

# Embedding Learning Analytics in a University: Boardroom, Staff Room, Server Room, Classroom

*Simon Buckingham Shum*

*Connected Intelligence Centre, University of Technology Sydney  
PO Box 123, Broadway, Ultimo, Sydney, NSW 2007, AUS  
[Simon.BuckinghamShum@uts.edu.au](mailto:Simon.BuckinghamShum@uts.edu.au)*

**Abstract:** In this chapter, I describe and reflect on the last 8 years at an Australian public university, inventing, piloting and evaluating Learning Analytics tools, specifically focused on data-driven personalised feedback, leading in some cases to integration with the institution’s learning technology ecosystem, and accompanied by staff training and support. I will summarise this as conversations in the *Boardroom*, the *Staff Room*, the *Server Room* and the *Classroom*, reflecting the different levels of influence, partnership and adaptation required to introduce and sustain novel technologies in the complex system that constitutes a university, or indeed, any educational institution. This chapter is pragmatic, documenting aspects of our work that are typically not the focus in research papers, intending to make a practice contribution.

**Keywords:** Organisational Strategy, Innovation Diffusion, Personalised Feedback

## 1 Introduction

In this chapter, I describe and reflect on the last 8 years at an Australian public university, inventing, piloting and evaluating Learning Analytics (LA) tools, leading in some cases to enterprise-wide deployment accompanied by extensive staff training and support. I will summarise this as conversations in the *Boardroom*, the *Staff Room*, the *Server Room* and the *Classroom*, reflecting the different levels of influence, partnership and adaptation that are required to introduce and sustain novel technologies in the complex system that constitutes a university, or indeed, any educational institution.

- *The Boardroom* symbolises engagement with the university’s senior leadership, who need to understand how LA aligns with and advances their strategic priorities — since they expect returns on their investment in LA.
- *The Staff Room* symbolises engagement with the academics and tutors who need to understand in advance how LA could advance their teaching — since they expect returns on their investment of time and trust in introducing LA tools to their teaching practice.
- *The Server Room* symbolises engagement with the information technology service, who need to understand how LA fits into the university’s digital ecosystem — since they need assurance that this meets architectural requirements, will not compromise security, and meet data governance requirements.
- *The Classroom* symbolises actual engagement with LA by students and teachers ‘in the heat’ of teaching sessions (face-to-face and/or online) — since if this does not go well, trust in the value of LA is undermined for either or both educators and students.

I suggest that without the ability to conduct these very different kinds of conversations, LA teams will struggle to sustain the adoption and scaling up of LA tools. The implication is that LA teams must have people who can engage competently with these stakeholders and the agendas and constraints under which they operate. These rooms are of course interconnected: without Boardroom backing, there are no resources to sustain LA; without the Staff Room conversations nobody will be aware of LA tools, which will never make it into their classrooms, and senior leadership will not hear positive feedback from faculties; without robust computing infrastructure, end-users’ trust is eroded by unresponsive or unstable software; without IT approval, there is no case to argue to senior leadership for new development or procurement funds; and so forth. I hope, however, that the four rooms help rather than hinder, and serve as a *method of loci* mnemonic.

This chapter is intended to be very pragmatic, documenting aspects of our work that are typically not the focus in research papers, although the research-based invention and gathering of evidence is central to our *modus operandi*, and will be cited as relevant. So, this chapter is intended as a practice contribution, with links to online educator resources and practitioner stories illustrating what our work looks like in practice. I trust that this is of interest to readers seeking accounts of how LA tools can embed and scale in an educational institution.

## 2 “Learning Analytics”: scope and definitions

Before proceeding, I should clarify the kinds of LA-enabled applications that provide the context for these reflections. Firstly, there are *LA dashboards*, namely, business intelligence style graphs/charts summarising student data of some sort. While such dashboards certainly keep the human in the decision-making loop, this does not increase human agency if they are overwhelmed by too much data, or uncertain how to interpret and act. Such *exploratory* visualisations place the burden on the user to explore efficiently, interpret appropriately and act responsibly.

