

LEARNING ANALYTICS FOR SMART CLASSROOMS IN HIGHER EDUCATION

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Abstract

Higher education sector has always been incorporating changes pertaining to technology in order to provide better teaching and learning environment to the stakeholders, including 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 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 technology and infrastructure provide better opportunity for HEI to move a step forward and to make a shift from traditional to smart classrooms. Assessments are the best form to evaluate 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.

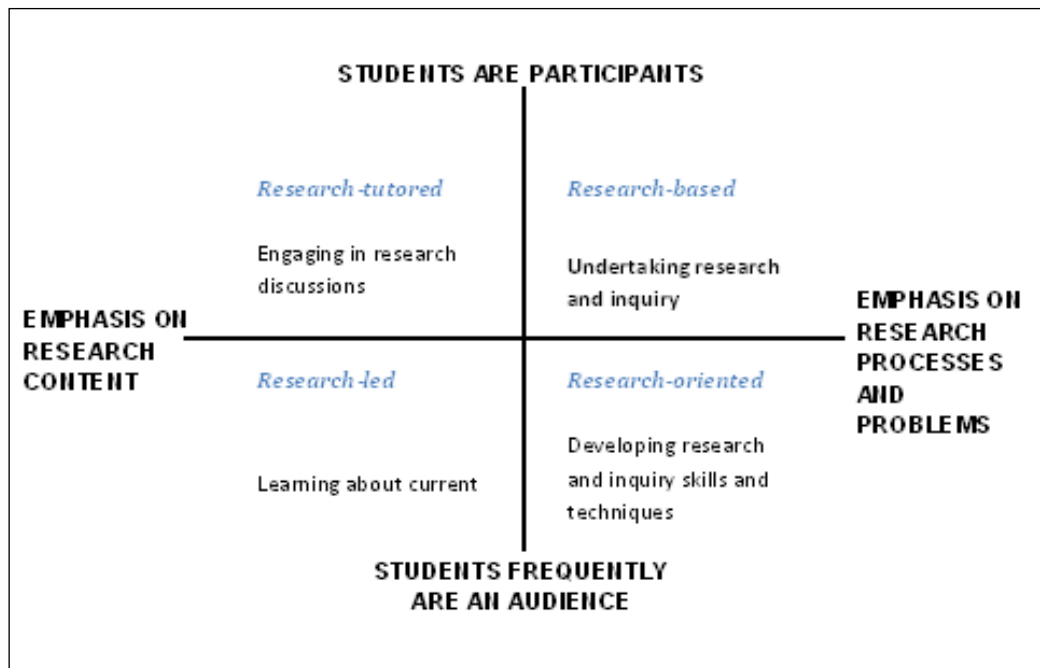


Figure 1. Healey and Jenkins Model (2009)

The model shown in Fig.1 confirms 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. This leads to Educational Data Mining (EDM) and Learning Analytics (LA). Here, learning analytics will measure, collect, analyze and display 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 done recently with the aim in enhancing the student's effort on the different activities in education. The development of the learning system has aided 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. This study proposed 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 teaching and learning 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 studies stated that learning analytics plays an important role in affecting the student's perspective and the way the students learn. Learning analytics is related to the activities of the students through LMS. It helps to build the data and is available to the teacher and administrator. There are two hypotheses that showed the relation between learning analytics and LMS. First hypothesis illustrates significant learning through a set of sites. This refers to the widely used learning methods by students in various LMSs. However the interaction can be low because it specified just through activities such as quizzes, and the course material. Moreover, there is a hypothesis that LMS are dependent for learning. It is common that the method of learning analytics on LMS ignores activities which come from outside the system, with the conclusion that only a simple part of a students' participation in learning is being taken.

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

The system faces some difficulties in identifying trackable contributions, where a project named Uatu has studied to use data visualization to determine the practical work activity of the student participation through the course material. The students work as a group to add and store in the cloud document via Google. The collection of data is stored within these documents in Google about the students' activity, containing a set of edits and content which added each edit. The research concludes that the collection of data is not capable to take and get any comments. Hence students are unable to offer a proper interaction within the groups. The final result shows that it is difficult to trust in finding the analytics and that the system might be going to be closed.

