze the area of improvement suggested for them. In this way, faculty can ensure that learning is taking place at each level in the classroom. This research paper highlights such environment which provides a strong base for learning analytics for enhanced learning environment especially in higher education.

Keywords: Dashboard, Educational Data Mining, E-learning, Enhanced teaching and learning practices, Interactive educational tools, Learning analytics, Multimedia in education, Smart Classroom, Technology-enhanced learning.

1. INTRODUCTION

Information Communication Technology (ICT) plays a vital role in the economic growth of any country. The ICT infrastructure gives ubiquitous computing for better and fast communication in all aspects of life. The benefit of these technologies can be used in Higher Educational Institutions (HEI) for better teaching and learning. As the technology and infrastructure provides better opportunity for HEI to move a step forward and making the classroom away from traditional to smart classrooms. Assessments are the best form to assess the quality of students and faculty (E. L. Baker et al., 2010). An assessment in most Higher Educational Institutions remains a standard to ease the administrative tasks. Grading and assessments are used to observe students' success and faculty excellence.

"Universities should treat learning as not yet wholly solved problems and hence always in research mode." (Humboldt 1970). There are four main ways to engage students of undergraduate level with research and inquiry.

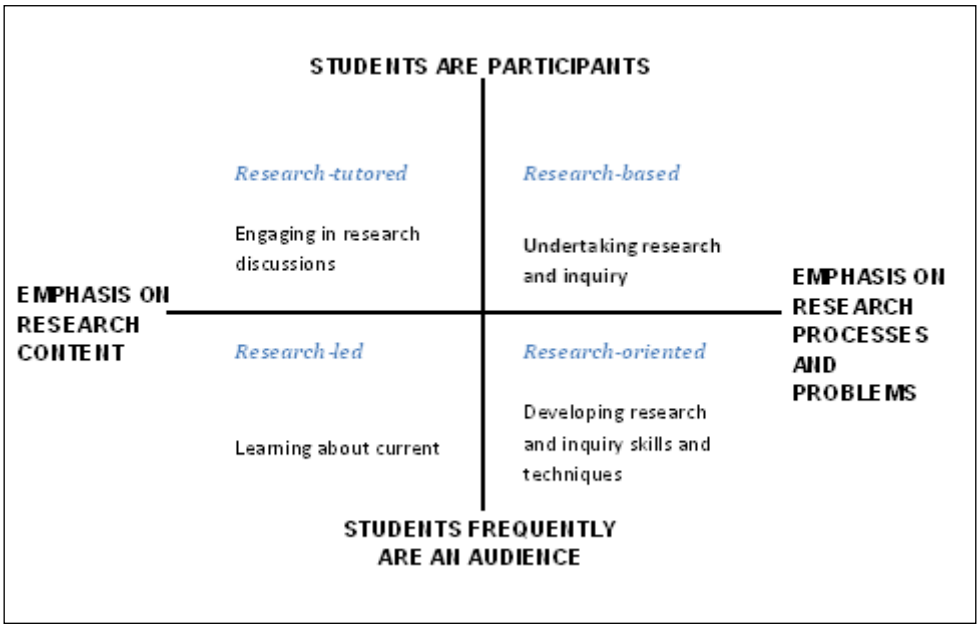

Figure 1. Healey and Jenkins Model (2009)

The model shown in Fig.1 defines that the students maybe engaged in research and inquiry either being as a participant or audience. Also, it classifies the approach as emphasizing either research content or research processes and problems. The ways of engaging the student with research and inquiry are not independent (Healey and Jenkins 2009). This can only be achieved by using blended learning (Gebre Yohannes et al. 2016, Hasan et al. 2015, Siddiqui et al. 2012), but that is not enough. Capturing the information about the learners and learning process is required which leads to Educational Data Mining (EDM) and Learning Analytics (LA). Here, learning analytics will measure, collect, analyze and displays the report data of each student (Hadhrami 2017) and provide continual progress of the students during the intended course (Shute, 2008), help faculty to disseminate the knowledge and administrators to predict forecast for future intake.

Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs. (Siemens & Gašević, 2012)

2. LITERATURE REVIEW

Several researches in the learning field have been showed recently in order to enhance the student's effort of the different activities in the education. The development of the learning system has aided the education to grow in the best manner in both students and teachers. The Structural approach covered in all parts of the educational field like design and implementation. The proposed of this study is to improve the educational system for teacher and student. Learning analytics focus on the data that came from Learning Management System (LMS).

The benefit of using Learning Management System is to help, develop and enhance the learning and teaching in a suitable manner. "Learning analytics tends based on data from distributed sources is increasingly important and popular. And of open learning environments and distributed well represented by the concept of personal learning environment", (Chatti, Schroeder and Jarke 2012b).