We see various strategies in the field for addressing this risk:

- *When the target user is the student*, the cognitive effort to derive actionable insights from a novel visualisation risks undermining adoption unless suitably scaffolded through learning design that makes this a pedagogically valued and productive activity. As discussed later, a significant part of our work has been to make the effort required to reflect on LA feedback into a productive activity by integrating it into student activities and assignments as formally valued work. We have also implemented a principle of “embracing imperfection” with advanced LA tools, which seek to provoke mindful engagement by learners through critical engagement with AI (Kitto et al., 2018). Finally, our most recent work has begun to focus on increasing *feedback literacy* as a capability that both students and educators bring to the use of automated feedback.<sup>1</sup>
- *When the target user is an educator*, increased workload will also raise concerns about the return on investment (ROI) — we are requiring staff to trust that their efforts will be repaid. One strategy for addressing this is to keep the dashboards so simple that they are essentially like “walk up and use” information appliances (cf. public interactive tools like tourist guides and automated bank tellers). However, with more sophisticated displays requiring exploration, one must provide effective training that builds LA literacy (Herodotou et al., 2020, Corrin et al., 2016). Equipped with this literacy, educators gradually build their agency and skills to read the dashboard and act confidently, safely and ethically (Molenaar and Campen, 2019, Li et al., 2021). This is analogous to pilots learning to fly by instruments when they lose direct visibility of the physical environment. To pursue the analogy, particularly with large cohorts, and especially in online learning, with limited visibility of one’s students, without dashboards and the competence to use them we might say that educators are somewhat “flying blind”. This approach — training teaching teams how to use complex dashboards — is exemplified by the in-house UTS Subject Dashboard<sup>2</sup> and commercial Canvas Analytics.<sup>3</sup>

An approach to mitigating the risk of gathering data whose interpretive effort outweighs the ROI, is that the LA (i) identifies significant patterns in the data rather than leaving this to the user, and (ii) lowers the effort required to take action. We take two main approaches to this. One approach is to focus on making LA dashboards *explanatory visualisations*, using ‘data storytelling’ as a design approach to actively communicate the most salient ‘take home’ messages, reducing the interpretive burden on the user. This approach is exemplified by tools such as the Nursing Simulation Teamwork Analytics (Fernandez-Nieto et al., 2021).<sup>4</sup>

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<sup>1</sup> DAFFI 2020: Designing Automated Feedback for Impact symposium: <https://cic.uts.edu.au/ensuring-automated-feedback-is-pedagogically-sound-daffi2020>

<sup>2</sup> Subject Dashboard training: <https://lx.uts.edu.au/events/overview-of-the-subject-dashboard-an-academic-perspective-28-february/> and <https://lx.uts.edu.au/blog/2022/04/13/what-the-subject-dashboard-can-teach-you-about-your-students>

<sup>3</sup> Canvas Analytics training: <https://lx.uts.edu.au/collections/building-your-canvas-course/resources/canvas-new-analytics>

<sup>4</sup> Nursing Simulation Teamwork Analytics: <https://cic.uts.edu.au/new-video-captures-cic-health-collaboration-on-automated-feedback-to-nursing-teams>

The other approach has been to involve academics in co-designing educational technology tools that assign greater machine agency, that is, interactive web applications that provide *automated feedback* to either students or teaching teams. This approach negotiates the ROI trade-off in a different way, by changing the human-machine “allocation of function” (to use an old ergonomics term). This approach requires greater effort to configure the responses the tools should provide to differentiate feedback to different student profiles, but the tools then act autonomously, sending instant or scheduled feedback, 24/7, to potentially hundreds of students at a time, which is humanly impossible. This approach is exemplified by tools like AcaWriter<sup>5</sup> (Shibani et al., 2022, Knight et al., 2020) and OnTask<sup>6</sup> (Lim et al., 2021, Lim et al., 2020).

### 3 Boardroom

**Securing senior leadership support.** In 2010, the University of Technology Sydney (UTS) began to discuss what it might mean to become a “data intensive university”, led by Shirley Alexander, the Deputy Vice-Chancellor for Education & Students (DVC-ES). This broad notion was inspired by the ‘big data’ transitions being witnessed in other sectors (health; retail; medicine; finance; leisure; etc.), and the emergence in education of the Learning Analytics community. Following several years’ cross-university consultation involving the senior leadership, interviews with operational leaders, and audits of university data stores and flows (or lack thereof), what started as the “Data Intensive University” was renamed the “Connected Intelligence Strategy” as a broader, richer notion, and the Connected Intelligence Centre (CIC) was launched in 2014.

The importance of this preparatory work (Figure 1) is not to be underestimated, since it led to senior leadership engagement and investment, and prepared the ground following launch, for the CIC team to work with stakeholders who were by then well aware of the senior backing behind it, and excited to engage.