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 includes the students' interaction of their own data. The students are made aware of their efforts in the system and about 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 focuses on the students' performance, reflection and answer that assists to know how student behavior gain the knowledge by student's understanding.

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

Hadhrami stated that learning analytics is not a new article, it developed in many areas of the educational fields and business intelligence. The increasing quality amount of data is related to students' participation in different educational processes over the world. Learning analytics aims to gain good knowledge and 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 are required in students' learning (Hadhrami 2017).

Learning analytics focuses on data that comes 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 environment; 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 will move towards research based learning.

Dashboard provides real time visualization which helps to improve the students' performance, teachers' time and effort that is by providing the information in which student 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 many 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.

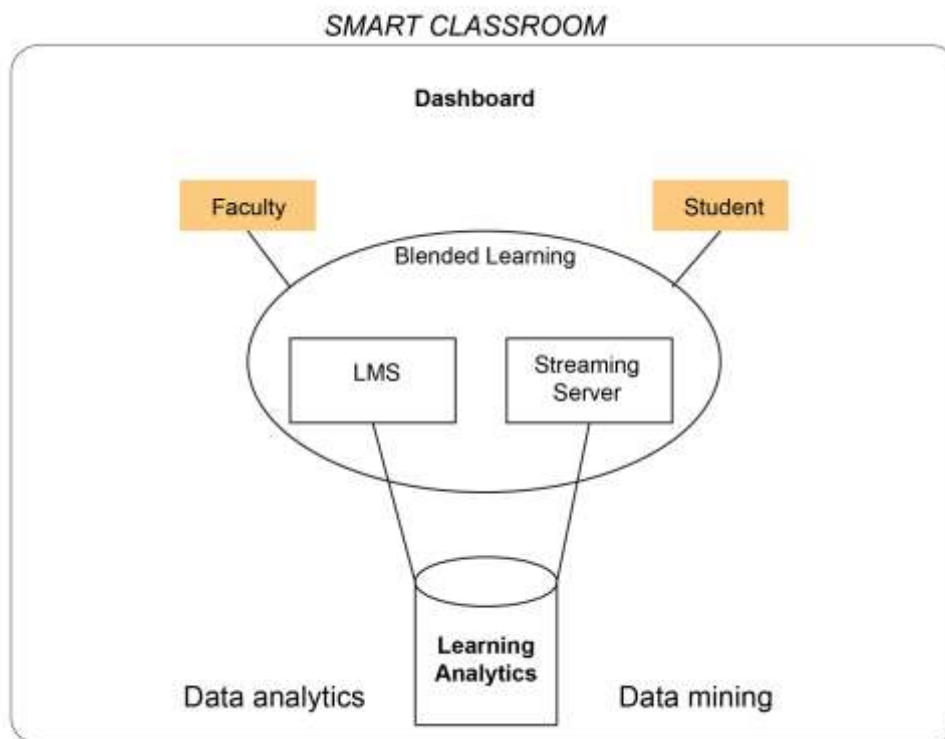


Figure 2. Proposed Framework for Smart Classroom

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).

