Proposal for an Innovation and Development Grant

Project title:
Enabling connected learning via open source analytics in "the wild": Learning Analytics beyond the LMS

Lead institution: Queensland University of Technology
Partner institutions: University of South Australia; University of Technology, Sydney; University of Sydney, University of Texas, Arlington

1. Project Aims, Objectives, Outcomes and Deliverables

1.1 Aim(s)

This project aims to improve the quality of student engagement and learning in collaborative online environments by incorporating and analysing social media platforms that the majority of students already use. It will create an easy to use and open source Connected Learning Analytics (CLA) toolkit utilising the latest mathematical and computational approaches. The analytic tools delivered by this project will work within closely delimited learning activities, underpinned by connected learning pedagogy, which will (i) preserve student privacy, (ii) enable academics and students to identify the nature and quality of student connections, and (iii) assist with developing learning analytics systems that have strong pedagogical and technical features.

1.2 Objectives

The objectives of this project will be to:

- O1. Develop data analytic techniques that can be used to characterise connected learning, drawing on novel models from mathematics and computer science to extend the field of Learning Analytics (LA).
- O2. Use these new LA techniques to create a Connected Learning Analytics (CLA) toolkit which can be used to both: identify the nature and quality of student engagement in online learning activities; and provide real-time reports to students and academics.
- O3. Develop a set of protocols for utilising CLA feedback to plan, implement and evaluate real-time interventions for improving the quality of students' collaborative engagement and online learning.
- O4. Test the utility of the toolkit and protocols for intervening in student learning in specified social media environments, trialling it in selected Test Studies incorporating connected learning pedagogies.
- O5. Deliver training to the wider Australian higher education community in the underlying philosophy of connected learning, as well as its facilitation using the CLA toolkit.

1.3 Deliverables

In meeting these objectives, we will deliver:

- D1. Web based data capture and reporting tools that can query specific artefacts generated through participation in learning activities using designated social media. The web forms will be designed for users without programming skills.
- D2. An open source CLA toolkit for extracting data from a specified set of social media, analysing patterns of behaviour within it, and reporting it back in an understandable format. This will function in a limited educational context, so ensuring student privacy beyond the designed learning activities.
- D3. Protocols to guide interpretation of the analytics in the context of the specific learning activities adopted. This includes suggested interventions to facilitate student achievement of learning outcomes.
- D4. Widespread dissemination, support and training to the Australian higher education sector to aid the adoption and application of the CLA toolkit, via a website, workshops and a community of practice.
- D5. A report summarising: project activities; toolkit usage in the learning activities designed for social media environments; outcomes of wider training; and future development opportunities.

1.4 Outcomes

This project significantly advances the ability for academics and students to obtain timely and useful feedback on the nature and quality of connected learning evidenced by students in social media environments. The

ability to access such data will enable academics to better support and improve student learning. Thus, this project will enable us to bring the most recent advanced research in LA into current teaching practice.

2 Project Rationale and Need

2.1 Rationale

Contemporary higher education is opening up to a wide range of online learning opportunities and new technologies. For example, the 2014 NMC Technology Outlook for Australian Tertiary Education (Johnson et al. 2014) identifies a range of emerging technologies likely to be adopted within the next 1-5 years, including online and mobile learning, and learning analytics. However, the widescale adoption of such technologies will require a technical transition from closed "in house" Learning Management Systems (LMS) towards a more open and distributed engagement in "the wild", for example using social media.

At the same time, we see emerging connected learning pedagogies (Educause 2013; Ito et al., 2013) that are highly suited to online and mobile learning. For example, connectivist learning theory (Siemens, 2004) holds that knowledge and learning is distributed across a social, conceptual network. When people forge, negotiate and nurture connections (between people, information, knowledge, ideas and concepts), learning is more powerful and sustainable. Connected learning pedagogy is grounded in the long standing strength of social constructivist theories of learning, which are then combined with the affordances of digital and social media (Haythornthwaite & Andrews, 2011). Connected learning environments leverage social media to create learning communities that enable curation, co-creation and co-production through collaboration and peer support (Jenkins et al., 2006; Ito et al., 2013), allowing students to create personalised learning pathways.

These two drives, technical and pedagogical, raise three inter-related challenges that universities must face:

1. Supporting and scaffolding students as they learn to collaborate in online learning environments.
2. Proactively assessing the impact of learning activities in participatory technologies, returning feedback to students in a timely manner, which can then assist with their ongoing learning processes.
3. Providing support to students engaged in learning outside an institutionally controlled LMS.

This project seeks to address these challenges, by developing a *Connected Learning Analytics* toolkit that can be used to provide feedback to students and academics on the nature and quality of their online interactions in ubiquitous social media environments. Thus, this project asks:

How can we use learning analytics "in the wild" to provide feedback on the quality of connected learning?