**Figure 1: Timeline showing initial UTS strategic consultation process 2011-2013 on what became the Connected Intelligence Strategy, to launch of the Centre in 2014 and subsequent activity.**

As reflected in Figure 1, CIC’s mandate was very broad, namely, to catalyse greater data and analytics literacy among students, academics and professional staff, and show the utility of LA, with three years to prove our value. CIC’s organisational positioning outside the faculty structure emphasised the clear understanding that our mission was to add value to frontline business, providing data science insights to units spanning teaching, student support and research. The direct reporting to DVC-ES recognised LA as a distinctive, applied field requiring transdisciplinary, research-informed expertise that was not active in UTS. CIC was also given a faculty-like mandate to design and launch (i) a new Master of Data Science & Innovation degree, (ii) an introductory numeracy/data literacy course that faculties could permit their students to choose, and (iii) a PhD program

<sup>5</sup> AcaWriter orientation: <https://uts.edu.au/acawriter> and research <https://cic.uts.edu.au/tools/awa>  
Co-designing automated feedback on reflective writing with the teacher: <https://www.heta.io/co-designing-automated-feedback-on-reflective-writing-with-the-teacher>

<sup>6</sup> OnTask orientation: <https://cic.uts.edu.au/tools/ontask>

dedicated to LA. The staffing of the centre was therefore critical, with great emphasis placed on interdisciplinary, research-active, academic ability in LA, strong communication skills, as well as human-centred design and software developers to prototype interactive tools.

Buckingham Shum and McKay (2018) diagnose the pervasive research/services divide in universities which can result in what in other organisations would be considered deeply dysfunctional: a data science research group can be using state-of-the-art computational infrastructure to solve societal challenges, a faculty-based research group can be tracking the most robust evidence about effective LA — all just 10 minutes' walk over campus from the professional services data/analytics team who are struggling with outdated IT to address the university's strategic challenges, and no knowledge about how to design dashboards that educators will adopt. As we will see, this has implications for what happens in the Server Room, but where in the university organisational architecture the LA work has voice and visibility obviously plays out in the Boardroom. In reporting to the DVC-ES, I meet weekly with fellow directors who are leading UTS-wide student support, library services, and academic professional development in pedagogy and learning technology. This not only ensures that the DVC and directors are continuously abreast of our LA strategy and deployment, but in turn, our strategy could be aligned closely with these other facets of the student experience. CIC's data scientist also serviced these directors with reports, making the division the first in UTS to have its own data scientist to call on.

**Aligning LA with strategic priorities.** It is important that LA's practical benefits can be positioned in terms of the university's strategic priorities, since this can also open access to resources to advance the work — often much more rapidly than competing for scarce public research grants, accompanied of course by corresponding expectations of business outcomes. The UTS *Learning.Futures* strategy provided the teaching and learning approach that was being embedded at institution-level, within which we needed to position our LA work. At the time of writing, our current *UTS 2027* strategy foregrounds a range of thematic priorities, against which our LA tools align.<sup>7</sup> For instance, our work on skills analytics is funded internally to advance the priority on *Lifetime of Learning* and *Distinctive Identity* by informing prospective as well as current students about which courses will most likely equip them to achieve their career aspirations, engaging the public as well as enterprise learning partners.<sup>8</sup> The UTS *Learning.Futures2.0* strategy launched in 2021 had as one of its elements the use of *automated feedback*, in recognition of the progress CIC made.

**Budget.** Boardroom conversations are naturally often around resourcing. While CIC secures some competitive external research grants (e.g., Office for Learning & Teaching; AUS Research Council; AUS Technology Network of Universities), we have been fortunate that compared to a faculty research lab, less of our time must be devoted to grant writing since we have core funding as an institutional innovation centre. That normally enables longer-term planning and staff retention, with the proviso that the centre is demonstrating its relevance to UTS strategic priorities. Conversely, like all university units, CIC's budget drops in financially challenging times (whereas an external grant is guaranteed for its duration). The closest model, therefore, is with any corporate or government R&D lab, whose mission is to keep the organisation on the forefront of practice, with foresight of what may come over the near horizon. CIC started as a Strategic Project for its first three years, converted to core business on successful review by university leadership. The 2017 report documented a range of quantitative and qualitative indicators of impact, including the level and types of engagement CIC had across UTS, the numbers of students and staff using our LA web applications, data science consulting across business units, the success of the Masters degree program, and the international standing of UTS in the LA community. CIC has also received short-term funding for strategic projects, including several small, 1-year learning and teaching innovation grants partnering with faculties,<sup>9</sup> plus R&D developing skills analytics services<sup>10</sup> which integrate with other platforms, and advance university strategy around lifelong learning and the future of work.