Most of the studies stated that learning analytics plays an important role to affect the student's perspective and the way of the students learn. Learning analytics related to the activities of the students through LMS. It helps to build the data and being available to the teacher and administrator. There are two hypotheses showed the relation between learning analytics and LMS. First hypothesis illustrated significant learning through a set of sites. It means the widely used of learning by students in various LMSs however the interaction can be low because it specified just through the activities like quizzes, and other activities of the course material. Moreover, there is a hypothesis that LMS are dependent for learning. Commonly the

method of learning analytics on LMS ignores activities which came from outside the system, with the conclusion that just a simple part of a students' participation in learning is being took.

The second hypothesis illustrated the system is geared towards the authority of administrators instead of the students and teachers. Therefore, learning analytics focused to the educational measurement rather than people.

The system faced some difficult to trace trackable contributions, where the project named as Uatu that studied to use data visualization to determine the practical work activity of the student participation through the course material. The students worked as a group to add and store in the cloud document via Google. The collection of data was stored within these documents in Google about the students' activity, containing a set of edits and content which added each edit. The research concluded that the collection of data was not capable to take and get any comments that made the activity and another concluding that the preferences of students working not abled of this study to offer a proper view the interaction within the groups. The final result got that it is difficult to trust on finding the analytics and may the system going to close.

According to an observation by Michael Wesch, where he took a part of the problem that he faced to analyze the progress of the learning services; the observation was to identify the relation between the questions and inquiries. Another approach is by focusing to learning analytics which including the students' interaction of their own data. The students aware of their efforts in the system and how to the system will make the reflection of their performances to identify the behavior. So, learning analytics will support the researcher to understand the progress of system in depth. It focused on the students' performance, reflection and answer that assist to know how the student behavior to gain the knowledge by student understanding.

The aim of learning analytics is not just to let the teacher to present the information for the students, but how the teacher will support, guide, motivate and assist the student to learn and gain a good knowledge. Through learning analytics, the students will able to make the self-evaluation and identify their behavior.

Hadhrami stated that learning analytics is not new article, it developed in many areas of the educational fields and business intelligence. The increasing quality amount of data is related of students' participation in different of educational process over the world. Learning analytics aims is to gain the good knowledge and ability to gather the data and adapt the mechanism of education; therefore, it will assist the teacher to use and improve the skills in teaching and learning to provide the different activities that required for students' requirement in their studies (Hadhrami 2017).

Learning analytics is focusing on data that coming from Learning Management System (LMS). The data coming from LMS includes the number of times the student has logged into the page, the assessment of the student according to course prerequisites, the time spent by the student in reading the course materials and the time taken to complete the module assessments and attending discussions on forum (Hadhrami 2017).

This is not enough in the fast changing environments; video analytics by using streaming server can add more benefits along with LMS which gives more capability to the stakeholders for better prediction, improving student's success factor and enhancing the learning and learners experience. Blended learning will boost the two analytics and moving towards research based learning.

Dashboard will provide real time visualization which helps to improve the students' performance, teachers' time and effort that is by providing the information on which student's needs to gain good knowledge and enhance skills. The achievement goals of learning become more rapidly through providing the accessible tools to let the learners and educators to evaluate their performances progress and get the best result. "The benefit of learning analytics assists to enhance the teaching and learning to the teachers to make the students' understanding well" (Eckerson 2011). In addition to that learning analytics helps and supports the educational institutions to achieve the students' performance. The enhancement of a good knowledge is based on the types of education that has followed in the both of learning analytics technique and data mining communities in the educational institutes (Hadhrami 2017).

3. RELATED WORK

Supporting Higher Education to Integrate Learning Analytics (SHEILA): Systemic approach to learning analytics is the Supporting Higher Education to Integrate Learning Analytics (SHEILA) project, which has been developed to "assist European universities to become more mature users and custodians of digital data about their students as they learn online" (Amy et al. 2017).

EDUCAUSE: Enable institutional leaders and practitioners to educate themselves about the emerging field of predictive learning analytics and understand how it will impact the higher education landscape (ECAR-ANALYTICS, 2015).

Learning Analytics Community Exchange (LACE): Learning manifesto for learning Analytics in a workplace (Ferguson et al. 2016).

Check My Activity Tool: University of Maryland, Baltimore County implemented this tool to compare the learning activity within the LMS and their peers. This is to encourage the learners to self-motivate and engage with the better fellow students.

Khan Academy: The Khan Academy platform enables powerful on-line courses in which students can watch videos, solve exercises or earn badges. This platform provides an advanced learning analytics module with useful visualizations for teachers and students. Nevertheless, this learning analytics support can be improved with recommendations and new useful higher-level visualizations in order to try to improve the learning process (José A, 2013).

