

The missing link for learning from analytics

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Learning analytics is an area of growing importance in higher education. Lead practitioners acknowledge this development as a convergence of many fields, including educational data mining, technology systems development, learning design and SoTL, and encourage synergistic connections. Past experience of learning technology innovations shows that incentives and professional development for teachers are keys to successful adoption, along with easy to use tools, evidence of benefits and institutional support. However, current literature shows little evidence of initiatives designed to forge connections between these fields of practice, and a review of papers from a leading learning analytics conference does not identify professional development as a priority. This paper outlines a professional development initiative designed to address this gap and make learning analytics practice accessible to tertiary teachers. The area needs urgent attention if the potential of learning analytics to increase knowledge about learning and inform learning design is to be realized.

Keywords: Learning analytics, SoTL, professional development, learning technology innovations

Background

Learning analytics is an area of rapidly growing interest across the tertiary education sector internationally. In mid-July 2016, Google Scholar ranked the proceedings of the International Conference on Learning Analytics Knowledge (LAK) number eight of all publications in the Educational Technology category. This is remarkable considering the conference was only launched in 2011, to highlight trends in the use of learning analytics in the education sector, ranging from K12 to tertiary, vocational, and MOOC learning.

Two major areas of application for learning analytics are the use of system log data to identify and trigger support for students at risk of failure, and as evidence to inform learning design. Educational researchers have produced theoretical and conceptual frameworks; a range of analytics tools, and various cases where benefits from the use of data can be demonstrated (see e.g. Clow, 2012; Ferguson, 2012). Institutions are implementing learning analytics strategies, resolving privacy issues, promoting ethical use of data, and developing policies to support this emergent field of practice (Ferguson et al., 2014). Learning analytics seems to be on a similar path to past innovations such as educational multimedia, learning objects and virtual worlds, so warning bells about adoption and long-term sustainability should start ringing about now.

Experience has shown that a multi level approach is required to address the challenges facing an innovation with potential to change something as well established as teaching and institutional practice. In this respect, learning analytics may be a step ahead of some of its predecessors. Institutions are motivated to engage on many levels, because the stakes are high and many stakeholders are involved in using data to generate learning and business intelligence. Unlike the initial development stages of earlier learning technology innovations, learning analytics has not been left for a few enthusiastic teachers to explore as they choose. This time, student administration and business intelligence units, IT departments, institutions and even national policy makers are part of the operating environment along with teachers, researchers and learning designers. However, experience shows that the full potential of innovations is rarely realized, as investment in even the highest quality elearning systems and tools can fail to achieve the anticipated levels of engagement by target user groups. In the case of learning analytics, teachers and learning designers are one major target. A number of reasons for this failure have been proposed (Duncan, 2004; Dede, Honan & Peters, 2005). A review of progress on the promotion of learning analytics practice related to the conditions for successful adoption identified by Alexander (2001) and Ferguson et al. (2014) is timely. These conditions include supportive management and institutional context; adequate resources

for development (or acquisition) and implementation of user-friendly tools; appropriate forms of professional development and training; and incentives and rewards for staff to engage. Professional development and incentives and rewards are as critical to successful adoption as all other conditions, yet there is limited evidence of action in this area at the present time. Some initiatives involve end users in scoping and design. Many appear to be developing tools and frameworks for later dissemination to these intended users. This approach may be less effective than one where target users become familiar with the concepts early on, and offer input to the scoping, design and development processes (Gunn, Woodgate & O'Grady, 2005).

This short paper outlines progress on learning analytics research and development across the higher education sector, then describes the scoping phase of a professional development initiative aimed at teachers and learning designers. Professional development of tertiary teachers has its own challenges, regardless of the topic in focus (Bamber, 2013) particularly in research-intensive institutions. Where the topic is as potentially complex and controversial as learning analytics, the challenges can only increase. The design rationale for the professional development plan is explained, and incentives and rewards for engagement are considered. While the plan is designed for the tertiary sector in New Zealand, the conceptual approach has been used elsewhere, and feedback suggests the design principles and activities will be useful in other contexts.

The leading edge of learning analytics research

The SOLAR Network's annual Learning Analytics and Knowledge (LAK) conference has come to be regarded as the world-leading event for researchers and practitioners in the field. Google Scholar's ranking of the LAK Proceedings as eighth top educational technology publication means it gives a fair indication of the priorities the research community is engaged with, and is well placed to identify any gaps that may need to be addressed.

Acknowledging learning analytics as a point of intersection between different fields of practice, the LAK16 conference theme was 'the convergence of communities'. The proceedings noted, 'the emphasis of this year's program is enhancing our impact through synergistic connections with other related research communities' (LAK16 Proceedings p1). Two areas where strong, synergistic connections are both possible and presumably desirable are teacher professional development and the scholarship of teaching and learning (SoTL). However, there is little evidence in the LAK16 proceedings that such connections are actively being promoted.