**Advancing data/analytics pedagogy and literacy.** There is scope for LA teams to help advance the university's agenda to be on the leading edge of pedagogy, delivering a future-focused student experience. *Transdisciplinary* teaching and learning are one of the hallmarks of UTS at undergraduate level (Baumber et al., 2020, Kligyte et al.,

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<sup>7</sup> UTS 2027 Strategy: <https://strategy.uts.edu.au>

<sup>8</sup> UTS Tailored Recruitment Analytics & Curriculum Knowledge (TRACK) web applications: <https://cic.uts.edu.au/track-data-informed-insight-into-how-the-uts-curriculum-maps-to-careers>

<sup>9</sup> Examples of internally funded CIC learning and teaching innovation projects partnering with faculties: <https://cic.uts.edu.au/category/project/uts>

<sup>10</sup> TRACK: data-informed insight into how the UTS curriculum maps to careers: <https://cic.uts.edu.au/track-data-informed-insight-into-how-the-uts-curriculum-maps-to-careers>

2022), opening opportunities for CIC to demonstrate the difference this could make to the teaching of data science. CIC designed, launched and coordinated the first transdisciplinary postgraduate degree at UTS, the Master of Data Science & Innovation (MDSI)<sup>11</sup> for its first three years before handing it over in 2018 to a new faculty dedicated to Transdisciplinary Innovation. The high degree of engagement that students had with state government and industry, often winning data hackathons, showcased the distinctive quality of UTS students, providing examples for senior leaders to point to. While not all LA centres run Masters programs, far more can offer shorter training programs which demonstrate how they are advancing their university's strategy by upskilling students and staff in data and analytics. CIC also designed and ran *Arguments, Evidence & Intuition*<sup>12</sup> as an elective course for any student, advancing the institutional priority to improve numeracy and data literacy. As UTS developed its online learning program in 2018, material from this was adapted and extended to create free, open modules such as *What Does Facebook Know About You?* and others.<sup>13</sup> These courses were accompanied by accessible communications for general readership to provoke greater curiosity in the topics.<sup>14</sup> This capacity to create engaging learning experiences does of course require the right kinds of academic staff, bringing teaching skills likely to be missing if an LA centre is staffed only with data scientists and software developers — another strong argument for entwining LA teams with academic teams.

**Keeping faculties informed and onboard.** CIC presents briefings to Faculty Boards and Associate Deans with oversight of their faculty's teaching, where it has been important to demonstrate the relevance of CIC's work to each faculty. Depending on the collaborative partnerships forged with that faculty's academics, this might include examples of automated feedback tools in use within their degree programs, including evidence of the responses of the teaching team and students to such novel technology, and the impact on student experience and outcomes. This emphasises the need for the LA centre to have the capability to evaluate the impact of LA pilots, in order to create an evidence base (detailed in next section).

**Statistical consulting.** Complementing deployments of LA-enabled educational technologies, are more conventional statistical analyses of institutional data ("academic analytics" to use the terminology of Siemens and Long, 2011). CIC hired a data scientist in a non-academic role to provide statistical analyses in response to business questions faculties and student support units faced. While we referred to this as 'consulting' this was not for fee, but a reference to the mode of engagement with our 'clients', and with no expectation that this should lead to research publications, which is always a legitimate concern when PhD students and postdoctoral researchers are asked to undertake such work. To take one example, *Is there any evidence that the student cohort who spent their second year abroad benefited from this, compared to their peers who stayed at home?* This required a comparison with students on the same degree program and elective courses, but without the international year. To be robust, this analysis involved tens of thousands of individual student grades over many years. The results did indeed demonstrate a positive impact, enabling the faculty to be confident in making evidence-based claims when advertising their international program. CIC has also serviced non-faculty units with statistical analyses, such as a student support centre who asked, *Can we claim that students who come to us for academic support benefit in terms of their grades?* The analysis demonstrated how the gap had closed over successive years for students who had sought support.

**Data storytelling.** It is common that presentations for senior leaders produced by data scientists are not always the most intuitive for their audience, typically packed with detail that can overwhelm. The field of "data storytelling" offers a set of information design principles that we have adopted to provide helpful guidance for multimodal LA feedback (Echeverria et al., 2018), but also use to refine the presentation of our more conventional statistical analyses to be more engaging for non-specialist audiences, and to advise other groups developing

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<sup>11</sup> UTS Master of Data Science & Innovation 2015-17: <https://cic.uts.edu.au/professional-development/mdsi>

<sup>12</sup> UTS Arguments, Evidence & Intuition elective 2015-17: <https://cic.uts.edu.au/professional-development/aei>