4. PROPOSED MODEL FOR SMART-CLASSROOM

Smart classrooms can create multiple opportunities for students to learn material in a variety of ways. In addition, they can give access to materials in a variety of ways (Uskov 2016). Learning environment of such classes are enhanced by means of various technological interventions such as Learning Management System (LMS) and the streaming server. These technologies facilitate a smooth conduct of active classroom teaching, which in turn, is a part of blended learning. Fig 2 illustrates a model designed for smart classroom.

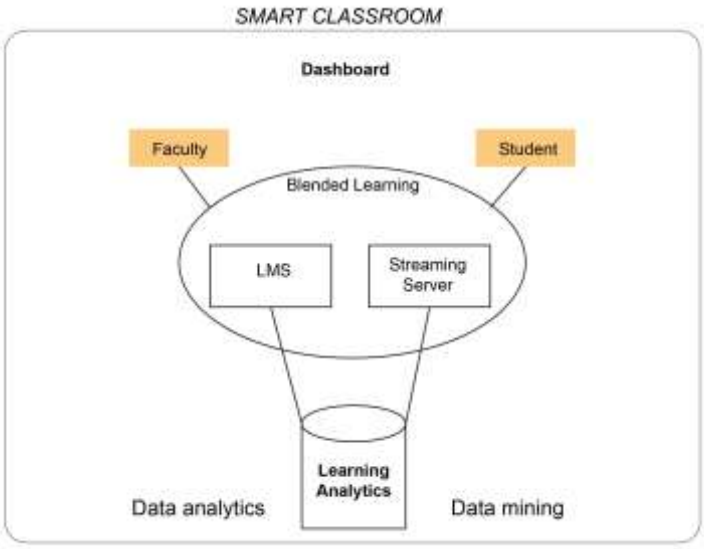

Figure 2. Proposed model for Smart Classroom

As given in Fig 2, the faculty plays a role of facilitator in this class and the students have direct access to all the learning resources. LMS is implemented for providing a common platform for information exchange, then whether it is an online class activity, or an assessment. Streaming server facilitates the usage of video with high quality for parallel playback with considerable amount of delay. Learning analytics involves the data analysis and data mining of these data, captured through the log generated at LMS and the streaming server.

With this environment settings, possible LA objectives can be achieved such as monitoring, analysis, prediction, intervention, assessment, feedback, adaptation, personalization, recommendation, and reflection (Chatti et al. 2012).

4.1 Monitoring and analysis

LMS tracks the students' activities and reports can be generated according to the requirements by stakeholders and faculty. These reports can be useful in decision making for HEI and faculty members. Dashboard provides the monitoring of the students along with the students' accomplishments. Faculty members can detect patterns from the students' activity and alter the design for future learning activities.

4.2 Prediction and intervention

With the given sets and information, a novel approach to predict learners knowledge future performance. Dashboard will be holding all the information of the students current activities and accomplishments. This can also help for students that requires early help or additional facilities. This will improve the learners to improve their performance.

4.3 Assessment and feedback

Self-assessment with appropriate feedbacks is helpful to improve the effectiveness and efficiency of the learning process. Dashboard with the help of the data about the students using their interests and the learning environment.

4.4 Adoption

It is used to initiate and organize the flip activities and trigger by the instructor. LMS and Dashboard can be used to collaboratively organize the learning resources and activities based on the individual learners in order to excel.

4.5 Personalization and recommendation

Due to the learner-centric environment, the main focus here is to provide learners with their own learning settings and achieving their own goals.

4.6 Reflection

It can a valuable tool backed by analytics both faculty and students can benefit from the system. Courses comparisons, across sessions, or even the inter-departmental modules. Drawing conclusions on the effectiveness of the learning and teaching practices.

Based on the literature review model smart classroom will be efficient and effective to achieve the goals.

5. CONCLUSION

Learning analytics provides the appropriate tools that help to evaluate the student's performance and process of learning where it is identified as measuring, collecting, analyzing and reporting the data of the student that will support for achieving the goals in the learning system. To reach this goal required to follow the progress of the different activities that related to the course material and to track the performance of the students and participation with other classmates through online learning field.

Learning Analytics focuses in the learner perspectives rather than educational requirements. It helps to provide the learners' requirement. This will enhance the student's skills and gain good knowledge in the educational institutes. This perspective will improve the criteria

The reasons of widely criteria for successful learning related to grading and tenacity that contains on inspiration, confidential and satisfaction. This will help to achieve the goals by displaying the performance of the learners on the report as visualizing analytics. This is will assist the learner to understand easily of the learning process of his/ her performance and the report will provide a feedback mechanism to the teacher to understand the capability of each student in the best way.

The model will be effective in making traditional classroom to smart classroom equipped with Learning Analytics.

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