The question then arises whether the development of learning analytics systems and tools is proceeding with due consideration of the strategies required to encourage use in the teaching and learning contexts they are designed for. Lower than anticipated levels of engagement with other elearning innovations have already been noted, and post-hoc analyses of the reasons are available for review (Duncan, 2004; Dede, Honan & Peters, 2005). Technical complexity, limited functionality and inflexible tools are all acknowledged as issues to be addressed. However, the limited influence of teacher professional development programmes; a lack of evidence of benefits to teaching and learning; and limited incentives for teacher engagement are also recognized as common barriers (Alexander, 2001). In this context, the value of synergistic connections between learning analytics, the theory and practice of academic development and SoTL research seems obvious. The professional development initiative outlined in this paper aims to strengthen the links between these three related areas of practice so the potential of learning analytics can be fully explored by the people who stand to reap the greatest benefits.

Professional development is not on the agenda

In a report recommending system-wide deployment of learning analytics in Australian higher education, Siemens, Dawson & Lynch (2013, p. 25) identified skills and capability shortages in teaching as well as IT and administration. The need to build technical capacity is coupled with development of a 'culture or mindset of analytics.' The report noted that this requires planning, resources and policy integration over many years. No small task, but a worthy goal that would support the transformation of practice at grass roots, institutional and sector levels, and help to narrow the gap between technical and academic functions in learning technology. For practice level, the report proposed an open and shared analytics curriculum, which presumably universities would contribute to. There are few moves in this direction if the LAK16 proceedings are anything to judge by.

A search of titles, abstracts and full texts of 96 accepted submissions (papers, workshops, posters and demos) published in the LAK16 proceedings returned only eight that referred to professional development. Of these, one addressed skill development for researchers, two focused on technical skills, and one on using analytics in professional learning contexts. This left just four that stated any intention to develop the learning analytics capabilities of teachers and learning designers. SoTL was rather better, if sometimes indirectly represented, with around two thirds of the submissions (n=64) focused on the use of analytics data to understand student learning, and/or to inform teaching or course design. However, many of the reported initiatives were specific to the study context and not necessarily suitable for wider application. Further investigation would be required to check if the authors aimed to share findings with colleagues as well as with conference delegates. This may reflect either an immature or an exclusive field of research, where only experts and enthusiasts are involved. Another possible

interpretation is that learning analytics researchers and innovative tool developers do not have the requisite skills to disseminate their work to a wider audience. Either explanation endorses the need expressed in the conference theme, i.e. to forge connections and foster synergies with related fields of practice. The question is; are moves being made to encourage these connections, or is it simply an idea waiting to be put into action? As stimulating and engaging as it was, LAK16 did not offer many clues. An outline of contributions referring to professional development reveals the limited scope of such action.

Wolff & Zdrahal (2016, p. 500-501) offered a workshop to explore how data literacy (i.e. the ability to use data in everyday thinking, reasoning and real-world problem solving) impacts on learning analytics for practitioners and end users. Literate practitioners can derive actionable insights from data. Literate end users can interpret and critique data analysis that is presented to them. The authors noted that this area requires further attention, as end users are usually not data specialists.

Ferguson & Clow (2016, p. 520-521) presented a poster describing the background and development of the Learning Analytics Community Exchange (LACE) hub, where data is presented in accessible format. They outlined the functionality of the site, gave a summary of its quantitative and thematic content, and an assessment of the evidence it presents. While this is not a professional development initiative per se, the aim is to encourage people to use and add content to a hub, which could be used for professional development purposes.

Mavrikis, Gutierrez-Santos, and Poulovassilis (2016, p. 168-172) described the iterative development of teacher assistance tools for exploratory learning environments. While the study setting was not naturalistic, evaluation of each version of the tool did involve teachers from the target user group. The authors explained the difficulty of involving teachers in scoping the tools, so it may be assumed that the design had limited input from target users. Professional development was noted as an area for future attention once the tools have been finalized.

Wells, Wollenschlaeger, Lefevre, Magoulas, and Poulovassilis (2016, p. 236-240) analyzed the relationship between student engagement with an LMS and performance to inform guidelines for course design. They noted plans for professional development to promote the guidelines developed as a result of their research.

While the first two of these contributions focus on teacher skills, neither of the others positions teachers or learning designers (outside the development team) as users of learning analytics data. The intention for teachers and learning designers to develop critical data literacy skills is not present. It is also not clear what approaches to professional development might be applied, and whether evidence of benefits from using learning analytics or incentives for them to engage will be involved. If teachers are a minimum of one step removed from learning analytics data, which is mediated by researchers to inform the development of tools and recommendations for teacher use, the principles of capacity development will not apply. This begs the question whether gleaning actionable insights from learning analytics data is too complex a task for teachers, and expert mediators will continue to be involved. The initiative outlined in this paper assumes both pathways will be productive. We recognize the value of expertise to develop data analysis and presentation tools, and to interpret complex data. We also take on the challenge of supporting teachers to develop their own data literacy skills, to engage directly with evidence and with data use scenarios.

