A learning analytics pilot in Moodle and its impact on developing organisational capacity in a university

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Moodle is used as a learning management system around the world. However, integrated learning analytics solutions for Moodle that provide actionable information and allow teachers to efficiently use it to connect with their students are lacking. The enhanced Moodle Engagement Analytics Plugin (MEAP), presented at ASCILITE2015, enabled teachers to identify and contact students at-risk of not completing their units. Here, we discuss a pilot using MEAP in 36 units at Macquarie University, a metropolitan Australian university. We use existing models for developing organisational capacity in learning analytics and to embed learning analytics into the practice of teaching and learning to discuss a range of issues arising from the pilot. We outline the interaction and interdependency of five stages during the pilot: technology infrastructure, analytics tools and applications; policies, processes, practices and workflows; values and skills; culture and behaviour; and leadership. We conclude that one of the most significant stages is to develop a culture and behaviour around learning analytics.

Introduction

The Moodle Engagement Analytics Plugin (MEAP) is a redesigned Moodle plugin (Liu, Froissard Richards & Atif, 2015a) based on the original plugin developed by a team led by Philip Dawson (Dawson & Apperley, 2012). MEAP has four 'indicators' that can be used to create an at-risk profile for students. The indicators were: (i) assessment activity that measures assessment submissions, (ii) forum activity that measures participation in forums, (iii) gradebook that interrogates students' records in the gradebook, and (iv) login activity that measures students' access to the LMS (Liu et al., 2015a). MEAP identifies the degree to which students meet the at-risk profile by calculating a total risk percentage based on weighted thresholds set by teachers. MEAP then allows teachers to email groups of students with a personalised message from Moodle. From August 2015 to November 2016, we conducted a pilot with MEAP at Macquarie University, involving 36 units with enrolments from 79 to 1,599 students for a total of 13,824 students. These were first- and second-year units across a range of disciplines, as diverse as Ancient History, Accounting and Engineering. Throughout the pilot, 2,263 personalised emails were sent to students. Before the MEAP pilot, there was little organisation capacity in learning analytics (LA). After the pilot we developed organisational capacity in LA which

allowed us to improve teaching and learning. Here we use the organisational capacity framework for LA by Arnold et al. (2014) and pathways to the integration of LA by Beer, Tickner and Jones (2014) to discuss and explore the pilot.

Arnold et al. (2014) presented a framework to develop organisational capacity in LA which is based on five stages. These were: (1) technology infrastructure, analytics tools and applications; (2) policies, processes, practices and workflows; (3) values and skills; (4) culture and behaviour; and (5) leadership. They argue that ideally they should all be addressed if organisational capacity in LA is to be achieved (Arnold et al., 2014). We consider each of these stages in the context of the pilot.

The development of a LA tool (stage 1) is only the first stage in the implementation of LA in an institution. Next is the "integration of this tool into the practice of teaching and learning" (Elias, 2011, p.5). Teachers are crucial to this process (Radloff, 2008). Beer et al. (2014) outline three pathways to consider when embedding LA into teaching practice at a university. These include the 'do it to' teachers pathway whereby LA solutions are imposed from the top down, starting from an identified institutional strategic goal. The 'do it for' pathway results from a 'technologist' alliance (Geoghehan, 1994) between teaching, professional and information technology staff.

The 'do it with' teachers pathway is a result of learning and teaching staff working closely with teachers in a unit to develop an understanding of their needs which then informs the process. Ultimately these three pathways are not mutually exclusive and elements from all three may be required in the implementation of LA in an institution (Beer et al., 2014). These pathways provide a useful lens through which to explore the implementation of LA during the pilot through the stages (Arnold et al., 2014) comprising of policies, processes, practices and workflows; values and skills; and culture and behaviour.

Technology infrastructure, analytics tools and applications

An LA system that is appropriate to the needs of an institution is crucial, as is the technical infrastructure underpinning it (Arnold et al., 2014). In the context of our institution, these needs included a system that worked within the existing learning management system (LMS) and did not require extensive resources to operate. In addition to systems and infrastructure, analytic tools that meet the needs of stakeholders are required (Arnold et al., 2014). During the pilot we followed a design-based research methodology whereby we worked with unit convenors (academics responsible for a unit of study) and student support staff to understand their needs around measuring student performance and how they would determine if students were engaged (Liu et al., 2015a). This process resulted in iterative and incremental development of MEAP so that it was able to display more meaningful information about student engagement with the LMS, and provide for efficient and personalised communication with select students.

Due to the exploratory nature of a pilot, it was necessary to set up test servers with clones of the organisational LMS. This resulted in unavoidable infrastructure issues that could have potentially undermined acceptance of MEAP. Buchanan, Sainter & Saunders (2013) discussed factors associated with lower technology use which included institutional/infrastructure issues. A number of these incidents during the pilot revealed issues around data currency and accuracy caused by the underlying infrastructure. In one incident a unit convenor sent emails to students incorrectly stating that they had not completed specific tasks. This was caused by a lag in the update of a database resulting in out-of-date activity logs for students in the LMS. In another instance the student information system did not regularly update the enrolment status of students in the LMS. As a result of these incidents, students contacted unit convenors, tutors and student support staff expressing confusion, frustration and anger about having received these emails. Staff expressed concern about their future use of this tool if the technical infrastructure was not improved.