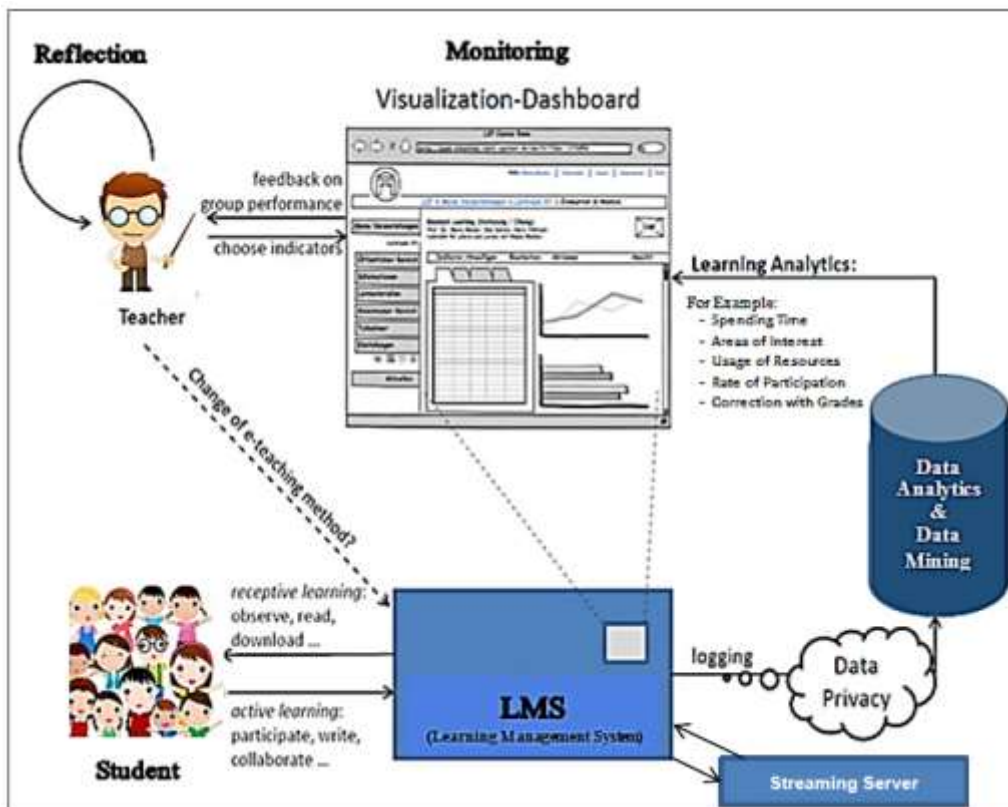


Figure 3. Proposed Model for Smart Classroom

4.1 Monitoring and analysis

LMS tracks the students' activities and reports which can be generated according to the requirements of 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. Learning analytics will help to measure student's participation throughout the module/course helping faculty member to change their teaching style and methods in interests of student's needs.

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 student's current activities and accomplishments. This can also help for students that require early help or additional facilities. This will improve the learners to enhance their performance. Detecting student's behaviors in a learning environment such as participation in the flipped class, activities and formative assessments and predicting on which student might fail the module.

4.3 Assessment and feedback

Self-assessment with appropriate feedbacks is helpful to improve the effectiveness and efficiency of the learning process. Dashboard provides with the help of data about the student's interest and the learning environment. Providing real-time feedback to students on their progression through Moodle and dashboard using learning analytics will help them to know their standing in the module. Student demographics, past history can be obtained through SIS. Moodle on the other hand, will be providing online learning activity and dashboard will be giving students standing in the module/course.

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' ability to excel. Based on the predictive analysis the system will help the facilitator to develop an intervention program that could include face to face support or it can be online support. Here the faculty member can also

update the content on the streaming server based on the performance of the students where interventions are necessary.

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 in achieving their own goals. Dashboard will provide the patterns to the faculty which helps to expose trends and expectations in the Learning environment. Faculty has to take care not to overload with the information to students thus giving directed material. Here, recommendation system comes into play where based on the student's behavior the material will be suggested so he/she can be able to couple up and be able to excel (Chatti et al. 2012). Here the recommendation system will show the content using streaming server where the lecture files are hosted

4.6 Reflection

It can be a valuable tool backed by analytics both faculty and students can benefit from the system. Course comparisons, comparisons across sessions or even the inter-departmental modules success. Drawing conclusions on the effectiveness of the learning and teaching practices. Learning analytics can be a vital tool in assisting educational institutions to achieve their goals and students performance. As HEI adopting blended learning approach, learning mostly relies on online platforms. Learning analytics refers more towards the teaching and learning at the institutional level for improving the student's success. Determining diverse behaviors or patterns of the students can help faculty to adopt and change their teaching style in order to obtain higher success rates.

Based on the literature review model smart classroom will be efficient and effective to achieve the desired 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, it is required to follow the progress of the different activities that are 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.

The reasons behind successful learning is related to grading and tenacity that contains inspiration, confidence and satisfaction. This will help to achieve the goals by displaying the performance of the learners on the report as visualizing analytics. This 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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