<sup>13</sup> UTS Open Taster Modules developed by CIC academics Kirsty Kitto and Simon Knight, to build introductory data and statistical literacy:  
What Does Facebook Know About You? <https://open.uts.edu.au/uts-open/study-area/analytics--data-science/critical--creative-thinking/what-does-facebook-know-about-you>  
Journey Through Data: <https://open.uts.edu.au/uts-open/study-area/analytics--data-science/critical--creative-thinking/journey-through-data>  
Statistical Thinking: <https://open.uts.edu.au/uts-open/study-area/analytics--data-science/data-science/statistical-thinking>

<sup>14</sup> Simon Knight and Kirsty Kitto (2018), *4 Ways to Build Data Curiosity*. UTS Futures: <https://ix.uts.edu.au/blog/2018/08/21/4-ways-build-data-curiosity>



dashboards.<sup>15</sup> No matter how rigorous our analysis, if we lose our audience, we don't do ourselves justice, and the work may have no impact.

## 4 Staff Room

**Walking in the shoes of academics.** If we can't talk to teachers and gain their confidence, we're not going to get very far deploying LA apps in their classrooms. Consequently, CIC's appointments included academics who were also experienced educators. We know what it takes to teach students at undergraduate and postgraduate levels, using blended learning pedagogies. We appreciate the constraints on what is possible in a given classroom setting, and the challenges of coordinating other academics and casual tutors around a course innovation. We know the pros and cons of the different learning technologies available. We know what it is like to grade, and to receive critical feedback in student surveys. We know the pressures on academics to publish research, as well as teach. Without members of the LA team who appreciate the lived experience of academics and tutors, there is a risk that unrealistic assumptions are made in the design and deployment of LA, as evidenced, for instance, in the literature now emerging around obstacles to educators' adoption of LA dashboards (Kaliisa et al., 2022).

CIC's team has a sound understanding of what it will take for academics to pilot an LA tool with their students. The team can also share with them the evidence we already have from previous uses in UTS, support them in deployment to minimise the risks of technology failure, and help them co-author peer reviewed publications that add to their research profiles. An important element in our approach to LA is alignment with learning design (LD). In brief, while LD specifies what you hope will happen, LA tells you (partially) what's actually happening (Lockyer, et al. 2013). LD provides the context that enables the meaningful interpretation of analytics: whether or not a pattern of usage is productive or not depends on what the students were being asked to do. We detail elsewhere the framework that has been refined over the years to enable the contextualisation of LA to different courses (Shibani et al., 2019), and have documented the student and teacher experience with different tools. Rigorous research around the adoption of LA also provides the evidence base when making a case to senior leaders — an evidence base that is in fact more robust than is typically available for any other learning technology product the university deploys.

**Reframing LA as Automated Feedback.** For most academics other than the computing disciplines, “analytics” is either a meaningless term, or deeply suspect, part of the Big Data rhetoric about which many are justifiably sceptical. For those that care about student outcomes and creating a high quality student experience, however, the concept of feedback is familiar, albeit challenging. The massification of higher education has left academics and tutors with scarce time to devote to giving each student the personal care and feedback they would like to offer. For this reason, we talk much more these days about *automated feedback* than LA — emphasising that we are not automating people out of jobs, but equipping them to co-design how they want to use such tools to expand their capabilities as a teaching team, as part of a richer feedback ecosystem.<sup>16</sup> This coincides with a UTS-wide priority to increase *sense of belonging*, and improve *feedback literacy* among both students and educators.

Those are the kinds of conversations to hold in the Staff Room. It can also be seen that from an LA strategic perspective, there is no point in gathering data if it is not actioned. The imperative to show the value of data-intensive tools motivated the focus on automating the analysis and actioning of data, with personalised feedback which now spans dispositional feedback, skills feedback, collocated teamwork feedback, writing feedback and LMS engagement feedback. Each of these is the focus of evaluation studies that clarify the student and staff response, and contribute to the peer reviewed research evidence base.

## 5 Server Room

**LA tools must be robust and usable.** All of the preceding considerations establish the organisational and human context in which LA can take root and thrive, and are, arguably, the most difficult conversations to have, given the inertia of changing organisational processes, and upskilling staff. However, if the technology itself is not usable, stable, secure, scaleable, on-brand, and supported when problems arise, all this will have been for nought.

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<sup>15</sup> UTS Subject Dashboard: educator stories: <https://lx.uts.edu.au/blog/2022/04/13/what-the-subject-dashboard-can-teach-you-about-your-students>

<sup>16</sup> Automated Feedback: UTS educator briefings <https://lx.uts.edu.au/blog/2021/06/11/automated-feedback-looking-back-forward>

As discussed in some detail by Buckingham Shum and McKay (2018), there are inherent tensions in universities between developing innovative, research-inspired LA in-house because there are no products that provide such advanced capability, and evolving these into 24/7 enterprise grade services. The incentives and skillsets required to do each of these are rarely found in the same team. CIC's rationale, organisational position and modus operandi require a particular organisational structure, which aims to blend research-inspired innovation with reliable service delivery.