A learning analytics professional development initiative

The aim of the professional development initiative described here is to promote the use of ‘learning intelligence’ in course design and teaching. We acknowledge that this will require easy to use analysis and visualization tools as well as a basic level of data literacy among teachers and learning designers. We also understand that evidence of benefits and incentives for teachers to engage will be critical success factors.

As part of a scoping phase, we interviewed early adopters of learning analytics in teaching practice to explore their aims, achievements and challenges. Some of those interviewed also took part in a second phase, allowing their experience to be developed into case studies. Research team members produced further case studies based on emergent learning analytics practice at their institutions. These sources combined to offer a real sense of the challenges and opportunities facing teachers wanting to access and use learning analytics data in their institutional context at this point in time. Scenarios derived from the interview data and case studies are part of the professional development strategy. Each scenario has a different pedagogical focus and reflects a common situation that most teachers can relate to. The aim is to demonstrate how analytics data can be accessed, analyzed and applied at different stages of the course planning, teaching and review cycle (Donald, Blumenstein, McDonald, Milne, and Gunn, 2016).

We realized early on that the early adopters who participated in our study are likely to be more data literate than many in our target group. Despite this advanced starting point, we found that understanding of learning analytics concepts and terminology could still be problematic, and ran a survey to gauge how some of our target users talk about their practice. These data collection activities, a literature review and many years of relevant experience among the research team members all contributed to the design of the professional development initiative.

Scenarios reflect real world examples

Scenarios are useful professional development tools because they focus on real world situations that target users can relate to. They offer sample solutions to familiar problems that can be easily adapted for different teaching contexts. In this case, the scenarios reflect real situations encountered by early adopters, and the solutions they applied and evaluated. The learning analytics professional development scenarios demonstrate ways to:

- Support students to avoid drop out or failure
- Gain insights into (mis)conceptions and knowledge
- Explore students' disciplinary knowledge
- Give students a sense of how they are performing
- Identify and address concepts students struggle with
- Monitor online discussion to focus teaching on pertinent issues

The following example shows the format of the scenarios, and how one lecturer used analytics data to gain insight into student (mis)conceptions and knowledge, and to design learning activities and resources to address the problems identified.

Problem

- Students arrive at university with high school passes in subjects they will continue to study. This initial success builds false confidence where common misconceptions and rote learning lead to failure later on.

Strategy

- What - use analytics data to understand what students know, expose common misconceptions, and design feedback to influence deep learning strategies.
- How – schedule a test or multi-choice quiz at the start of the course with questions designed to assess prior knowledge and reveal common misconceptions. The quiz can provide constructive feedback and direct students to tutorials designed to promote deep learning and knowledge development.

Data sources used

- An analytics report with quiz scores, correct and incorrect answers, number of attempts, and use of hints and feedback
- Verbal and/or written feedback from students to clarify the interpretation of quantitative data
- Discussion posts, survey results and other forms of feedback to add a qualitative dimension

Evaluate and take action

- Understanding what students bring to a course provides focus for teaching and learning design
- Discuss quiz results with students; explain common misconceptions and pathways to successful study
- Develop online tutorials to address learning challenges, monitor use, and invite feedback on usefulness

Design implications

- Requires development of test or quiz questions and tutorials to revisit subjects previously covered
- Investment of time is small relative to the benefit of understanding what learners need

Caveats

- Misconceptions can be deeply rooted, addressing them can be a long-term process of reinforcement
- Additional strategies may be required, e.g. peer review, frequent tests, student designed questions or study resources
- Causal relationships are hard to establish from data, but higher mean grades may be indicative

Discussion and recommendations

From our initial exploration of the LAK proceedings, there is a pressing need to add professional development and strategies to engage teachers to the growing range of learning analytics initiatives. If these areas are not addressed, adoption of the quality systems and tools that are currently available or under development may remain in the domain of researchers and data analysis experts. While the distinction between analytics practitioners and users noted by Wolff & Zdrahal (2016) may or may not remain relevant, the need to increase the data literacy skills of teachers and learning designers is compelling. Scenarios are one professional development strategy that can present evidence of benefits and make it easy for teachers and learning designers to develop a basic data-driven analytics practice. They can also demonstrate the need for a critical approach to data interpretation, and thus avoid the common pitfall of basing decisions on incomplete evidence or incorrect analyses. Scenarios demonstrate ways to use available data to solve real world problems, and thus provide an obvious incentive for teachers to engage. If the use of scenarios is embedded in existing activities such as credit-bearing courses, they can also provide the opportunities for action learning and sustained engagement that contemporary professional development frameworks recommend. There are various ways that local implementations might achieve this by embedding scenarios within programmes or courses. There is high optimism and perceived potential in the field of learning analytics. It is up to the various stakeholders to be proactive in forging the connections that lead practitioners deem necessary to achieve the synergies, realize the potential and let the benefits of learning analytics flow through to teachers and learners.

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