It is not just the number of connections between students, but the *characteristics* of those connections that must be considered and analysed. The need for developing more nuanced qualitative data about student interactions was also identified in previous learning analytics projects funded by the OLT (e.g Dawson, et al., 2011). To date, the majority of data capture and analysis tools developed for educational settings (often for LMS) have tended to focus on quantitative measures, in lieu of assessing the rich set of qualitative data that is also generated through learning activities. Furthermore, many of the tools proposed for measuring the quality of an educational experience tend to rely upon indirect methods, such as student responses to surveys about their behaviour. For example, the Effective Lifelong Learning Inventory (ELLI) has a scale that includes *Learning Relationships* (the meta-cognitive capacity of knowing how to engage in connected learning, as well as when it is best to work alone); however, this approach gathers its data via the administration of surveys (Buckingham Shum & Deakin Crick, 2012), and so:

- Risks losing the contextuality of student interactions e.g. with different courses and teaching teams.
- Fails to recognise the problem that self report data is often a poor indicator of actual practice.
- Removes the data capture process from the point at which the learning activity is occurring.

Real time data collection would both allow for contextualisation to the scenario at hand, and provide accurate information about actual student practice, so enabling intervention and more immediate reflective steps.

This project will seek to extend the field of LA with a CLA toolkit. Such a step will be timely, as to date much LA experimentation has been driven by exploring what is becoming possible with new computational techniques and visualisations, but with a relatively weak grounding in pedagogy or instructional design. Yet all analytics approaches embody key assumptions about epistemology, pedagogy and assessment regimes (Knight et al., 2014) which shape the learning experience. Moreover, it is impossible to interpret analytics in a vacuum as

they are tied to the Learning Design which specifies, whether informally or explicitly, the intended learning behaviours and outcomes (Lockyer & Dawson, 2011).

This project will therefore design the CLA toolkit in close dialogue with academics currently using connected learning approaches in their teaching, in order to inform the design of both the user interfaces and underlying analytics. This is expected to be a mutual learning experience, as academics understand the possibilities of the new technologies, and learn how to think in terms of analytics, this will feedback into and test their learning designs, and the CLA toolkit itself. This method will greatly increase the likelihood of designing intelligible analytics which inform educators, and students, about progress on those qualities of most importance to student success. A diverse potential user base will therefore benefit from the outcomes of this project:

User Group A: Academics with little programming ability (many of whom are already utilising social media in their teaching practice), who would like to explore the potential benefits of LA.

User Group B: Technical developers working to deliver next generation analytics within an institutional setting, who are proficient in using existing technology and extending it as their particular usage requires, but who are not highly proficient mathematically or pedagogically.

User Group C: Students who want to understand the nature and quality of their collaborative online interactions in educational activities using social media.

The release of the Experience API (xAPI[1]) makes it possible to collect large amounts of data in a highly flexible manner and send it to a Learning Record Store (LRS) for immediate or later analysis. Taking xAPI as its basis, this project will develop a CLA toolkit. Tools will be provided to scrape data from specific learning activities into a LRS, from which it can be analysed using a range of semantic technologies. The resulting information will then be presented to students, academics and technical developers (User groups C, A, and B respectively) in a form that will enable them to explore the nature and quality of connected learning (see Fig. 1).

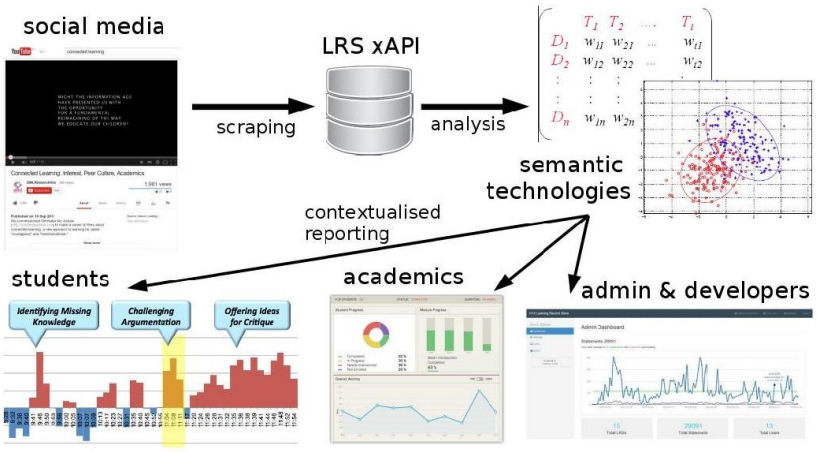

Figure 1: The CLA toolkit Conceptual Schema

2.2 Value and need for the project

Open Learning Analytics (OLA) has become an international priority, with the recent SoLAR OLA summit emphasising that LA is "poised to become mainstream technology".[2] This project will take a significant step towards advancing this international program, providing tools that help students to learn about their own learning in online environments. This is important, as all too often a trend has emerged in LA to report data at the institutional level (Siemens et al., 2013). While such post hoc organisational reporting is useful for the identification of systemic problems in course structure, delivery and basic learner engagement, it does not help current learners to learn, or make timely suggestions that they could use to improve their current practice. It also raises many concerns about privacy: are we merely 'spying' on our students? Moving from the more traditional organisationally focussed analytics, this project will create opportunities for learner centred analytics and content delivery, so helping to personalise student learning (Siemens et al., 2011).

