

An Investigation Into the Design of Learning Analytic Dashboards (LAD) for the Enhancement of Motivation, Engagement and Achievements in an E-Learning Environment

Mithila Thiruppugal
Middlesex University
UK

The current scenario of higher education reflects an increased permeation of digital technology, with this integration has influenced both learning and teaching practices. One of the main impacts has been in the advancement of Learning Management Systems (LMS). By facilitating synchronous and asynchronous communication and interactions linked to a virtual environment, LMSs have become integral to higher education. Learning Analytic Dashboards (LAD) are the digital platforms used by educational institutions for collecting, measuring, analysing and reporting data concerning learners and their activities and achievements. Related to that, as an area of research and development, learning Analytics is a rapidly growing field of LMS and of particular significance to LAD design.

Many universities are utilising LADs, but guidelines to support effective design underpinned by research are limited. This study aims to assess the role of LAD design in optimising learning by influencing factors such as student motivation, engagement and achievement. The significance of this study is that it will offer novel insights on principles that should be adopted while designing LADs capable of leading students towards better learning experience and performance. Based on implications from previous studies as well as an empirical investigation on the need for such tools, this study will develop a prototype of a LAD that befits with student-facing demands.

Learning analytics dashboard; Learning management system; Information visualisation

1. INTRODUCTION

The recent definition of learning analytics is that it is constituted of the collection, evaluation and measuring of learner's data in pursuit of improvising the learning. One of the powerful features that are integral to the analytics systems is dashboards. Dashboards serve as a robust means for the presentation of information that are relevant to student learning (Dyckhoff, Zielke, Bltman, Chatti, & Schroeder, 2012).

A number of universities are using Learning Management Systems, namely Edume, Blackboard, Loop and Moodle and these systems have made various attempts to utilise educational data, which are automatically tracked from that LMS (Mouakket & Bettayeb, 2015). A number of universities have been applying analytical dashboards to visualize those data in a meaningful way but according to Verbert et al., (2013), evaluation results of

fifteen various dashboard applications indicate that perceived improvements in learning and teaching were low.

Studying for a university degree requires that students remain motivated and are able to make decisions about self-directed study. However, students can find themselves in a situation where they lack information about their learning progress. Added to this, distance learning is becoming a more common form of study and one in which students need to take greater responsibility for their learning.

These findings point out the significance of a platform which would serve as a support to the students by offering relevant information concerning student level of engagement and progress. It is in this context; Learning analytics has been recognized as a growing area, taking an interdisciplinary approach, including visualization techniques and statistics (Yoo, Lee, Jo, & Park, 2015).

Learning analytics dashboards are widely used to support instructors and decision makers by facilitating the management of the curriculum activities. The findings of Santiago et al (2015) present principles of information dashboard design and clearly mention that the understanding of information design dashboard directly depends on mining data, instructional design and visualisation tools. Until now, due to the diverse challenges and practices, learning analytics techniques such as prediction, modelling, crowd sourcing and learner profiling and so on, have been involved to solve dashboard design issues and to improve the quality of education-related services (Montebello, 2018).

However, these analytic systems have placed little emphasis on the offering of control and adequate tools to the students which would enable easier comprehension of their learning practices. This had led to the dilution of the impacts of these systems on the motivation and achievements of the students (Sclater, Peasgood, & Mullan, 2016). The failure to offer students access to information regarding learning theories and models, it could be stated that the deliverance of opportunities could introduce the capabilities of self-regulated learning and metacognitions of the students leading to the accomplishment of the learning objectives.

The student facing dashboard aggregate and analyse relevant data for easier understanding by the students. However, previous studies have shown the insufficient impact of these dashboards on student achievement. This means that the student dashboard developments have not considered the motivational needs of the students as noted by Shephard et al., (2015).