Policies, processes, practices and workflows

Since the pilot was the first practical implementation of actionable LA at our university, it raised a number of issues around governance, procedures and structures that are necessary for a sustainable and systemic LA culture (Arnold et al., 2014). The pilot raised issues around data stewardship and usage, triggering the development of an university-wide code of practice for LA, based on Jisc's work in this area (e.g. Sclater & Bailey, 2015) to inform future funding, implementation, and governance decisions. The pilot also uncovered a wide range of conflicting approaches and expectations of student support across the university, which provided an opportunity to start standardising practices. There were two models of student support identified during the pilot. The first involved unit convenors being wholly responsible for student support, where they used MEAP to identify and contact students and follow up with support. This included composing and sending personalised messages to students with specific instructions and references to support materials. The second model was where the unit convenor worked with student support staff to identify students and compose messages. Students were also referred to additional support programs run by the faculty, and support staff followed up with them. In some units, support staff would send the messages on behalf of the unit convenor. The second model was typically adopted where there were large student enrolments (> 450 students) in the larger faculties that had financial capacity to employ support staff.

To provide further consistency for student support, practices and workflows around the use of MEAP were developed during the pilot by leveraging the experience of unit convenors and student support staff. These included what type of unit MEAP was most effective for, strategic times during the semester to contact students, how to compose the most effective messages for students, aligning the use of at-risk indicators in MEAP with the instructional design of the unit, sharing information about at-risk students with support staff, and using MEAP as an evaluation tool to make unit improvements at the end of semester. In addition, a workflow was developed that addressed challenges that unit convenors experienced when using MEAP during the pilot. Consequently, unit convenors who want to use MEAP must now complete a training session and are supported by learning and teaching staff. They are provided with regular communications during the semester about approaches to using MEAP that include typical questions and issues. Unit convenors are also automatically enrolled in an online community of practice on LA within the university.

The approach taken in the pilot around the development of processes, practices and workflows was to 'do it for' teachers (Beer et al., 2014). Unit convenors did not have the time or capacity to contribute to these. Instead, the project team developed these based on observations and feedback provided by staff. A limitation of this approach is that there may be significant differences between the perspectives and needs of the larger academic population and members of the 'technologists' alliance (Geoghagen, 1994), which can lead to the benefits of LA not being effectively communicated and hence implemented in the institution (Beer et al., 2014). This was addressed through a flexible and iterative approach where practices and workflows were adapted and amended following lessons learnt and feedback from staff.

Values and skills

When using MEAP, staff needed to understand how the limited indicators available in the tool could reflect student engagement. This required a level of data expertise (Arnold et al. 2014) which was developed through relationships between the project team and staff. Through a process of questioning and discussion, we worked with staff to determine what metrics they thought were important and to help them select appropriate settings and interpret results. In particular, MEAP has four indicators that can be used to create an at-risk profile for students (assessment activity, forum activity, gradebook and login) and each indicator has a number of parameters. The project team would work with the unit convenors to choose the relevant indicators and their parameters. The team would ask unit convenors what students needed to do online to successfully complete the unit. If students needed to engage with content online to access videos, readings and discussions, then login activity would be more heavily weighted. In this example, unit convenors would then consider the time students would need to spend online to complete all the tasks required. These parameters would then be input into the login activity indicator. If there were regular online tasks that contributed towards students' final grades, such as weekly quizzes, then gradebook could be used to identify students who, for example, scored below 50%. A weighted combination of indicators could then be used to develop a nuanced profile of an engaged or disengaged student that reflected the intended learning design of the unit.

Evaluation and research competencies are another key component of driving LA acceptance (Arnold et al., 2014). An integral part of the pilot was evaluation of the impact of MEAP on student learning and unit convenor teaching experience. Students' expectations of early alert systems and their experience of personalised messages from MEAP were surveyed. The results on expectations of early alert systems aligned with those from a previous survey (Atif, Bilgin & Richards, 2015); an overwhelming majority

of students wanted to be contacted by their unit convenor if their performance was not satisfactory (90%) by university email (77%) and as soon as the behaviour occurred (60%). The results on their experience of MEAP found that of the students that had received an email, 76% reported that they took follow-up action when contacted, 62% started to engage more with the readings and/or forums, 40% completed a missing assignment and 25% realised that they needed help. Students' attitude towards being contacted were strongly favourable where they reported they were glad to speak to teaching staff about their situation, appreciated that someone was looking out for them, and were grateful that they were contacted. We also interviewed unit convenors on their views and challenges on using early alert systems in general and MEAP in particular. In addition, we performed analyses to validate the effectiveness of the indicators in MEAP to predict student performance (Liu et al., 2015b).