More specifically, while the necessity of social interactions and peer collaboration is widely acknowledged as a key feature of modern pedagogical practice, at present such engagement tends to be tracked in LA systems via base level interaction maps (e.g. Dawson, 2010), which does not capture important variables such as the nature or quality of student interactions. Extending LA to the point where the rich semantics inherent in social learning contexts could be captured and used to classify student behaviour will require an ongoing and respectful dialogue to arise between education theorists and computer scientists. This project will create such

[1] An API is an Application Programming Interface, and specifies how different software components should interact with one another. The xAPI, as the new educational data standard provides a consistent technical framework that can be assumed in design.

[2] http://www.solaresearch.org/wp-content/uploads/2014/04/OLAPressReleaseFINALv2.pdf

a dialogue by bringing together experts from both communities, in the project team itself, as well as in the Reference Group and in the wider community of practice that it generates.

One problem preventing the broad-scale uptake of more sophisticated approaches to LA arises from the gap in expertise between User Group A (academics) and User Group B (technical developers). While a motivated computer scientist could design their own LA system, even utilising the xAPI and a LRS, this is not an option that can be undertaken by very many academics. As a result, educational specialists are forced to rely on in-house LMS, but these are viewed with scepticism by those academics most committed to connected learning.

> *A **major contribution of this project** will be its creation of a system agnostic LA toolkit that can be easily adopted by academics to their current teaching practice in widely accessible, social media environments.*

Specific class related learning activities will be designed in tandem with the CLA toolkit which will assist with analysis, interpretation, and sensemaking[3] of the data so obtained. This means that instead of a highly intrusive and unrestricted data capture of all events relating to a user, only data relating to events that occur within those learning activities will be captured. Thus, while the toolkit will take data from ubiquitous social media, it will do this without violating the privacy of students (see section 3.1 for an example scenario).

In summary, this project will address an important gap by delivering a sophisticated open source toolkit, informed by connected learning pedagogy, which can be utilised in any online learning environment implementing a LRS as stipulated by the newly released xAPI standard (Advanced Distributed Learning, 2013). For these reasons, this project both builds on prior OLT funded activities in this area and addresses the stated OLT priority for *Innovative use of technology in learning and teaching*.

2.3 Institutional commitment

The Society for Learning Analytics Research (SoLAR) & xAPI developers

SoLAR is an international society which "exists to ensure that there is an expansive, transformative vision for what analytics might mean for the future of learning and to promote critical practice-based research and discourse."[2]. One of its key priorities is to facilitate collaborative research, particularly in the development of OLA, and as such this project lies at the heart of current priorities for this key professional body, with several SoLAR Executive Members participating in this project (Dawson; Pardo; Buckingham Shum, and Siemens). Furthermore, this project will be well supported by the worldwide community of xAPI developers, via its demonstrated link with the Learning Locker developers (see the letter of support written by HT2 on p18).

QUT (Transform Program & Institute for Future Environments)

The Transform Program involves a significant investment of some 80 staff (and associated resources) working to develop fully online courses informed by connected learning pedagogies and appropriate learning analytics. The requirements of this program inspired the underlying framework for this project. The Transform Program will offer an obvious means of both identifying and approaching academics already using social media in their teaching (User Group A), as well as for a primary institutional implementation and testing of the toolkit (User Group B). Additionally, QUT's Institute for Future Environments (IFE), of which a number of the team are members (Kitto, Mallet & Bruza), has made a strong commitment to big data and sophisticated analytics, and hosts a number of research centres that will prove conducive to project progress and eventual wider dissemination of outcomes (including the ARC Centre of Excellence node in Mathematical and Statistical Frontiers of Big Data). The support of both Transform and the IFE is reflected by their cash and in-kind commitments to support this project (see Attachment 1B).

Partner Organisation Commitments

Each of the partner institutions The University of South Australia, The University of Technology Sydney, The University of Sydney and The University of Texas, Arlington offer substantial expertise in both Learning Analytics and Connected Learning, as well as excellent scenarios in which to examine the socio-technical pressures to better enable future adoption and dissemination. Each partner has committed expert staff to this project, and these core members of the project team will provide access to course teams who will work to test the CLA toolkit in specific learning scenarios unique to those institutions (see Attachment 1B).