In contrast to building a research concept demonstrator, LA research involving student-facing tools must scale elegantly, which is aided immeasurably by contemporary cloud computing infrastructure that can expand and contract capacity dynamically depending on the load. Tools must also be usable, and as they move into mainstream use, university branded. CIC's work emphasises human-centred design as a mindset, but it is still easy to underestimate the effort it takes to refine a user interface to the point where it is 'walk up and use', or close to this following minimal orientation. This typically requires liaison with the UTS IT Unit's graphic and interface designers, and accessibility testing services.

One way to sum up the LA software transition required is the move *from LA project to LA product*. LA projects are the bread and butter of research groups, typically lasting for a few years, in order to investigate and demonstrate exciting new research ideas, after which the team moves onto the next grant or the next PhD student. Even if there is continuity in the software development, there are critical steps to this becoming a recognised part of the learning technologies ecosystem, governed by the IT services division, and which many/most research projects do not reach.

These include:

- institutionally approved user authentication ("single sign-on") to provide a seamless and trusted user experience for students and staff;
- auditing of the software to ensure compliance with preferred/required language and architectural design
- security of code and APIs
- cloud hosting in infrastructures approved for security and location (student data should not ideally leave our State, or at least stay in Australia, which may require additional vendor effort);
- cloud scaling strategy to meet variable user demand;
- integration of the tool into support services, so that should a student report a problem, there is a workflow to handle the issue.

Satisfying the above technical requirements in order to deploy at scale requires many conversations, learning new business processes, documentation, and the building of trusted partnerships. The LA team must be able to "talk tech" in the server room, and build confidence in the IT services division that they know what they're doing, and will not be responsible for a data or security breach that could compromise the university, or poor branding/user experience.

## 6 Classroom

The classroom is, of course, where we hope to see LA-enabled learning technologies — once we successfully negotiate the Staff Room and Server Room. The software must be both sufficiently usable and robust when deployed in the pressure of live lectures and workshops, where a traumatic experience with broken technology can dissuade academics from risking it a second time. We therefore work closely with academics to maximise the chances of a positive experience for them and their students.

**Human and technical support in the classroom.** If a whole cohort of students will be using a tool in a classroom, we need to ensure that the system can handle possibly hundreds of simultaneous logins, which for a computationally intensive tool like our writing feedback app, might require a responsive increase in cloud resources. CIC may field researchers to present live, or pre-recorded video briefings, in introducing a new tool, to relieve extra load on the academics. The classroom extends, naturally, to the online world. We build orientation portals and share news stories for students and staff,<sup>17</sup> and construct modules in Canvas that provide an extended introduction, with activities to scaffold use of a new tool.

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<sup>17</sup> UTS orientation for LA tools: *Learning Journeys* dispositional feedback <https://LearningJourneys.uts.edu.au> and *AcaWriter* writing feedback <https://uts.edu.au/acawriter>

**Sound learning design safety net.** A ‘safety net’ that can be provided in case LA tools do fail for some reason, which is to ensure that the activities in which students were intended to use the tool is still a meaningful, productive activity without the tool. We have detailed how this learning design strategy has been used with our writing feedback tool in courses, by modifying well-designed assignment activities with the optional use of AcaWriter (Shibani et al., 2019, Shibani et al., 2022).

**Explaining LA relevance to students.** It is critical that students understand the relevance of an LA-enabled tool to their studies and career aspirations. The faculty academics are the best people to explain this to their students, and often bring a passion and energy that excites students, which may be missing if CIC designs and delivers the presentation (students don’t know us, and we lack the domain knowledge), or if the introduction is left to the many casual tutors who are employed to support teaching (but who are less motivated about the new tool). Since academics cannot attend every class in person, we now have a number of videos from academics introducing the tool to their students, explaining why as a lawyer, accountant or pharmacist (to take three examples) they need to care about making rhetorical moves visible in their writing.<sup>18</sup>