Our approach around the development of values and skills could be characterised as a combination of 'do it for' and 'do it with' teachers. 'Do it for' because the MEAP expertise and knowledge of the project team was used to develop the skills of unit convenors. 'Do it with' because, during the pilot in our evaluations we attempted to develop an understanding of the lived experience (Beer et al., 2014) of the unit convenor and students so as to establish how LA could best support teaching and learning.

Culture and behaviour

When staff gain practical experience with LA, conditions are created for conversations about its advantages and disadvantages. As staff started to use MEAP, we observed that they began to think more deeply about how student engagement might be measured. Some unit convenors experimented, to understand what was happening in their unit, and how they might change the learning design to capitalise on these insights (Lockyer, Heathcote & Dawson, 2013). For example, a unit convenor noted, "In tracking students' progress in the various different assessment tasks, I have gained an insight into how the cohort approaches the completion of the unit's requirements. In redesigning the learning tasks over summer (in a renovation of the unit) I have been able to take this into account."

The rapid pace of change in higher education can result in 'change fatigue'. Whilst unit convenors were receptive to supporting students, they were disinclined to use a tool such as MEAP since there were already too many tools to use and understand. A successful strategy to address this challenge was to highlight the time-saving benefits of MEAP. As one unit convenor noted, "Before MEAP came along, I would use the time consuming method of going through individual [LMS] logs to identify at-risk students

… and then send them individual messages. MEAP provides a far more efficient way to identify students by level of engagement and achievement, especially in large units."

When an institution implements LA it needs to be aware of risk aversion that some staff have in relation to negative student responses. The institution must be prepared to help staff place their concerns within a wider context of the benefits that a majority of students gain from the continuing use of LA. It is also important to deliver a message of persistence and dedication to allow sufficient time for LA to yield meaningful results (Arnold et al., 2014). The pilot attempted to convey this message through workshops and conversations between staff and the project team. Specifically, research (Liu et al., 2015a; Pistilli, Arnold & Bethune, 2012; Harrison, Villano, Lynch & Chen, 2016) was presented on the impact of LA on retention and students' behaviours, together with information from students and unit convenors that had already used MEAP and had gained benefits from its use.

The pilot was run over several semesters, allowing the university to develop a growing body of practice and understanding of the advantages and challenges of using LA. As unit convenors have become more aware of, and familiar with, the impact of MEAP on supporting their teaching and learning, they have started to support its use within their departments and with their colleagues. This resulted in more unit convenors using MEAP which in turn created a growing body of staff who relied on the tool to support students. This increase in usage was crucial in convincing senior management to support the development of MEAP into an enterprise tool in early 2017. It went from a tool only available to a small group of unit convenors in a pilot on a test server, to becoming available to all unit convenors on the institutional LMS.

The 'do it with' teachers approach was used when developing culture and behaviour for LA. It was important to understand, from the perspective of the unit convenor, the advantages of, and challenges faced using MEAP. We sought to understand the barriers that they faced when using new technology and worked with them to develop compelling reasons to adopt the new practice (Beer et al., 2014). This, in turn, resulted in new experiences for unit convenors and students that led to reflection and change and ultimately a development of culture and behaviour around LA at our university.

Leadership

Leadership is crucial to successfully launch LA in an institution, but also to ensure coordination, problem-solving and strategic planning (Arnold et al., 2014). However, the university was undergoing major change, and key policies in relation to LA had yet to be developed. LA had been an area of interest and focus of multiple

projects for a number of years, but no single view or direction prevailed. As a consequence, the university was not at a point where it could undertake strategic thinking or planning about LA. Despite this, the MEAP pilot was successful in driving a bottom-up adoption of a particular LA tool and development of practices, values, and culture around LA.

Conclusion

Leadership of a unified approach to LA was lacking in the university. This caused a drag on the development of organisational capacity. Fortunately, all the other stages (technology infrastructure, analytics tools and applications; policies processes, practices and workflows; values and skills; and culture and behaviour; Arnold et al., 2014) contributed to developing organisational capacity. In addition, the culture and behaviour that had been developed during the pilot acted as an impetus to drive senior management to make decisions that ultimately supported organisational capacity development in LA.

During the pilot, the project team used a combination of 'do it for' and 'do it with' teachers pathways (Beer et al., 2014) to support the integration of MEAP into teaching and learning at the university. The 'do it for' pathway provided for the expertise and knowledge of the 'technologists alliance' to develop policies, processes, practices and workflows that unit convenors did not have the time, inclination, interest or knowledge to develop. The 'do it with' pathway was followed when developing culture and behaviour, whereby the project team worked with teachers to understand from their viewpoint, the advantages and challenges of using MEAP. A combination of these two pathways was followed during the development of values and skills, allowing the growth of unit convenors' data literacies based on knowledge of the technology inherent in MEAP and their insight into learning design.

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Note: All published papers are refereed, having undergone a double-blind peer-review process.