---

[3] http://www.educause.edu/eli/events/eli-spring-focus-session/2012/sensemaking-beyond-analytics-technical-activity

3 Project approach

As discussed in the rationale, connected learning pedagogy will underpin the design and implementation of this project. Connected learning activities will be designed which enable students to interact and engage with ubiquitous social media. The quality and nature of this engagement will be analysed using the Connected Learning Analytics toolkit, and action research cycles will allow for ongoing testing and development.

3.1 Project methodology

Action research cycles will guide the ongoing implementation and trial of the effectiveness of the toolkit in specific connected learning activities, and software development will follow an Agile[4] methodology. This will result in a toolkit that can (i) obtain (i.e. scrape) social media data from student engagement in specific learning activities, (ii) send it to a Learning Record Store (LRS) capable of storing a wide range of other learning events in a unified format, (iii) analyse it using the latest semantic and machine learning approaches for rich textual information about the quality and nature of student interactions in the learning environment, and then (iv) report this data back to both students and academics, allowing for timely and ongoing intervention.

Five social media tools have been identified which are increasingly in widespread educational use: Facebook; YouTube; the Google cloud based tools (Google Communities, Docs, Analytics etc.); WordPress; and Twitter. In the first instance, the team will focus on creating tools that can extract data from these environments, using the context that they provide to narrow the scope of this project to a manageable level. We note that each would serve a different purpose in an online educational environment, with text based content delivered by a website such as WordPress, discussions between students enabled by tools like Facebook, Google Communities or Twitter, and video content easily delivered, and interacted with, via YouTube.

As a part of her Transform Fellowship, the project leader, Dr Kitto has been running a proof of concept pilot project in YouTube. The pilot project took its inspiration from a learning activity run in the QUT Creative Industries Faculty where students are required to produce a video, upload it to YouTube, and then provide rich commentary and analysis of other students' work. Such activities are "in the wild", beyond standard LMSs, which makes tracking student engagement and participation in them problematic. However, Google has released a number of APIs for interacting with YouTube[5] which allow for all of the information stored on a particular YouTube page to be extracted (e.g. the YouTube usernames of both the video poster, and of those who comment on their video, the text of the comments posted, and likes/dislikes). This data can then be sent to an independent LRS from where it can be accessed and analysed by other software. This pilot tool has been made available online,[6] along with a basic reporting function.

The team acknowledges that gathering data from social media "in the wild" may risk compromising student privacy. This risk will be addressed and mitigated by (i) designing data capture such that only data relating to learning activities will be harvested; (ii) informing students that only restricted data relating to learning activities will be scraped; and (iii) suggesting that students create a separate educational account to use when undertaking the learning activities if they would like to ensure a higher level of privacy.

The action research cycles will comprise the following stages: (i) learning activities designed and implemented (ii) data scraped; (iii) data analysed using the CLA Toolkit, (iv) data reported to academics and students as appropriate. Thus, we anticipate that after one cycle has both produced and trialled a set of learning activities, and associated LA reporting functionality, our user groups will be able to develop more sophisticated ways in which they can generate more rich connected learning experiences, and measure the results. A second and third cycle will thus enable the development of more advanced functionality and activities.

Ongoing user-led design of new connected learning activities

There will be 3 points in the action research cycle where workshops will be held with potential users. These workshops will allow users to interact with and explore the current prototype CLA tookit, and then provide feedback as to what further functionality they would like to see in an enhanced system. As the tools are designed within the context of explicitly specified learning activities (see the YouTube example above), these

[4] Agile software development involves an iterative and incremental process, where requirements and solutions evolve together through collaboration between self-organizing teams: http://en.wikipedia.org/wiki/Agile_software_development

[5] See https://developers.google.com/youtube/getting_started

[6] At https://users.on.net/~kirsty.kitto/CLT

workshops will provide a key testing point for the effectiveness of those activities. They will also be used to elicit proposals for new connected learning activities from those users, which will then form the basis of the next cycle of tool development. Furthermore, both the Reference Group, and the Community of Practice that is created at the beginning of the project (see phase 1, and section 3.3 below) will be a constant and ongoing source of new proposals for sophisticated learning activities that would be facilitated by the CLA toolkit.

Encouraging students towards meta-learning via Semantic Technologies

This project will make use of existing semantic technologies, which have not to date been widely used in Learning Analytics. We will implement a number of new analytic approaches and reports for different user groups, each based around student engagement within online learning communities and activities.

One semantic technology that this project will exploit involves latent topic models. These arose from the field of machine learning and have matured to the point where 'off the shelf' software components exist for thematic analysis of electronic discourse e.g., Latent Dirichlet Allocation, LDA (Blei, Ng and Jordan, 2003). The power of these approaches derives from underlying statistical methods, which flexibly capture the semantics of terms and concepts by their actual usage; themes are not fixed, but change according to the underlying discourse. This project will employ a recently developed iterative version of the LDA algorithm which allows an academic to interactively explore the spectrum of latent topics in a user friendly way. For example, themes can be used to identify the students who have expressed the same theme in their respective discourse. The latter aspect will be exploited to allow the academic to cluster students according to themes and then pair students based on similar (or opposing) thematic positions.

