What if student attrition was treated like an illness? An epidemiological model for learning analytics

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Learning analytics is a technology on the rise in higher education. Adapted from business analytics, this approach is being used to track and predict student engagement and success in higher education. There is evidence to suggest that learning analytics can be successfully used to predict students at risk of failing or withdrawing and allow for the provision of just in time intervention. Despite this, the output of universities is not like that of other commercial ventures and business models for understanding consumer behaviour, for instance, are not equipped for accurate prediction of learning outcomes. The model presented in this poster is an attempt to create a predictive framework for 'learning health' from a multifaceted, epidemiological perspective. The model serves as a framework for understanding early student success at the micro and macro levels and provides a foundation for evidence-based use of learning analytics within a higher education perspective.

Keywords: learning analytics, student retention, early alert, learning health

Learning analytics and higher education

According to the 2011 version of the Horizon Report (Johnson, Smith, Willis, Levine & Haywood, 2011), learning analytics is a technology to watch over the next five years. Learning analytics is the integration of data about or generated by students and is based on similar analytics used in business modeling. This type of analytical modeling is being used to understand consumer preferences and purchasing behaviour, for example.

The most common use of learning analytics in higher education is to identify students who are potentially at risk of failing or withdrawing from their studies (Campbell & Oblinger, 2007). For example, Macfadyen and Dawson (2010) discuss an 'early warning system' which tracks student engagement with a university learning management system for identifying students who are not interacting with the online course material. They argue that the use of learning analytics in this context can accurately predict 81% of students who will fail a subject and allow for appropriate intervention to take place in these instances.

Critiquing learning analytics

Although there is evidence accumulating that learning analytics can help with reducing unnecessary student attrition, the use of these analytics are limited by a number of factors. Although there are undoubtedly complex processes underpinning consumer preferences, business models attempting to understand preference in a consumer context are simply about whether consumers purchase the product or not. Which consumers purchase which products is also of interest but, ultimately the behaviour being analysed is simply that of an alternate choice, the consumer equivalent of a multiple choice exam. Biggs (1999) in particular is critical of using multiple choice as a way of understanding learning outcomes and encouraging deep approaches to learning. A framework aimed at understanding student engagement in learning through choice, such as that attempting to understand consumer behaviour, is similarly limited. The framework for understanding learning based on business analytics is therefore not suited to the complex and multidimensional phenomenon that is human learning.

To understand the current level of analysis involved in learning analytics, one only needs to look to the work of B.F. Skinner (1948). Skinner famously used instrumental conditioning techniques to examine learning in pigeons and rats. Pigeons learning to peck and rats will press a level for food rewards under certain circumstances. Counting the number of times a student clicks on a learning management site is similar in many ways to counting lever presses. Although instrumental conditioning has been pivotal in the development of general theories of learning, strict behaviourism is an inadequate approach for understanding the complexity involved in student learning in higher education. A more complete approach for understanding student engagement and predicting quality student outcomes requires a more sophisticated way of synthesising data pertaining to multiple indicators of the student experience and about the students themselves.

The epidemiology of learning health

The model presented in this poster and outlined in table 1 is an attempt to develop a framework for learning health. Using health as an analogy to learning is advantageous to business models for a number of reasons. Epidemiological models are based on myriad micro and macro level factors that impact on individuals in different ways. As effective learning is also about a large range of factors influencing student success in individualised ways, the use of an epidemiological approach is more readily adaptable to learning than is an approach based on consumer behaviour. An additional benefit of adopting an epidemiological perspective is that it does not take a deficit approach to understanding outcomes. Good health is not just about increasing life expectancy, it is also about enhancing day-to-day living. Similarly, any approach to managing student attrition should not just be about keeping students in higher education, it should be about enhancing learning outcomes. The current approach is an attempt to develop a framework to allow learning analytics to do just that.

The learning health framework has been adapted from that of Turrell and Mathers (2000). This framework was selected as the basis for the current approach for several reasons. Firstly, it has been created within an Australian context and therefore has applicability to our national circumstances. Secondly, this framework has been specifically created to account for socioeconomic factors which are amongst those highlighted by the Australian Government as being of concern within the current widening participation agenda (Australian Government, 2009). The framework also encompasses multiple levels for consideration and is similar to the multiple levels of factors impacting learning in higher education. The adaption of this framework to learning, keeping in mind what is known about the reasons for student attrition (e.g. Yorke & Longden, 2004), with possible sources of data is presented in table 1. The table includes a concise outline of the model depicted in the associated poster.

Table 1: Outline of learning health framework based on Turrell & Mathers (2000)

Level of analysis	Indicators	Data sources
Micro	Engagement with course material Attendance on campus/in class Course satisfaction Academic capacity	Learning management system Class attendance register Survey tool or CRM Educational history – Student information system
Intermediate	Enrolment load Number of working hours Socioeconomic status	Student information system Student engagement survey Student information system/GIS software
Macro	Support available at institution Government support Degree structure Course/unit/subject requirements	Institutional information systems Student information system Course management database Course/unit/subject profile system

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