**Evaluating what actually happens.** Central to our approach is to evaluate, using quantitative and qualitative methods, what *actually* unfolds in the (physical/online/blended) classroom, and the stakeholders’ *experiences* of these, as well as *process and product* impacts. As detailed in our research articles, these deployments in authentic teaching contexts are extremely illuminating regarding how students and educators engage (or not) with the LA tools, clarifying both the enabling factors as well as the obstacles (e.g., technical; usability; pedagogical; logistical) and strategies for resolving them. Explicit attention is paid to questions such as whether academics feel that the time investment required to introduce a new tool was justified (Shibani et al., 2020); students’ emotional responses to receiving novel forms of automated feedback using AI (Lim et al., 2020); and privacy values about who should be able to see and act on LA visualizations of student activity (Martinez-Maldonado et al., 2020). Research studies can provide a detailed understanding of whether students are able to make effective use of automated feedback, leading to pedagogical interventions to more effectively scaffold their use of the tool. For instance, Shibani, et al. (2022) describe the creation of annotation tasks for students to encourage deeper, critical engagement with the automated writing feedback, while studies of the use of the OnTask tool by Lim et al. (2021b) documented negative student responses to automated ‘nudges’, who suggested that metacognitive prompts in the form of questions could be more productive. Regarding dispositional analytics, Barratt-See et al. (2017) report qualitative and quantitative findings from piloting the CLARA tool with nearly 3000 students, distilling a more detailed internal report that provided the basis for procurement of the product. Research studying student responses to OnTask has similarly provided the evidence base needed to justify ongoing investment (Lim et al., 2021, Lim et al., 2020, Lim et al., 2022).

Design iterations tend to follow the semester cycle, as lessons are learned from each deployment, but may take longer depending on other factors. Consequently, while academics and instructors will see improvements (and some academics co-author research papers with CIC), most students will not, unless a subsequent course also uses the same tool. At this stage, usage of these tools is not so ubiquitous at UTS that degree-wide adoption is the norm, but we are now beginning to have such conversations, which represents another significant milestone. However, as certain tools reach a level of maturity that they can be released to all students for self-initiated usage (AcaWriter; Learning Journeys; TRACK), this increases the chances of students seeing improvements over the longer term, as they would expect to see in the commercial products they use.

**Academic professional development and support.** The importance of ongoing staff development with LA tools cannot be overstated. There is a longstanding, large graveyard of ed-tech innovations that fail to move “beyond prototypes” (Scanlon et al., 2013), with a key challenge being lack of investment in staff to help them use new tools effectively and with confidence. We therefore run regular briefings in the central campus “Learner Experience Lab” (<https://lx.uts.edu.au>) where academic development workshops are run for staff, introducing the different tools, explaining what they do (and don’t do), showing examples of their use in UTS, and inviting follow-up conversations for academics to explore in detail how they might introduce the tool into their course.<sup>19</sup> We have started to convene small communities of practice (Lave and Wenger, 1991), which enable academics with different

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<sup>18</sup> AcaWriter educator resources with UTS examples: <https://www.uts.edu.au/research-and-teaching/teaching-and-research-integration/acawriter/educators/how-acawriter-being-used-uts>

<sup>19</sup> For instance, see LX Lab briefings on Automated Feedback <https://lx.uts.edu.au/?s=%22automated+feedback%22> • AcaWriter <https://lx.uts.edu.au/?s=acawriter> • OnTask <https://lx.uts.edu.au/?s=ontask> • TRACK <https://lx.uts.edu.au/?s=track> • Learning Journeys <https://lx.uts.edu.au/?s=%22learning+journeys%22>



levels of experience to meet and share how they are using a tool. This is also a forum where we as researchers can share the latest technical advances, teaching practices and research evidence, or convene workshops to prioritise new features for future releases or products. The academics may become co-authors with us when writing up collaborations, and may also present/publish the work in their own disciplinary communities concerned with education (engineering education, pharmacy education, etc.).

**Doctoral researchers.** It is labour-intensive work to partner with an academic and walk with them as they introduce LA-enabled tools for the first time, not only for themselves, but often, for the degree program they teach, and in their faculty. Particular acknowledgement is deserved for the contribution that doctoral researchers can make in this regard, since CIC doctoral researchers need to bring not only a passion for their research, but a commitment to supporting the academic(s) with whom they work, and strong interpersonal capable of sustaining long term collaborations. Students may not be in the Boardroom, but are part of the Staff Room conversation that conceives the partnership, and very hands-on before/during Classroom engagement when the stakes are at their highest for the educator in front of students, and for the students using new ed-tech.

Good PhD students add critical capability to the team, with the time and skills to explore new possibilities with academics in order to co-design LA tools that they come to trust sufficiently that they are ready to deploy them with their students. Of course, a PhD is a high risk undertaking at the best of times, and working in authentic contexts with academics and paying students raises the stakes, but it is also exhilarating when it goes well. Our students have used combinations of Design-Based Research and Human-Centred Design as methodologies to structure such research, give academics a voice, minimise the risks, and learn from each iteration. Naturally, the academic supervisors play a critical role in managing the risks for all stakeholders, as students seek to test advanced concepts within the constraints of all four Rooms discussed here.