A second analytic tool that we will provide revolves around the notion of *cognitive presence*. This concept is defined as the extent to which participants in a community of inquiry are able to construct meaning through their communication within it (Akyol & Garrison, 2011) and so would prove highly useful in a connected learning framework. However, its analytical use has yet to be realised in LA due to the lack of a consistent operational framework. Recent work has demonstrated that it is possible to extract certain linguistic features from performing a content analysis of discussion forum transcripts, and relate these features to each level of cognitive presence (Joksimovic et al. 2014; Kovanovic et al., 2014). We will analyse online transcripts for evidence of this important connected learning concept, and show these results to the relevant students.

Test Studies at Partner Institutions

Each domestic partner institution (UniSA, UniSyd, and UTS), has committed to running Test Studies of the CLA toolkit, and each has been allocated $10,000 in the budget towards this goal. Development of the toolkit will occur at QUT, in close ongoing contact with a cohort of academics and students who are developing and using the online modules developed within the Transform Program for the Creative Industries and Education Faculty (Team members Banks and Lupton are both closely involved with these courses). The tools developed will then be trialled with cohorts at the partner institutions, both during the scheduled project workshops (for quick elicitation of requirements), and with the Test Studies scheduled for the second year of the project. An early call for expressions of interest to participate in these Test Studies has resulted in a large amount of interest. Academics who would like to participate in these Studies are documented at http://goo.gl/yZMpNp

3.2 Project phases and detailed activities

This project will follow three phases: Commencement, Development, and Wrap-up (see Attachment 1C).

Phase 1: Project Commencement (3 months)

This project will commence with an early set up phase, during which:

- An independent evaluator will be appointed, who will work closely with the project team. They will develop an evaluation plan during this time, in close consultation with the team and reference group.
- The Software Engineer, and Project Assistant will be recruited, and the internal QUT secondments will be arranged. (See Attachments 1A/B for details.)
- A specialised community of practice will be generated that bridges the already thriving SoLAR community of technical specialists (with their existing dissemination infrastructure) with existing communities of User Group A academics (e.g. the T2T. Techies meet teachers blog http://abelardopardo.blogspot.com.au/ and QUT's Higher Education Research Network).

Communication within this community will occur via a google community and Twitter account, and it will be used to recruit Group A academics interested in utilising the tools developed in this project.

- A Project Plan, Risk Management Plan and Communication/Dissemination Plan will be developed.
- Ethics approval will be obtained, allowing us to report data obtained from both academic and student participants. First, data will be obtained from both academics and students participating in QUT's online courses in Social Media Management and Education. Partner institutions (UniSA, UTS, and Sydney) will provide future participants within the specific Test Studies run at those institutions.
- The pilot project will be extended, with more data scraping capabilities set up for basic learning activities on standard social media platforms once (e.g. Twitter, Facebook, Google Tools, WordPress).

Phase 2: Toolkit development and testing - three Action Research cycles (18 months total)

Each Action Research cycle will follow the same set of steps:

1. Select a set of connected learning activities for implementation, based upon interactions with key user groups and stakeholders during the workshop held in the previous round.
2. In the context of the selected connected learning activities, identify the kinds of data needed to describe the nature and quality of the connected learning interactions.
3. Create tools that can run over a specified learning activity (so ensuring privacy), scraping specific data into a LRS specified by the User (academic or technical) utilising the CLA toolkit.
4. Design a reporting capability that interfaces with the dashboard framework proposed by the Open Learning Analytics initiative (Siemens et al., 2011) for each of the different User Groups (A, B, & C). Reports will be considered for their intervention possibilities, and these will be trialled in step 5.
5. Test the proposed learning activities and tools, both within the User workshops run during each team meeting, and within the broader case studies run at each Partner Institution. We will do this using (i) surveys and interviews that ask different user groups about their experience in using the tools (ii) analysing these responses with the data generated by those tools, and (iii) correlating both sets of data with external outcomes (e.g. assessment performance).
6. Hold a project team meeting between available participants, reference group members, and the independent evaluator appointed to the project, where we will use the feedback obtained from users in step 5 to determine the next set of priorities for implementation and testing.

Ongoing dissemination will occur during phase 2 via the community of practice and project reference group. The software engineer RA will be responsible for ensuring up to date software documentation is maintained throughout this phase, so enabling wider usage, and a smoother final wrap up phase. The project team will also develop appropriate publications (education media, conference and journal) throughout this phase.