For facilitating student motivation toward enhanced dashboard utilisation, a different theoretical approach is identified, which can be effectively implemented in building Learning analytics Dashboard. From the work of Evans et al. (2015) the Danielson's depth of knowledge framework is identified to be an appropriate method for facilitating the learning process of the students, which emphasise five stages for in-depth comprehension levels. Additionally, the SOLO taxonomy is identified as another theoretical underpinning that serves the opportunity for enhanced learning engagement for students (Biggs and Collis, 2014). The structure of the focused taxonomy is developed with five stages that emphasise the preliminary stage to the extended phase of understanding. One of the practical educational frameworks for motivating the learners as per Edyburn (2010) is the Universal design of learning. The framework addresses three main principles in which representation, action and engagement are

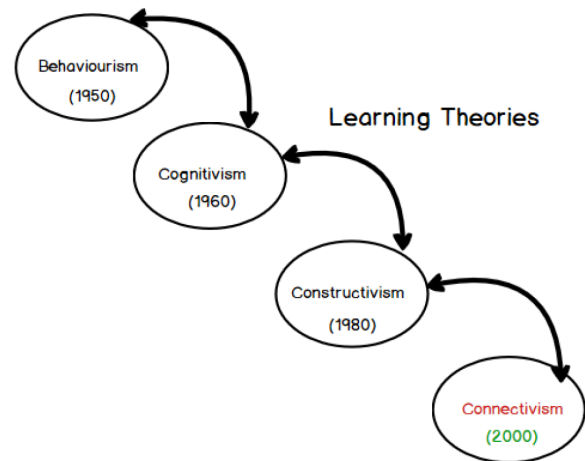


Figure 1: Role of Learning Theory

criticised. While considering the outcome of universal design learning, the result develops in-depth details regarding the student's learning compared to other mentioned educational framework. On the other hand, the complexity in utilising this framework is further observed as a negative aspect concerning a much-advanced framework. Finally, the Bloom's taxonomy is one such model, as per Hwang et al (2016) observation, it is constituted a set of three hierarchical models that are used for classifying educational learning objectives into different levels of specificity as well as complexity.

Students face difficulties with matching assessment items to the level of the set goals. One of the problems of distance learning was identified as students' queries which caused them to slow down in their learning and they must then contact the institution for clarification. Bloom taxonomy helps dealing with this situation and provide support for classifying learning levels into one, which is complex and one which is specific (Olsson, Mozelius, & Collin, 2015). Hence this study deals with developing a set of design principles for LAD which is a collective outcome produced by the learning analytic process and visualization technologies.

2. CONCLUSION

This report represented the significance of adopting a new design of dashboard for universities. Analysing the previous literature, this gap in the research could be presented. Though previous studies have elaborated on the role of learning analytics in supporting student learning, the impacts on student achievement are not strongly focused upon. The main benefit that would be incurred by the new design is the increased engagement and motivation of students leveraging their performance and achievement aspects.

REFERENCES

- Biggs, J.B. and Collis, K.F. (2014). *Evaluating the quality of learning: The SOLO taxonomy (Structure of the Observed Learning Outcome)*. Cambridge: Academic Press.
- Briman, A. (2004). *Social Research Methods*. Oxford: Oxford University Press.
- Charleer, S., Santos, J. L., Klerkx, J., & Duval, E. (2014). *Improving teacher awareness through activity, badge and content visualizations*. International Conference on Web-Based Learning, 143-152. Springer.
- Dyckhoff, A. L., Zielke, D., Bültmann, M., Chatti, M. A., & Schroeder, U. (2012). *Design and implementation of a learning analytics toolkit for teachers*. Journal of Educational Technology & Society, 15(3), 58-76.
- Edyburn, D.L. (2010) *Would you recognize universal design for learning if you saw it? Ten propositions for new directions for the second decade of UDL*. Learning Disability Quarterly, 33(1), 33-41.
- Evans, B.R., Wills, F. and Moretti, M. (2015) *Editor and section editor's perspective article: A look at the Danielson Framework for Teacher Evaluation*. Journal of the National Association for Alternative Certification, 10(1), 21–26.