**Beyond early adopters.** Within months of launching, CIC ran a series of briefings open to all academics and tutors. I introduced the topic of LA, explaining our strategic interest in building transferable, lifelong learning competencies, and demonstrating the kinds of approaches that were now becoming available for academic writing, learning dispositions, and embodied learning. We were seeking early adopter partners and invited academics to ‘pitch’ to CIC (using a simple template) the match they saw between these kinds of LA, and teaching challenges they were experiencing. This launched our first six or so faculty collaborations. Several years later, there was a distinct sense of passing an important milestone when these academics presented their use of LA to their colleagues within their faculties, and at the annual UTS Learning & Teaching Forum, as well as on national and international stages. These academics are typical early adopters, who are interested in new technology, and open to making changes in their teaching in order to take advantage of the new affordances. Their courage, however, is what encourages enquiries from their colleagues (in UTS, and nationally/internationally) about using LA in their teaching. Compared to hearing LA researchers enthuse about their work, seeing a trusted academic colleague describe their positive experiences using LA to teach often speaks volumes more to academics.

We now have such ‘second generation’ academics using all of our LA tools, as well as academics ‘inheriting’ courses that pioneered LA, who now requiring briefings because ‘this is a tool used in this course’ just like other ed-tech products. We are also beginning to discover by accident that an academic has introduced one of our tools without engaging at all with CIC, which is both exciting (this has grown so big we can’t keep track of it), but also concerning since it exposes weaknesses in the induction processes that we have sought to establish (especially if they are not introducing the tool as something of a ‘bolt on’ rather than as an integrated part of their course’s learning design). We are considering whether teaching teams should need a ‘driving licence’ before they jump behind the wheel of our tools, as a quality control measure, or whether culturally, this will not be accepted.

## 7 Closing reflections

I have discussed and reflected on each room as we have walked through them. In this final section, I will touch on a couple of topics that span all of them.

Questions around data ethics, algorithmic bias, explainable AI, and so forth are rightly to the fore of many people’s minds when we discuss LA. This is a topic that CIC has engaged with academically (Kitto and Knight, 2019, Khosravi et al., 2022), providing the university with a deep understanding of the issues. It brings an unusually high degree of control over the LA we design and deploy, compared to procuring commercial products with limited algorithmic transparency, or permitting only minor re-configuration/modification. This permits us to adopt more human-centred design processes that engage stakeholders in evaluating early prototypes, building the trust required to deploy live.

While all LA research is governed by the Human Research Ethics Committee, access to data must also be approved by the DVC(ES) who must be briefed about the project, and integrations of data from more than one UTS unit must be declared in Data Sharing Agreements. Students must be able to give informed consent, and we must be able to exclude their data if they choose to withdraw. Visualisations can have an aura of truth around them for educators and students, but if it leads to misinterpretation and inappropriate action, poor information design suddenly takes on ethical implications.

Most recently, we have investigated a ‘deliberative democracy’ model for in-depth consultation with UTS staff and students about the principles that should govern the use of LA (and now AI) in learning technologies, with promising results (Buckingham Shum, 2022). This modelled a structured, participatory and rewarding process for tech ethics consultation, with a concrete deliverable, and helped to catalyse the drafting of a UTS AI ethics policy. At the time of writing, members of this staff/student team are reviewing the principles they proposed against the draft AI Ethics policy, maintaining their voice in shaping responsible technology governance. CIC has also convened a movie screening and panel debate to engage the UTS community with the ethical implications of Big Data in society.<sup>20</sup> Initiatives such as these are designed both to educate the university community, and build trust that UTS is deploying LA in a responsible manner, since no matter how usable and technically sound the LA may be, if the community loses trust this could be hard to regain.

To conclude, it is a privilege to be given the opportunity to shape an institutional innovation centre charged with advancing data literacy, and LA-enabled learning and teaching, with the freedom to hand-pick a team whose expertise covers applied, transdisciplinary research, human-centred design, full-stack software development and enterprise integration. I hope that the reader leaves with a clearer sense of how our journey has unfolded, since the “back room” conversations are rarely foregrounded in LA literature. In order to deploy LA-enabled tools in authentic contexts, we must sustain and manage the interdependencies between, conversations in the Boardroom, Staff Room, Server Room and Classroom. And as in any meaningful conversation, it comes down to trust.

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<sup>20</sup> *The Human Face of Big Data*: public screening and panel debate <https://cic.uts.edu.au/events/human-face-of-big-data-movie-panel>

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