Phase 3: Wrap up (3 months)

The final phase of the project will involve intensive evaluation of, and wider dissemination about, project outcomes. It will also finalise the development of project related documentation. We will:

1. Evaluate final products: Tools developed and user-tested in phase 2 will be evaluated by students and technical development staff, and by academic staff during the Project Conference (see section 3.4). Outcomes will be considered by the project evaluator. Further detail is provided in section 3.5.
2. Project Conference (SoLAR event): We will host a SoLAR Learning Analytics Summer Institute (LASI) as a key dissemination event (see section 3.4). The IFE has committed funds to bringing George Siemens to this event as an international keynote, which allows allocation of OLT funds to his domestic travel.
3. Documentation: this phase will involve the finalisation of a set of software related documentation that can be accessed by anyone intending to make use of the toolkit. This documentation will be made available on the project webpages, as well as in a downloadable pdf format.
4. Final Report: This final three months will also be devoted to the production of a final report which details the contributions of the project, and makes recommendations for future directions.

3.3 Dissemination

As *Open Source Software*, all tools resulting from this project will be made freely available for any interested party to use, extend, and/or adapt to their own purposes. This allows the toolkit to be freely used at both an organisational level (by any organisation using a LRS using the xAPI) or individually (via the web interface).

A communication strategy has been designed to encourage a wider adoption of the CLA toolkit:

1. A connected learning community will be created (phase 1), to inform ongoing project developments, assist test subject recruitment, and help widen awareness of project outcomes. A Google group and Twitter hashtag will be used to exchange information among interested parties. This community will itself provide a rich social media data source for analysis with the toolkit. Basic de-identified reports about community behaviour, made available on the project website, will demonstrate the toolkit's power.
2. A project website will be created (phase 1). This will (i) discuss the evolving toolkit, providing examples of usage and evolving user documentation, (ii) link to the connected learning community and ongoing analysis of its behaviour, (iii) provide an interface that individual academics can use to trial those functions of the toolkit that are amenable to such a form, and (iv) store past webinars and online information events.
3. Workshops will be held, both online and face to face with key stakeholders, and recordings will be made available via the project website. Four public workshops are planned, and will be co-located with team meetings in Brisbane, Adelaide, and Sydney.
4. QUT's Higher Education Research Network (HERN) will be encouraged to explore the project resources, and to disseminate via its own Australian networks.
5. The SoLAR (The Society for Learning Analytics Research) community will be reached via participation in the SoLAR Google group, and attendance at the Learning Analytics and Knowledge (LAK) conference.
6. The Project Reference group which will be provided with updates at each iteration of the Action Research cycle, and will assist with the wide scale dissemination of the project tools.
7. A Project Conference will be held in the final phase of the project (discussed below). This will be hosted by the project participants and other members of the domestic SoLAR community.
8. Key academic outlets, such as annual SoLAR Learning Analytics and Knowledge conferences, HERDSA, ascilite, the Journal of Learning Analytics, and British Journal of Educational Technology will be targeted.

Project Conference

In the final months of the project we will run a SoLAR LASI (Learning Analytics Summer Institute) in Brisbane, with a component dedicated to enabling connected learning via analytics. This will provide a key outreach opportunity for the project, allowing for a showcase of its results and tools, and helping to identify further development opportunities and user groups beyond the life of the project. The SoLAR LASI will seek to further the development of Learning Analytics as a whole in the Australian Higher Education context, and provide a further bridge between User Groups A and B via its demonstration of the Connected Learning Toolkit.

3.4 Evaluation framework

As discussed above, step 5 in the action research cycle will involve an evaluation step which will feed into further cycles of toolkit development. An independent evaluator will be appointed in Phase 1, who will work closely with the project team during this phase to develop an evaluation plan. This plan will include ongoing contact with the team (e.g. the evaluator will be present at all 4 Team Meetings discussed above), and will provide iterative feedback on progress and direction against project objectives, deliverables and milestones.

At the completion of the action research cycles (i.e. Phase 2) we will move into a final more formal evaluation phase. The evaluator will be asked to consider the usage of the new CLA Toolkit across four stakeholders:

User Group A academics: Evaluation will examine the extent to which academics using social media in their current teaching practice find the tools produced by this project enabling and useful.

User Group B: Evaluation will consider the number of type B users displaying interest in the toolkit.

User Group C students: Evaluation will consider how student learning processes change as a result of interacting with the tools produced by this project, and whether this affects their wider learning and assessment outcomes. Particular importance will be attached to the privacy of students, and how well the project has ensured that student data is only accessed for specific educational experiences.

Higher education organisations: Finally, the evaluation will examine instances of organisational commitment to the project, via proposed or actual large scale adoption and support.

4. Project management

This proposal brings together a team from four Australian Universities (QUT, UniSA, UTS, USyd) and one international (University of Texas, Arlington). Many of the project participants have established working relationships (e.g. UniSA, UTS, USyd, and UTex are all contributing team members who are part of the SoLAR

executive committee, and the QUT team comes from a set of established internal working relationships).The team leader, Dr Kirsty Kitto, has a proven track record of leading research projects, having lead an ARC Discovery Project to completion (DP1094974) as a part of her recently completed Australian Postdoctoral Fellowship. In addition, QUT is committing a part-time Senior Project Manager (HEW9 0.1FTE) to assist her with this enterprise, to which she has committed a substantial component of her time (0.4FTE). A Project assistant (HEW3 0.4FTE) will also be recruited to help with the day to day project management under the guidance of this Project Manager. The specific roles of team members are outlined in Attachments 1&2.

4.1 Risk management

A project of this size and scope requires rigorous risk management. The Project Manager working in collaboration with the Project Leader will have responsibility for monitoring risks in consultation with all team members. Risk management will feature in project reporting and will be a standing agenda item in Team meetings. A risk management strategy will be developed in Phase 1.

Staff turnover in project teams is repeatedly reported as a key challenge in OLT projects. However, the breadth of this team will help to ensure project consistency. The participants leading the project at each Institution (Kitto, Dawson, Buckingham Shum, Pardo and Siemens) will work with the Project Manager to ensure that a succession plan is in place to mitigate this risk.

Many of the risks associated with this project revolve around *technology changes*. APIs can change, and social media platforms frequently come and go. However, the open source nature of the toolkit serves to mitigate much of this risk. Open Source projects are well known for their quick responses to changes in APIs, and the dual nature of the CLA toolkit (scraping + reporting) means that any new social media source can be scraped for appropriate data as soon as a tool is released, with no underlying change in reporting and analysis tools. The risk of LRS/xAPI changes is mitigated by the established relationship between the project team and HT2 (the developers of the LRS to be used for this project – see Attachment 4), who have provided a letter of support for this project (see page 18).

Finally, a key potential risk, *that student privacy could be violated*, is controlled for by the design of the CLA toolkit itself. As the toolkit will be created to work within *specified learning activities,* it will not assist with the indiscriminate scraping of student data. Furthermore, as most social media APIs prohibit widescale access to their data, they will not allow for such indiscriminate data capture. Students who are exposed to the CLA toolkit will be informed of this, and given an opportunity to create alternative higher education accounts if they so desire.

4.2 Collaboration and communication strategy

Face to face meetings will be essential for enabling strong collaborations to occur between a large team. These events will also contribute to the wider dissemination strategy, as they will be used to run workshops aimed at engaging the broader community in the project itself. We have budgeted for travel, accommodation and other expenses involved in bringing each of the domestic project participants together at 4 key stages throughout this project: commencement, the beginning of action research cycles 2 and 3, and wrap-up. Further details about these events, as well as their costings, can be found in Attachment 1B.

In addition to these face to face events, the full team will meet once every month using the tools provided by the online community of practice (i.e. using Google 'hangouts' in the first instance). These meetings will be used to discuss ongoing ideas (one group will be scheduled to present a new idea in an informal seminar format each meeting), project management issues, and to identify potential new directions and opportunities as they arise. Wherever possible, webinars of project demonstrations and outcomes will be made available to the broader connected learning community, as this will help to demonstrate the current directions of the project, and so to generate 'pull requests' from potential toolkit users about what they would most like to see implemented next. All project participants will contribute to the community of practice generated as a part of the general project dissemination strategy (via the creation of posts, tweets, webinars etc.) and so will engage in frequent casual contact via this mechanism. Furthermore, the toolkit (as it is developed) will be used to analyse the behaviour of the team in this environment and so will provide an opportunity for the team to reflect about the nature and quality of its own interactions throughout the project. Extra *ad hoc* meetings will

also be planned as they become possible (e.g. at conferences, and as other travel commitments allow), to enable an ongoing dialogue to be created between the participants.

Wherever possible, documents produced by this project will be created in the cloud (e.g. using google docs), which will both eliminate version control problems, and ensure that all team members participate in the creation of publications and reports in a straightforward manner.

4.4 Reference group

A reference group will be appointed comprising experts from the LA and Curriculum Design communities. The following list of people have so far agreed to be involved: Professor Maarten de Laat (Open Uni Netherlands), Professor Phil Long (UQ), Professor Caroline Haythornthwaite (UBC), Dr Leah Macfadyen (UBC), Dr Christopher Brooks (UMichigan), Professor Jill Downie (Curtin), Assoc. Professor Simon Barrie (Sydney), Professor Beverly Oliver (Deakin).

5 References

Anderson, L. W., Krathwohl, D. R., & Bloom, B. S. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Allyn & Bacon.

Advanced Distributed Learning. (2013) Experience API Specification Version 1.0.0. Available at: www.adlnet.gov/resources/Experience_API_Specification_Version_1.0.0?type=technical_documentation

Akyol, Z., & Garrison, D. (2011). Understanding cognitive presence in an online and blended community of inquiry. *British Journal of Educational Technology*, *42*(2), 233-250.

Biggs, J. A & K. Collis (1982). Evaluating the quality of learning: The SOLO taxonomy. NY, Academic Press.

Blei, D., Ng, Y, & Jordan, M.J. (2003). Latent Dirichlet Allocation. *Journal of Machine Learning Research*, 3:993-1022.

Buckingham Shum, S. & Deakin Crick, R. (2012). Learning dispositions and transferable competencies: pedagogy, modelling and learning analytics. In *Proceedings of the 2nd International Conference on Learning Analytics and Knowledge* (LAK '12), Simon Buckingham Shum, Dragan Gasevic, and Rebecca Ferguson (Eds.). ACM, New York, NY, USA, 92-101.

Dawson, S. P. (2010). 'Seeing' the learning community: an exploration of the development of a resource for monitoring online student networking. *British Journal of Educational Technology*, 41 (5), 736-752.

Dawson, S. P., Bakharia, A., Lokyer, L. & Heathcote, E. (2011) 'Seeing' networks: visualising and evaluating student learning networks, OLT Final Report, http://www.olt.gov.au/resource-final-report-2011-0 .

EDUCAUSE (2013). "7 things you should know about connected learning." Retrieved May, 2014, from http://www.educause.edu/library/resources/7-things-you-should-know-about-connected-learning.

Fisher, J., Whale, F., & Valenzuela, S (2014). Learning analytics: a bottom-up approach to enhancing and evaluating students' online learning, http://www.olt.gov.au/project-learning-analytics-bottom-approach-enhancing-and-evaluating-studentsapos-online-learning-201

Haythornthwaite, C. & Andrews, R. (2011). *E-Learning theory and practice*, London, UK, Sage Publications.

Ito, M. Gutierrez, K., Livingstone, S., Penuel, B., Rhodes, J., Salen, K., Schor, J., Sefton-Green, J. & Watkins, S.C. (2014). Connected learning: an agenda for research and design. Irvine, C.A., The Digital Media and Learning Research Hub.

Jenkins, H., Clinton, K., Purushotma, R. , Robinson, A. J., & Weigel, M. (2006). *Confronting the Challenges of Participatory Culture: Media Education for the 21st Century*. Chicago, IL: MacArthur Foundation.

Joksimovic, S., Gasevic, D., Kovanovic, V., Adesope, O., & Hatala, M. (2014) Psychological characteristics in cognitive presence of communities of inquiry, *The Internet and Higher Education*, 22: 1-10.

Johnson, L., Adams Becker, S., Cummins, M., & Estrada, V. (2014). 2014 NMC Technology Outlook for Australian Tertiary Education: A Horizon Project Regional Report. Austin: The New Media Consortium.

Knight, S., Buckingham Shum, S., & Littleton, K. (2013). Epistemology, pedagogy, assessment and learning analytics. In Proceedings of the Third International Conference on Learning Analytics and Knowledge (LAK '13), ACM, NY, USA, 75-84.

Kovanovic, V., Joksimovic, S., Gasevic, D., & Hatala, M. (2014). Automated Cognitive Presence Detection in Online Discussion Transcripts, *Workshop Proceedings of LAK 2014*, Yacef, K. Drachsler, H. Eds. http://ceur-ws.org/Vol-1137/LA_machinelearning_submission_1.pdf

Lave, J., & Wenger, E. (1991). *Situated learning*. Cambridge: Cambridge University Press.

Lockyer, L., Heathcote, E., & Dawson, S. (2013). Informing pedagogical action: Aligning learning analytics with learning design. *American Behavioral Scientist*, 57 (10), p. 1439-1459.

Lockyer, L. & Dawson, S. (2011). Learning designs and learning analytics. In Proceedings of the 1st International Conference on Learning Analytics and Knowledge (LAK '11). ACM, New York, NY, USA, 153-156. http://doi.acm.org/10.1145/2090116.2090140

Siemens, G. (2004). Connectivism: A Learning Theory for the Digital Age. *elearnspace* http://www.elearnspace.org/Articles/connectivism.htm

Siemens, G., Gašević, D., Haythornthwaite, C., Dawson, S., Buckingham Shum, S., Ferguson, R., Duval, E., Verbert, K., Baker, R. (2011). *Open Learning Analytics: An Integrated and Modularized Platform* (Concept Paper): SoLAR. Available at: http://www.solaresearch.org/OpenLearningAnalytics.pdf

Siemens, G., Dawson, S., Lynch, G. (2013) *Improving the Quality and Productivity of the Higher Education Sector: Policy and Strategy for Systems-Level Deployment of Learning Analytics.* (White Paper): SoLAR. Available at: http://www.solaresearch.org/Policy_Strategy_Analytics.pdf